

Syllabus of Under Graduate Course

Session: 2025-26	
Part A – Introduction	
Subject	Sanskrit
Semester	V
Name of the Course	आयुर्वेदिक पाककला और सात्त्विक जीवनशैली
Course Code	B25-VOC-142
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	VOC
Level of the course (As per Annexure-I)	100-199
Pre-requisite for the course (if any)	NA
Course Learning Outcomes(CLO):	CLO : 1 – इस घटक के अन्तर्गत आयुर्वेद के अनुसार आहार, आहार के गुण, आहार के प्रकार एवं ऋतु के अनुसार भोजन आदि का ज्ञान कराया जाएगा । CLO : 2 – इस घटक में पारम्परिक खाद्य पदार्थों यवादि धान्य, मासाले, दुग्धादि के गुणों एवं प्रयोगविधि का बोध कराया जाएगा । CLO : 3 – उपवास हेतु फलाहार, व्यञ्जन, पेयपदार्थ, विरुद्धाहार एवं षड्रसों का अवबोध कराना इस घटक का उद्देश्य है । CLO : 4 – अनाज, दालें, सब्जियाँ, फल एवं घृतादि आहार से प्राप्त होने वाले पौषक तत्वों का ज्ञान इस घटक द्वारा कराया जाएगा । CLO : 5 – इस घटक के माध्यम से ऋतु अनुसार आहार,

	पित्तशामक ठण्डाई सूप, आरोग्यवर्धक रस आदि बनाने का प्रायोगिक ज्ञान दिया जाएगा।		
Credits – 4	Theory	Practical	Total
	2	2	4
Contact Hours	30	30	60
Max. Marks: Theory+Practical 50 + 50 = 100 Internal Assessment Marks: 15 + 15 =30 End Term Exam Marks: 35 + 35 =70		Time: 3 Hrs.	
Part B- Contents of the Course			
Instructions for Paper-Setter			
1. प्रश्नपत्र में पांच प्रश्न होंगे । प्रश्नपत्र के लिए 35 अंक निर्धारित हैं । प्रत्येक प्रश्न 7 अंक का होगा ।			
2. प्रथम प्रश्न अनिवार्य होगा, जो पाठ्यक्रम के चारों घटकों पर आधारित होगा । इसमें 7 लघूत्तरीय विकल्परहित प्रश्न होंगे । प्रत्येक प्रश्न एक अंक का होगा ।			
3. द्वितीय तृतीय चतुर्थ एवं पंचम प्रश्नों का निर्माण यथाक्रम चारों घटकों से होगा । प्रत्येक घटक से वैकल्पिक प्रश्न दिये जाएंगे ।			
Unit	Topics		Contact Hours
I	आयुर्वेदिक आहार का वैशिष्ट्य, सत्त्विक-राजसिक-तामसिक भोजन, ऋतु-अनुसार आहार, आयुर्वेदिक ग्रन्थों में वर्णित अन्न, जल एवं भोजन का माहत्म्य । एक निबन्धात्मक प्रश्न		7
II	प्रमुख भारतीय खाद्य पदार्थों का पारम्परिक एवं आधुनिक ज्ञान यव, तिल, मधु, क्षीर, सन्तु आदि । मसाले-हल्दी, हींग, जीरा, सौंठ, लवंग, त्रिफला, जायफल, दालचीनी, इलायची आदि ।		7

	दुग्ध, घृत, दही, मट्ठा आदि । अन्नं हि औषधं श्रेष्ठम् । ”नात्यश्नतः तु योग्यः भोजनसमयः“ । आदि सिद्धान्त एक आलोचनात्मक/निबन्धात्मक प्रश्न अथवा दो टिप्पणियाँ	
III	उपवास हेतु फलाहार, व्यंजन । पेय पदार्थ- बेल, गुलाब आंवला आदि का शरबत गिलोय, तुलसी सौंठ, सौंफ आदि का काढ़ा । षड्रस एवं उनके गुण व लाभ एक निबन्धात्मक/समीक्षात्मक प्रश्न	8
IV	आहार एवं पौष्टिक तत्त्व चावल, जौ, गेहूँ, बाजरा, रागी आदि अन्न, दालें एवं फलियाँ (मूंग, मसूर, चना, उडद, रजमा आदि) फलों एवं सब्जियों से प्राप्त होने वाले पोषक तत्वों का परिचय, विश्लेषण एवं प्रयोग । घृत तेलादि खाद्य पदार्थों से प्राप्त पोषक तत्त्व । एक विश्लेषणात्मक/समीक्षात्मक प्रश्न अथवा दो टिप्पणी	8
V	ऋतु के अनुसार एक आहार तैयार करना । यवागू (दलिया आदि) बनाना । पित्तशामक ठण्डाई, कफशामक सूप (कटु, कषाय, तिक्त, लवण आधारित) फलों से आरोग्यवर्धक रस बनाना । पथ्यापथ्य आहार तालिका, दैनिक आहार चार्ट निर्माण (ऋतु अनुसार, दोषशामक) ।	30

Suggested Evaluation Methods		
Internal Assessment:	30 Marks	End Term Examination: 35+35 =70 Marks
➤ Theory + Practical	15+15 = 30	
• Class Participation, Continuous comprehensive Evaluation	4+5	
• Seminar/presentation/assignment/quiz/class test etc.:	4+10	
• Mid-Term Exam:	7+0	

Part C-Learning Resources	
Recommended Books/e-resources/LMS:	
1.	चरक संहिता, चैखम्बा संस्कृत सीरीज आफिस, वाराणसी, 2012
2.	आयुर्वेद रत्नाकर, चैखम्बा ओरएंटलिया, वाराणसी, 2015
3.	सात्विक पाकशास्त्र, इस्कान फूड फार लाइफ, मुंबई, 2018
4.	Health and Diet, स्वामी शिवानंद, डिवाइन लाइफ सोसाइटी, ऋषिकेश, 2004
5.	जीवन में आयुर्वेद, आचार्य बालकृष्ण, दिव्य प्रकाशन, हरिद्वार, 2020
6.	Ancient Indian Food, K.T. Achaya, Oxford University Press, New Delhi, 2002

Syllabus of Under Graduate Course

Session: 2025-26	
Part A – Introduction	
Subject	Sanskrit
Semester	VI
Name of the Course	संस्कृतसाहित्य में पर्यावरण संरक्षण का आधुनिक दृष्टिकोण
Course Code	B25-VOC-341
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC
Level of the course (As per Annexure-I)	100-199
Pre-requisite for the course (if any)	NA
Course Learning Outcomes(CLO):	CLO : 1 – छात्रों को वैदिक साहित्य में प्रदर्शित पर्यावरण संवेदनशीलता से परिचित करना इस घटक का उद्देश्य है । CLO : 2 – वर्तमान सन्दर्भ में उपनिषदों एवं पुराणों में पर्यावरणीय दर्शन की उच्च चेतना से अवगत कराना इस घटक का अभिधेय है । CLO : 3 – संस्कृतकाव्य, नीति व धर्म शास्त्रों के पर्यावरण सन्देश का अवबोध इस घटक द्वारा कराया जाएगा । CLO : 4 – संस्कृतभाषा की सूक्तियों में निगूढ मानव व प्रकृति के मध्य गहन सम्बन्ध से अवगत कराना इस घटक का उद्देश्य है । CLO : 5 – इस घटक में पर्यावरण चेतना हेतु नाटक, वृक्षारोपण प्राकृतिक स्थलों का भ्रमण एवं रिपोर्ट तैयार करना आदि कार्य कराये जाएंगे ।

Credits – 4	Theory	Practical	Total
	2	2	4
Contact Hours	30	30	60
Theory+Practical Max. Marks: 50 + 50 = 100 Internal Assessment Marks: 15 + 15 =30 End Term Exam Marks: 35 + 35 =70		Time: 3 Hrs.	
Part B- Contents of the Course			
Instructions for Paper-Setter 1. प्रश्नपत्र में पांच प्रश्न होंगे । प्रश्नपत्र के लिए 35 अंक निर्धारित हैं । प्रत्येक प्रश्न 7 अंक का होगा । 2. प्रथम प्रश्न अनिवार्य होगा, जो पाठ्यक्रम के चारों घटकों पर आधारित होगा । इसमें 7 लघूत्तरीय विकल्परहित प्रश्न होंगे । प्रत्येक प्रश्न एक अंक का होगा । 3. द्वितीय तृतीय चतुर्थ एवं पंचम प्रश्नों का निर्माण यथाक्रम चारों घटकों से होगा । प्रत्येक घटक से वैकल्पिक प्रश्न दिये जाएंगे ।			
Unit	Topics	Contact Hours	
I	वैदिक साहित्य में पर्यावरण सन्देश वेदों में पृथ्वी, वायु, अग्नि, जल, सूर्य, नक्षत्रादि की उपासना। ऋग्वेद के भूमिसूक्त का सन्देश, ऋत व सन्तुलन का सिद्धान्त, यजुर्वेद के शान्तिपाठ का सन्देश । आपः स्वस्तये । ऋग्वेद 10.9.4, आदित्याय च सोमाय च । यजुर्वेद अ. 16, वायुरस्मि । ऋग्वेद 10.168.4 एक निबन्धात्मक प्रश्न अथवा मन्त्रव्याख्या	7	
II	उपनिषदों व पुराणों में पर्यावरणीय दर्शन • ईशावस्योपनिषद् में वर्णित उपभोग की मर्यादा की वर्तमान	7	

	में प्रासंगिकता (तेन त्यक्तेन भुञ्जीथाः) - अश्वमेधसहस्राणां सहस्रं यः समाचरेत् । एकाहं स्थापयेत्तोयं तत्पुण्यमयुतायुतम् ॥ अग्निपुराण, अ.16 (कूपादिप्रतिष्ठाकथन) - यथा वायुं समाश्रित्य वर्तन्ते सर्वजन्तवः । तथा प्रकृतिमाश्रित्य वर्तते निखिलं जगत् ॥ एक आलोचनात्मक प्रश्न अथवा मन्त्र/श्लोक व्याख्या	
III	संस्कृतकाव्य, नीति व धर्म शास्त्रों में पर्यावरण सन्देश । - ऋतुसंहार में पर्यावरण संरक्षण का सन्देश वनानि शीर्णपल्लानि पर्वता वल्लकलाम्बराः।.... आदि - परोपकाराय फलन्ति वृक्षाः....। नीतिशतक - दशकूपसमा वापी दशवापी समो हृदः।....मनुस्मृतिः 3/76 - न हिंस्यान्न प्राणिनं कञ्चि दिह लोके स्वकीयसुखहेतोः।.. हितोपदेश - पंचतन्त्र की कथाओं में निहित पर्यावरण सन्देश एक समीक्षात्मक प्रश्न अथवा श्लोक व्याख्या	8
IV	संस्कृतसूक्तियों में निहित मानव-प्रकृति सम्बन्ध व पर्यावरण सन्देश - वसुधैव कुटुम्बकम्, यत्र विश्वं भवत्येकनीडम्, आपः शुद्ध्यन्तु, अन्नं ब्रह्म । - मूले ब्रह्मा त्वचा विष्णु शाखा शंकरमेव च । पत्रे पत्रे सर्वदेवायां वृक्षराजो नमोऽस्तुते ॥ - ओं पृथिव्यै नमः, अन्नपूर्णायै च नमः, वसुन्धरायै च नमः - त्वं भूमिर्मधुमती पुण्या, त्वं शक्तिः पापनाशिनी ।	8

	त्वं माता सर्वतत्त्वानां त्वामहं शरणं गतः ॥ एक निबन्धात्मक/समीक्षात्मक प्रश्न अथवा सूक्ति/श्लोक व्याख्या	
V	पर्यावरणीय सन्देश हेतु श्लोक एवं चित्र-सहित संस्कृत भाषा में पोस्टर निर्माण । पंचन्त्र आधारित पर्यावरणीय नैतिकता पर लघु नाटिका लेखन एवं मंचन । स्थानीय प्राकृतिक स्थल नदी, झील, वन, उपवन का निरीक्षण कर पर्यावरणीय स्थिति की रिपोर्ट तैयार करना । तिविधि (कोई एक)- • महाविद्यालय परिसर में ओषधीय वृक्षों नीम, बेल, आँवला तुलसी आदि का रोपण • वृक्षों एवं पौधों के लिए संस्कृत नाम पट्टिका • वृक्षों के नामों की संस्कृत शब्दावली सहित चित्र प्रदर्शनी	30

Suggested Evaluation Methods

Internal Assessment: 30 Marks ➤ Theory + Practical 15+15 = 30 • Class Participation, Continuous comprehensive Evaluation 4+5 • Seminar/presentation/assignment/quiz/class test etc.: 4+10 • Mid-Term Exam: 7+0	End Term Examination: 35+35=70 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. ऋग्वेद संहिता, सम्पादक/अनुवादक: डा. रामगोविन्द त्रिपाठी, प्रकाशकः, चैखम्भा संस्कृत संस्थान, वाराणसी, प्रकाशन वर्ष, 2008 (नवीन संस्करण)
2. अथर्ववेद भाष्य, सम्पादक/अनुवादक, श्री सत्यव्रत सामश्रमी, प्रकाशक: चैखम्बा, ओरिएंटलिया, वाराणसी, प्रकाशन वर्ष, 2010
3. उपनिषद्-संग्रह (दशोपनिषद्) सम्पादक: डा. रामानन्द तिवारी, प्रकाशक: मोतीलाल बनारसीदास, स्थान, दिल्ली, प्रकाशन वर्ष, 2015
4. काव्यशास्त्र में पर्यावरण, लेखक, डा. उमा चतुर्वेदी, प्रकाशक, रश्मि पब्लिकेशन्स, दिल्ली, प्रकाशन वर्ष, 2018
5. कालिदास और पर्यावरण चेतना, लेखक: डा. मनीषा शर्मा, प्रकाशक, प्रभात पब्लिकेशन्स, दिल्ली, प्रकाशन वर्ष, 2021
6. हितोपदेश एवं पंचतंत्र में प्रकृति संरक्षण, लेखक: डा. सुधा भारद्वाज, प्रकाशक: ओरिएंट ब्लैकस्वान, हैदराबाद, प्रकाशन वर्ष: 2019
7. Environment in Ancient Sanskrit Literature, लेखक: Dr. V. Raghavan प्रकाशक: The Kalakshetra Press, चेन्नई, प्रकाशन वर्ष: 1977 (प्रसिद्ध क्लासिक पुस्तक)
8. वैदिक साहित्य में पर्यावरण चेतना, लेखक: प्रो. हरिदत्त शर्मा, प्रकाशक: श्री लाल बहादुर शास्त्री राष्ट्रीय संस्कृत विद्यापीठ, नई दिल्ली, प्रकाशन वर्ष, 2022

Kurukshetra University, Kurukshetra

Department of Geophysics



**Scheme of Examinations and Syllabus of
M. Sc. (Tech.) Applied Geophysics I to VI Semester
Under CBCS-LOCF
(w.e.f. session 2025-2026)**

Vision and Mission of Kurukshetra University

Vision

Be globally acknowledged as a distinguished centre of academic excellence.

Mission

To prepare a class of proficient scholars and professionals with ingrained human values and commitment to expand the frontiers of knowledge for the advancement of society.

Introduction

The sustainable development of society needs energy resources, clean drinking water, safety, advanced technologies and clean Earth environment. Geophysics is the study of physical processes of Earth and its surrounding space. It is a multidisciplinary subject with applications from Physics, Geology, Computer Science, Electronics etc. The interior of Earth can only be studied by indirect methods like propagation of seismic wave. The study of different phases from Earth provides constraints which are used to interpret physical properties of Crust, Mantle, Outer Core and Inner Core. The Earth processes are studied to know about origin of the Earth. The geophysics applications include Oil & Gas exploration, Ground Water exploration, Archaeological studies, Environmental studies, Seismic Hazard, Mineral explorations, Civil engineering, Geotechnical etc. The outer space applications include study of moonquakes, gravity field and magnetic field.

Vision and Mission of the Department of Geophysics

Vision

Be recognized as distinguished department in the Geophysical World for learning and research in Applied Geophysics.

Mission

To prepare the professionals in the broad spectrum of Applied Geophysics e.g. earthquake hazards, hydrocarbon exploration, tectonics, mineral and ground water resources etc. to serve the society.

Programme Outcomes (PO) of Post Graduate Science CBCS Programmes/Courses in the Faculty of Sciences, Kurukshetra University, Kurukshetra

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge one has gained during course of study
PO2	Research Aptitude	Develop research aptitude. Capability for asking relevant/appropriate questions. Capable of identifying, formulating and analyzing the research problems and to draw conclusions from analysis of research problems.
PO3	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO4	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO5	Individual and Team Work	Capable to learn and work effectively as an individual and as a member or leader in team(s) and in multidisciplinary settings. Facilitate cooperative or coordinated efforts on the part of a group and act together as a group or as a team.
PO6	Investigation of Problems	Ability of critical thinking and analytical reasoning. Ability to use disciplinary and research based knowledge including design of experiments, analysis and interpretation of data to provide valid conclusions.
PO7	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices.
PO8	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PO9	Life-Long Learning	Ability to acquire knowledge and skills including learning 'How to learn' that are necessary for participating in learning activities throughout life.
PO10	Ethics	Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism and adopting objective, unbiased and truthful actions in all aspects of work.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these as a member / leader of a team to manage projects

Programme Specific Outcomes (PSOs) for M.Sc. (Tech.) Applied Geophysics

PSO1: Understand the interior of Earth using latest Geophysical knowledge pertaining to various sub-fields within the discipline of Applied Geophysics.

PSO2: Inculcating analytical ability, research aptitude and relevant skills in the students useful for their professional life.

PSO3: Ability to demonstrate and communicate Geophysical knowledge, understanding of Geophysical techniques/principles and apply the same to solve geophysical problems relevant to society.

PSO4: Learning the techniques of data acquisition, data processing and data interpretation for Geophysical methods and their applications for the benefit of society.

DEPARTMENT OF GEOPHYSICS KURUKSHETRA UNIVERSITY KURUKSHETRA**SCHEME OF EXAMINATION, TEACHING LOAD AND SYLLABUS OF
M.Sc. (Tech) Applied Geophysics*****FIRST SEMESTER EFFECTIVE FROM THE SESSION 2025-26:***

S.No.	Course no. & Course	Teaching Load (hrs/week/group)			Th/P	Marks Distribution			Duration of Exam (Hours)
		L	T	P		CW	Total	Credit	
1.	GP-101: Mathematical Methods in Geophysics	4	½	0	60	40	100	4	3
2.	GP-102: Solid Earth Geophysics	4	½	0	60	40	100	4	3
3.	GP-103: Numerical Methods & Computer Programming	4	½	0	60	40	100	4	3
4.	GP-104: Basic Geology	4	½	0	60	40	100	4	3
5.	GP-105: Geology Lab	0	0	8	60	40	100	4	3
6.	GP-106: Computer Lab	0	0	8	60	40	100	4	3
Semester Total		16	2	16			600	24	

SECOND SEMESTER EFFECTIVE FROM THE SESSION 2025-26:

S.No.	Course no. & Course	Teaching Load (hrs/week/group)			Th/P	Marks Distribution			Duration of Exam (Hours)
		L	T	P		CW	Total	Credit	
1.	GP-201: Remote Sensing & GIS	4	½	0	60	40	100	4	3
2.	GP-202: Advanced Computing	4	½	0	60	40	100	4	3
3.	GP-203: Geophysical Signal Processing	4	½	0	60	40	100	4	3
4.	GP-204: Geophysical Fields & Waves	4	½	0	60	40	100	4	3
5.	GP-205: Geophysical Lab - I	0	0	8	60	40	100	4	3
6.	GP-206: Geophysical Lab - II	0	0	8	60	40	100	4	3
7.	GP-207: Geological Field Training	4 hrs/week*					100	4	30 min. per student
Semester Total		16	2	16			700	28	

THIRD SEMESTER EFFECTIVE FROM THE SESSION 2025-26:

S.No.	Course no. & Course	Teaching Load (hrs/week/group)			Marks Distribution				Duration of Exam (Hours)	
		L	T	P	Th/P	CW	Total	Credit		
1.	GP-301: Seismology	4	½	0	60	40	100	4	3	
2.	GP-302: Gravity & Magnetic Prospecting	4	½	0	60	40	100	4	3	
3.	GP-303: Groundwater Geophysics	4	½	0	60	40	100	4	3	
4.	GP-304: Electrical Prospecting	4	½	0	60	40	100	4	3	
5.	GP-305: Geophysical Lab-III	0	0	8	60	40	100	4	3	
6.	GP-306: Geophysical Lab-IV	0	0	8	60	40	100	4	3	
7.	OE-306 Dynamics of the Earth	2	0	0	35	15	50	2	2	
Semester Total		18	2	16				650	26	

FOURTH SEMESTER EFFECTIVE FROM THE SESSION 2025-26:

S.No.	Course no. & Course	Teaching Load (hrs/week/group)			Marks Distribution				Duration of Exam	
		L	T	P	Th/P	CW	Total	Credit	(Hours)	
1.	GP-401: Petrophysics & Well Logging	4	½	0	60	40	100	4	3	
2.	GP-402: Physical Oceanography & Marine Geophysics	4	½	0	60	40	100	4	3	
3.	GP-403: Seismic Prospecting	4	½	0	60	40	100	4	3	
4.	GP-404: Geophysical Inversion	4	½	0	60	40	100	4	3	
5.	GP-405: Geophysical Lab – V	0	0	8	60	40	100	4	3	
6.	GP-406: Geophysical Lab - VI	0	0	8	60	40	100	4	3	
7.	GP-407: Geophysical Field Training-I	4 hrs/week*					100	4	30 Min. per student	
Semester Total		16	2	16				700	28	

FIFTH SEMESTER EFFECTIVE FROM THE SESSION 2025-26:

S.No.	Course no. & Course	Teaching Load (hrs/week/group)			Marks Distribution			Credit	Duration of Exam (Hours)
		L	T	P	Th/P	CW	Total		
1.	GP-501: Near Surface Geophysics	4	½	0	60	40	100	4	3
2.	GP-502: Electromagnetic and Magenotelluric Methods	4	½	0	60	40	100	4	3
3.	GP-503: Geophysical Lab-VII	0	0	8	60	40	100	4	3
4.	GP-504: Geophysical Lab-VIII	0	0	8	60	40	100	4	3
5.	GP- Elective – I	4	½	0	60	40	100	4	3
6.	GP- Elective – II	4	½	0	60	40	100	4	3
Semester Total		16	2	16			600	24	

SIXTH SEMESTER EFFECTIVE FROM THE SESSION 2025-26:

S.No.	Course no.& Course	Marks Distribution		Duration of Exam Hours	
		Th/P	CW		
1.	GP-601: Dissertation	4 hrs/week*	400	16	30 min. per student
2.	GP- 602: Comprehensive Viva-Voce	1 hr/week*	100	4	30 min. per student
3.	GP- 603: Seminar	1 hr/week*	100	4	01 Hour per student
4.	GP-604: Geophysical Field Training-II	4hrs/week*	100	4	30 min. per student
Semester Total			700	28	

@For the students of other departments of the university.

*Credited to the teacher(s) associated with Field training/dissertation work/seminar/Comprehensive viva-voce of the students

**Students have to opt one course in third semester to be offered by other departments of the university or these courses can be opted though MOOCS/Swayam. However, students can opt for summer/industrial training in lieu of open elective course of 3rd semester. This training can be done in the summer vacation falling in the period intervening between second and third semester and as per university guidelines.

Elective – I Solid Earth

GP-506: Computational Seismology
GP-507: Geomagnetism
GP-508: Whole Earth Dynamics
GP-509: Solid Mechanics
GP-510: Numerical Simulation of Earth System
GP-511: Non-linear Geophysics

Elective – II

GP-512: Geotomography
GP-513: Seismic Data Analysis & Reservoir Geophysics
GP-514: Reservoir Modelling
GP-515: Radiometric Exploration
GP-516: Advanced Remote Sensing & Image Processing
GP-517: Artificial Intelligence & Machine Learning in Geophysics

GP-101: Mathematical Methods in Geophysics

Credits: 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

After completion of this course, the students will be able to:

- CO101.1:** Learn the concept of different mathematical special functions for the solution of geophysical problems.
- CO101.2:** Understand the concept of complex variables and different series for the application in geophysics
- CO101.3:** Learn the basics of Laplace and Fourier transforms and its application in geophysics.
- CO101.4:** Learn different kinds of partial differential equations and its solutions.

Special Notes:

Nine questions will be set and students will attempt five questions. Question no. 1 will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. 1, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Special Functions

Power series method to solve partial differential equations Legendre Function: Legendre differential equation and its solution, recurrence relation, Legendre functions, Rodrigue's formula, Associated Legendre functions and its recurrence relations and orthogonality property Bessel Functions: Bessel differential equation and its first and second solutions, Bessel functions, Recurrence relations, Orthogonality, Modified Bessel function, Spherical Bessel functions Applications of Legendre and Bessel functions in Geophysics

Unit-II: Complex Variables

Complex variable, limit, continuity and differentiability of function of complex variables, analytic functions, Cauchy Reimann's equations, Cauchy's integral theorem, Morera's theorem, Cauchy integral formula, Expansion by Taylors and Laurents series, singularities, Residue theorem, contour integration Applications in Geophysics

Unit-III: Integral Transforms

Fourier series, evaluation of coefficients of Fourier series, sine and cosine series, complex form of Fourier series, Dirichlet condition, integration and differentiation of Fourier series, Parseval theorem for Fourier series, Fourier sine and cosine integral Concept of integral transform, Laplace Transform (L.T): definition, properties, L.T. of periodic function, multiplication and division with L.T., L.T. of error function, L.T. of Bessel function, Inverse Laplace Transform. Fourier transform (F.T.): Definition, properties, Parseval theorem for F.T., Modulation, Conjugate and Convolution Theorem, Derivative of F.T., Inverse Fourier transform, application of Fourier transform in solving differential equations. Applications in Geophysics

Unit-IV: Partial Differential Equations (P.D.E.)

Solution by separation of variables of

- (a) Wave equation: Transverse vibrations of a stretched string; Oscillations of a hanging chain, vibrations of rectangular and circular membranes, tidal waves in a canal.
- (b) Laplace's equation: Laplace equation in Cartesian, Cylindrical and spherical coordinate systems, two dimensional steady flow of heat, General cylindrical and spherical harmonics.
- (c) Diffusion equation: Variable linear heat flow, periodic heat flow in one dimension, two dimensional heat conduction.

RECOMMENDED BOOKS

- (1) Applied Mathematics for Engineers and Physicists by L .Pipes & L.R. Horwell
- (2) Mathematical Methods for Physicists by G. Arfken

- (3) Mathematical Physics by B.S. Rajput
- (4) Elementary Applied Partial Differential Equations: With Fourier series and Boundary Value Problems by Richard Haberman
- (5) Integral Transforms by I. Sneddon
- (6) Elements of Partial Differential Equations by I. Sneddon

GP-102: Solid Earth Geophysics

Credits: 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

After completion of this course, the students will be able to:

CO102.1: Understand the basics of geophysics and origin of solar system as well as to develop concept of different theories for the evolution of earth

CO102.2: learn different radiometric dating techniques and to develop concept of gravity and its essential features.

CO102.3: Develop concept on magnetic properties of the earth and heat flow inside the earth.

CO102.4: Understand earthquake seismology, internal structure of the earth and mountain building

Special Notes:

Nine questions will be set and students will attempt five questions. Question no. 1 will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. 1, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Origin of the Solar System and Earth

A brief history of the development of Earth Sciences and of Geophysics in particular, an overview of Geophysical methods and their essential features, Problems of inversion and non-uniqueness in Geophysics, Origin & evolution of Solar system, Earth and Moon structure, Kepler's law of planetary motion, A review of the Earth's structure and composition

Unit-II: Rheology, Radiometric Dating and Gravity of the Earth

Chemical composition of Earth, Rheological behaviour of crust and upper mantle, viscoelasticity and rock failure criteria, Geochronology: Radiometric dating and their advantages, meaning of radiometric ages, Major features of the Earth's gravitational field and relationship with tectonic processes in the crust and upper mantle, concept of isostasy, mathematical concept of Airy and Pratt hypotheses of isostasy.

Unit-III: The Earth's magnetic field

Origin of geomagnetic field, polar wandering, secular variations and westward drift, reversals of geomagnetic field, sun spot, solar flares, geomagnetic storms, sea-floor spreading, Paleomagnetism and its uses, Thermal history of the Earth, sources of heat generation and temperature distribution inside the earth, convection in the mantle.

Unit-IV: Earthquake Seismology and Interior of the Earth

Earthquake seismology, Earthquakes and its classifications, Global seismicity and tectonics, Earth's internal structure derived from seismology, Earthquake mechanism and Anderson's theory of faulting, Continental drift and plate tectonics: its historical perspective and essential features, present day plate motions, Triple junctions, oceanic ridges, Benioff zones, trenches and island arcs, hot spots, Mantle Plume, Mountain building, origin, structure and subdivision of Himalaya, Geodynamics of Indian subcontinent.

RECOMMENDED BOOKS:

- (1) The Solid Earth by C.M.R. Fowler
- (2) Understanding the Earth by I.G. Guass, P.S. Smith and R.G.L. Wilson
- (3) The dynamic Earth by P.J. Wyllie
- (4) Introduction to Geophysics by B.F. Howell
- (5) Physics and Geology by J.J. Jacobs, R.D. Russel and J.T. Klilson
- (6) Fundamental of Geodynamics by A.E. Schieddeggar
- (7) Fundamentals of Geophysics by W. Lowrie

GP-103: Numerical Methods And Computer Programming

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to:

CO103.1: Learning about the problem solving approach and different operating systems used for computer programming to be used in processing.

CO103.2: Learning and acquiring knowledge of FORTRAN and its functions used for developing the codes used for processing and interpretation of geophysical problems.

CO103.3: Acquiring knowledge of C along with its functions for the development of programs.

CO103.4: Developing ability to make codes/ programs with problem solving approach towards various geophysical problem and numerical methods to be used in data processing and interpretation in geophysics.

Special Notes:

(i) Nine questions will be set and students will attempt five questions. Question no. I will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. I, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Introduction

Introduction- Computer organization, Functional Units, basic I/O devices and storage media, computer software, computer languages, Problem Solving Approaches: Notion of an algorithm, stepwise methodology of developing algorithm, flowchart and computer program, introduction to computer operating systems: DOS, WINDOWS, UNIX/LINUX.

Unit-II: Basics of FORTRAN

Introduction to FORTRAN, constants, variables, data types, operations and intrinsic function, expression and assignments statements, Logical operators and Logical expressions, iterative statements, input/output statements, subroutine and functions, data sharing among subprograms/programs, Arrays, operations with files, programming examples to handle problems of numerical and statistical type.

Unit-III: Learning C

Introduction: Variables, Constants, Functions, Arguments, Character Arrays; Statements, Arrays, Functions; Data Types, Operators and Expressions; Control Flow: Statements, If-Else, Else-If, Switch, Loops-While and For, Break and Continue, Goto; Functions and Program Structure: Basics, Header files, Static Variables; Pointers and Arrays; Structures: Basics, Array of Structures, Pointers to Structures; Input and Output: Scanf, Printf, Line Input and Output.

Unit-IV: Programming in FORTRAN

Numerical integration by Simpson's method, Trapezoidal method, Numerical differentiation, solution of algebraic equation, Newton Raphson method, solution of simultaneous linear equations, Gauss method, Gauss-Jordan method, Gauss-Seidel method, matrix inversion, least square curve fitting, straight line and polynomial fits, solution of ordinary differential equations.

A brief introduction of Binomial, Poisson and normal distributions, concept of mathematical expectations

RECOMMENDED BOOKS

- (1) Fundamentals of computers by V. Rajaraman
- (2) FORTRAN 77 and Numerical methods by C. Xavier
- (3) FORTRAN Programming and Numerical methods by R.C. Desai

- (4) Let us C by Yashwant Kanetkar
- (5) The C programming language by Brian W. Kernighan and Dennis Ritchie
- (6) Advanced UNIX- A Programmers guide by Stephen Prata

GP-104: Basic Geology

Max. Marks: 60

Time: 3 hours

Credits : 4

Course Outcomes:

On completion of this course, the students will be able to:

CO104.1: understand basic concept of geology and different geological process responsible for landforms.

CO104.2: familiarize with minerals and their identification and occurrence in the earth.

CO104.3: Gain basic knowledge of rocks, their process of formation and occurrence in the earth.

CO104.4: Gain knowledge of different geological structures associated with deformation processes

Special Notes:

(i) Nine questions will be set and students will attempt five questions. Question no. I will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. I, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit–I: Introduction of Geology

Introduction to geology, Geomorphological Processes: Exogenic processes, Geologic time-scale and age of the Earth, Geological processes by river, wind, glacier and waves and tides. Principle of stratigraphy, elements of stratigraphic classification, physical and structural sub-disciplines of Indian subcontinent and their characteristics, An outline of the geology of India with respect to distribution, classification, lithology and economic importance of the following: Archean, Dharwar, Cuddapah, Vindhyan, Gondwana.

Unit–II: Mineralogy

Mineral – its definition and mode of occurrence, physical properties of minerals like form, colour, lustre, streak, cleavage, fracture, hardness and specific gravity, radioactivity, isotopes and ions, Physical characters and chemical composition of the rock forming minerals, mode of occurrence and economic uses of some important rock forming minerals.

Unit–III: Petrology

Rock- its definition, classification and distinguishing characteristics of Igneous, Sedimentary and Metamorphic rocks. Igneous rocks: Magma and lava, extrusive and intrusive forms, textures; Classification and description of some common igneous rocks (Granite, Dolerite, Basalt, Rhyolite, Pegmatite). Sedimentary rocks: Sedimentation processes; Classification and description of some common sedimentary rocks (Conglomerate, Sandstone, Shale, Limestone). Metamorphic rocks: Processes of metamorphism, textures and structures of metamorphic rocks; Classification and description of some common metamorphic rocks (Slate, Schist, Gneiss, Quartzite, Marble). Indian distribution of major rock types.

Unit–IV: Structural Geology

Primary and secondary structures of rock, Dip, strike, bearing and azimuth, Outcrops, outliers and inliers, Folds: definition and classification scheme, mechanism of folding, recognition of folds in the field. Fault: definition and different terminology of fault, mechanism of faulting, recognition of fault in the field, shear zone, lineament. Joints: definition, types of joint. Unconformity: concepts, types, recognition and significance of unconformities. Clinometer compass and its use.

RECOMMENDED BOOKS:

- (1) Rutley's Elements of Mineralogy By H.H. Read
- (2) Structural Geology by M.P. Billings
- (3) Principles of Physical Geology by A.H. Holmes

- (4) A Text Book of Geology by P.K. Mukherjee
- (5) The Principles of Petrology by G.W. Tyrrell
- (6) Manual of Field Geology by R.R Compton
- (7) An introduction to structural geology by A.K. Jain
- (8) Structural Geology by Haakon Fossen

GP-105: Geology Lab

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to:

CO105.1: develop practical knowledge of minerals, rocks and landforms,

CO105.2: learn effective communication, presentation and understanding of geological knowledge.

CO105.3: know the use of toposheet, Brunton/clinometer in geology

CO105.4: learn to interpret and construct geological maps and cross section

1. Continental scale land forms of India
2. Physical properties of important rock forming minerals
3. Megascopic study and identification of important igneous, sedimentary and metamorphic rocks
4. Study of Toposheets
5. Uses of Brunton/clinometer and measurement of dip and strike of beds
6. Study of geological map and construction of cross section of area comprising of horizontal, unconformable, inclined, folded and faulted rocks.

GP-106: Computer lab

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to:

CO106.1: Acquaintance with the different computer operating systems.

CO106.2: Learn to run or operate the exercises using computer software's.

CO106.3: Learn to write codes/programs in Fortran and simple exercise in C.

CO106.4: Able to tackle the coding on computational problems and their solution on computers.

(1) Exposure to computer operating system : DOS, WINDOWS, UNIX/LINUX

(2) Simple exercises based on available computer softwares

(3) Programming exercises on computational problems and their solution on computers. These include the following:

(i) Matrix operations

(ii) Matrix inversion

(iii) Numerical integration

(iv) Solution of simultaneous equations

(v) Linear curve fitting

(vi) Correlation coefficient, standard deviation etc.

(vii) Numerical differentiation

(viii) Solution of differential equation

(ix) Solution of transcendental and algebraic equation using Newton Raphson method

GP-201: Remote Sensing and GIS

Max. Marks: 60

Time: 3 hours

Credits : 4

Course Outcomes:

After the completion of the course, the students will be able:

- CO201.1:** To understand the basic concepts of remote sensing and Aerial Photogrammetry including physical basis and photo-characteristics of various rock types etc.
- CO201.2:** To gain knowledge about Remote sensing sensors, satellite programmes, basic image interpretation, visual interpretation and digital image analysis.
- CO201.3:** To gain the knowledge about GIS and its components, GPS and its segments, creation of thematic layers, raster and vector data.
- CO201.4:** understand image interpretation and methodology for preparation of various thematic maps and applications of RS & GIS.

Special Notes:

(i) Nine questions will be set and the students will attempt five questions. Question No.1 will be compulsory and based on the conceptual aspects of the whole syllabus. It can have five to ten parts. Answers should not be in yes/no. In addition to question No. 1, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Introduction to Remote Sensing and Aerial Photography

Definition, Principle and Physical basis of Remote Sensing, Electromagnetic (EM) Spectrum, Interaction of EM radiations with earth's surface and atmosphere, Atmospheric Windows, spectral signatures, remote sensing platforms, Concept of Photogrammetry, aerial photographs, types of aerial photographs, Information recorded on aerial photographs, stereoscopy, stereoscopic parallax, measurement of height difference, vertical exaggeration, elements of photo-interpretation, geotechnical elements, photo-characteristics of different rock types, photo-mosaic, image distortion and rectification.

Unit-II: Sensor and Image Interpretation

Remote Sensing Sensors: active and passive sensors, Satellite Imagery: Imagery vis a vis aerial photograph, MSS, LISS, CCD, Infrared and thermal scanners, IRS, SPOT and LANDSAT satellite programmes, microwave remote sensing: RADAR, LIDAR etc, remote sensing data products, resolutions in remote sensing, multispectral, super-spectral and hyper-spectral remote sensing, fundamentals of image interpretations and analysis, visual interpretation of remote sensing data; colour composites, concept of digital image and pixels, image restoration, image enhancement and information extraction, supervised and unsupervised classification; accuracy assessment in remote sensing

Unit-III: GIS and GNSS

Introduction to Geographical Information System (GIS), components of GIS, functions of GIS, data structures, Concept of raster and vector data, digitization, editing, attribute attachment etc, creation of thematic layers, Data Integration, vector to raster conversion and vice-versa. Introduction to Global Position System (GPS), various segments of GPS, Uses of GPS, GNSS.

Unit-IV: Applications

Applications of Remote Sensing and GIS: image interpretation for identification of different rock types, structures, lineaments and preparation of geological map; recognition of landforms and preparation of geomorphological map; drainage pattern and its significance; ground water prospects mapping, integrated ground water resources (IGWR) mapping, landslide hazard zonation, route alignment for road/ canal, Hydrocarbon and minerals exploration, Disaster management (flood and cyclones)

Recommended Books:

1. Remote Sensing Geology (Springer Verlag). R.P. Gupta
2. Remote Sensing in Geology (John Wiley & sons). B.S. Siegel and A.R. Gillespie
3. Remote Sensing and image interpretation (John Wiley & sons). T.M. Lillesand and R.W. Kiefer
4. Remote Sensing Principles and interpretation (WH Freeman Company. F.F. Reeds
5. Remote Sensing fro Earth Resources (AEG publication), D.P. Rao
6. Principles of Remote sensing (ELBS London). P. J. Kuran
7. Advances in Geophysics Vol. 1 and 13 (Academic press) H.E. Landesberg
8. Handbook of Information issued by GSI (Airborne Mineral surveys and exploration wing), AEC (Atomic Minerals Divisions) and NGRI.
9. Principles of GIS, P. A. Burrough
10. Indian Society of GeomaticsNews letters 2004-2005
11. GPS: Theory and Practice (Springer Verlag). B. Hofman-wellenhof, H.lichtenegger and J.Collins

GP-202 Advanced Computing

Max. Marks: 60

Time: 3 hours

Credits : 4

Course Outcomes:

On completion of this course, the students will be able to

CO202.1: learn basics of programming and C++

CO202.2: understand simple concepts of programming in C++.

CO202.3: gain knowledge of advanced concepts of programming in C++.

CO202.4: understand concepts of programming in MatLab and GMT.

Special Notes:

(i) Nine questions will be set and students will attempt five questions. Question no. I will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. I, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Introduction to C++ programming

Brief history of C++, Basics of a C++ program; Command Line Compiler, Integrated Development Environment (IDE); Declarations and Expressions: Program Structure, Variable Storage and Declarations, Assignment statements, Characters; Programming Examples.

Unit-II: Simple Programming in C++

Arrays, Reading Data, Strings, Integers and Floats; Hexadecimal and Octal Constants; Decision and Control Statements: if, while, for, Break and continue- Statements; Makefile, Testing and Debugging; Variable: Scope and Functions: Basics of Structured Programming; Programming Examples.

Unit-III: Advanced Programming in C++

Structures and Array of Structures; File Input/Output: C++ File I/O, Binary and ASCII files, Buffering; Debugging and Optimization: Serial Debugging, Runtime Errors; Floating Point: Format, Roundoff Errors; Pointers: Pointers and Structure; Classes: Derived and Virtual Classes, Virtual Functions; Exceptions; Modular Programming.

Unit-IV MatLab and Generic Mapping Tools

Introduction to MatLab; Formats, Variables: Declaration; Characters; Strings; Functions; Control Statements; Vectors; Script file; Vector calculations, Matrix and its operations; Solving system of linear equations; m-file; Input/Output data; Graphical User Interface. Introduction to Generic Mapping Tools (GMT): Input, Job Control, Output; Projections; GMT defaults; Examples.

Suggested Books

1. The C++ programming language: Bjarne Stroustrup
2. The C++: The complete reference: Herbert Schildt
3. Object oriented programming C++: Petroleum Geology: Chapman, R.E.
4. Programming in C++: Robert Lafore
5. Programming in MatLab: Marc E. Herniter
6. Generic Mapping tools: Wessel and Smith

GP-203: Geophysical Signal Processing

Max. Marks: 60

Time: 3 hours

Credits: 4

Course Outcomes:

On completion of this course, the students will be able to

CO203.1: Understand the basic concepts of signal and system theory.

CO203.2: Understand the concept of discrete transforms and their applications in geophysics.

CO203.3: Analyze the time series using the concepts of geophysical signal processing.

CO203.4: Design and apply the filters to the geophysical signals.

Special Notes:

(i) Nine questions will be set and students will attempt five questions. Question No.1 is compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answer should not be in yes and no. In addition to Question 1, there will be four unit question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Signal and System

Signals: Various special signal and classification of signals, orthogonal function, band limited signals, sampling theorem, aliasing effect of sampling on reconstruction of continuous signal from their samples, extrapolation of band limited signals

Systems: Classification of Systems, Linear time invariant causal and stable system with continuous and discrete input, minimum phase signals, Hilbert transform

Unit-II: Discrete Transform

Z transform, properties of Z transform, and the region of convergence, Z transform of causal and non causal sequence, inverse Z transform, Transfer function, Solutions of difference equation using Z-transform, Relation between S-plane and Z-plane

Review of Fourier Transform, Introduction to wavelet transform and Walsh transform and their application in geophysics

Discrete Fourier transform (DFT), relation between DFT and Z transform, Fast Fourier Transform (FFT), Decimation in time(DIT) and Decimation in frequency (DIF) algorithms, applications of FFT in geophysics, deconvolution, circular convolution, Importance of Windowing, Commonly used windows, cepstral analysis

Unit-III: Time series analysis

Introduction of stochastic process, autocorrelation and cross correlation, Stationarity, Wide sense stationarity, ergodicity, power spectral density function, Wiener Khinchine theorem, White Gaussian Noise, Wiener Filtering, Matched Filtering

Unit-IV: Filters and System Realization

Recursive and non-recursive filters, ideal and realizable low pass, band pass and high pass filters, IIR filters, Design of Butterworth filters, Design of FIR filters using direct and canonical realization scheme, Cascade and parallel realization scheme.

Recommended Books

1. Signal and Systems, M.L. Meade and C.R.Dillon , Chapman and Hall London
2. Digital Signal Processing, 1975, Oppenheim, A.V. and R.W. Schafer, Prentice Hall, Englewood Cliffs, New Jersey
3. An Introduction to Statistical Communication Theory, J. B. Thomas, John Wiley, New York
4. Spectral Analysis in Geophysics, 1974, Markus Bath, Elsevier, Amsterdam
5. Signal Analysis, 1977, A. Popoulis, McGraw Hill New York

GP-204: Geophysical Fields and Waves

Credits : 4

Max. Marks 60

Time 3 Hrs

Course Outcomes:

On completion of this course, the students will be able to

CO204.1: Understand the basic concepts about the different types of Geophysical fields and associated laws.

CO204.2: Understand the basic of heat conduction processes in the earth and its applications.

CO204.3: Understand the basic of wave theory and fundamentals of electromagnetics theory.

CO204.4: Understand the basic of Electromagnetic methods.

Special Notes:

Nine questions will be set and students will attempt five questions. Question No.1 is compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answer should not be in yes and no. In addition to Question 1, there will be four unit question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Potential Field Theory:

Introduction to Geophysical fields; Inverse square law of field: Gravity, Magnetostatic and electrostatic, Green's theorem and Green's functions, Potential due to an arbitrary source distribution, continuation of potential fields, Dirichlet and Neumann problems.

Unit-II: Thermal Conduction in Earth

Heat conduction equation; effect of advection; time scale of conductive heat flow; calculation of simple geotherms in continents; Geological applications of heat conduction in semi-infinite half space: (i) penetration of external heat into the earth due to periodic variation of surface temperature, (ii) instantaneous heating or cooling of semi-infinite half space and its application to cooling of oceanic lithosphere and (iii) thermal and subsidence history of sedimentary basins, Age of Earth on the basis of cooling.

Unit-III: Wave Theory

Introductory remarks about seismic and electromagnetic waves, Elastic Waves: Analysis of stress and strain, properties of equilibrium and motion in terms of stresses/displacements for infinitesimal and finite deformation, Generalised Hook's Law, Isotropy and Anelasticity.

Electromagnetic Waves: Maxwell's equations, constitutive relations, Plane electromagnetic waves in dielectric and conductor.

Unit-IV: Electromagnetic method

Principles of EM prospecting, various EM methods, passive source and active source methods, theory of EM induction; elliptical polarization, Airborne electromagnetic survey. Telluric methods: Theory of telluric method, field procedure and method of measurement, analysis of telluric field data, Magnetotelluric method, processing and interpretation of MT data.

Books Recommended

1. Geodynamics applications of continuum Physics to geological problems : Turcotte & Schubert
2. Interpretation theory in Applied Geophysics: F.S. Grant & G.F. West
3. Electromagnetic theory: J. Stratton
4. Heat conduction: I.R. Ingersoll
5. Solid Earth: C.F. Fowler
6. Fundamentals of Geophysics: W. Lowrie
7. Introduction to theoretical Geophysics: C.B. Officer
8. Geophysical Electromagnetic Theory and Methods: Michael S. Zhdanov,

GP-205: Geophysical Lab-I

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

After the completion of the course, the students will be able

CO205.1: To write advanced programs in C++.

CO205.2: To write programs in Matlab and make plots in GMT.

CO205.3: To identify linear features using satellite images, prepare drainage map, land use map.

CO205.4: To prepare geomorphology and hydrogeomorphology map.

Section – A

1. Exercise based on basic concepts in C++.
2. Exercise based on if/while/for/Break/continue Statements in C++.
3. Exercise based on Data Structure in C++.
4. Exercises based on Pointers in C++.
5. Exercise based on Modular Programming in C++
6. Getting started with MatLab: Basics.
7. Numerical methods in MatLab.
8. Plotting maps in GMT.

Section – B

1. Preparation of base maps
2. Use of satellite image for identification of linear features.
3. Preparation of land use land cover map
4. Preparation of drainage map
5. Preparation of Geomorphology map
6. Preparation Hydrogeomorphology map
7. Simple exercises on digital image processing

GP-206: Geophysical Lab-II

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to

CO206.1: Apply convolution, correlation, and autocorrelation in time and frequency domain.

CO206.2: Compute Fast Fourier Transform of a given signal.

CO206.3: Design and apply filters to the geophysical data.

CO206.4: Use signal processing software MatLab in application to time series data.

Exercises based on

- (i) Convolution model in the time & frequency domain
- (ii) Computation of FFT
- (iii) Autocorrelation & Cross correlation
- (iv) Inverse filtering
- (v) Deconvolution using Z-transform
- (vi) Predictive Deconvolution filter
- (vii) Exposure to basic signal processing softwares like PITSA & MATLAB

GP-207: Geological Field Training

Credit : 4

Max Marks : 100

Time: 30 Minutes per student

Course Outcomes:

On completion of this course, the students will be able to

CO207.1: Understand rocks and structures in their natural environment and their natural relationship to one another.

CO207.2: Gain experience to use different geological field equipments in the field and collecting geological and structural data.

CO207.3: Learn to prepare geological and structural map, their analysis and interpretation.

CO207.4: Learn how to adopt in field work environment and how to work as a team in the field

GP-301: Seismology

Credits : 4

Max. Marks 60

Time 3 Hrs

Course Outcomes:

On completion of this course, the students will be able to

CO301.1: Understand the basic concepts and principles of Seismology to explore interior of earth.

CO301.2: Acquiring knowledge of earth's structure through seismograms to know more about the earth's interior to develop research aptitude.

CO301.3: Learn about the different model to understand the heterogeneous earth and able to communicate the geophysical knowledge.

CO301.4: Learn about the earthquakes and its related parameters for the benefits of the society.

Special Notes:

(i) Nine questions will be set and students will attempt five questions. Question No.1 is compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answer should not be in yes and no. In addition to Question 1, there will be four unit question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Seismic Wave Propagation

Review of basic concepts and relations in elasticity theory, Hook's Law, reflection and transmission of elastic waves at a plane boundary, plane waves, laws of simple reflection and refraction, head waves, total internal reflection, spherical waves, surface and interface waves, Rayleigh waves, Stoneley waves, love waves, dispersion curves, Free oscillations of the earth, toroidal and spheroidal oscillations, normal modes of a homogeneous sphere.

Unit-II: Earth Structure And Location

Travel time table: the ray parameter and seismic rays, time distance curves for local and teleseismic events, Inversion of travel times for earth's structure, the method of Herglotz and Wiechert, Preliminary location of earthquakes, refining the locations, review of various types of field observations, salient features of seismograms with description of different seismic phases.

Unit-III: Earthquake Source Process

Uniqueness and reciprocal theorems, Green's tensor for a uniform medium, mathematical models of earthquake source, radiation pattern for P & S waves from a shear fault, the fault plane solutions.

Unit-IV: Earthquake Parameters And Seismic Zoning

Earthquake parameters: Intensity and magnitude scales, seismic moment, relation between parameters, scaling laws, seismic zoning, seismicity, induced seismicity, earthquake prediction, discrimination between earthquakes and explosions. Earthquake Early Warning System.

Recommended Books:

- (1) Elementary Seismology: C.F. Richter
- (2) Introduction to theory of seismology : K.E. Bullen
- (3) Seismology and Plate Tectonics: David Gubbins
- (4) Seismic waves and Sources: A. Ben-Menham & S.J. Singh
- (5) Modern Global Seismology: Lay & Wallace
- (6) Seismology: Shearer

GP-302: Gravity & Magnetic Prospecting

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to

CO302.1: Understand the basic concepts and principles of Gravity and Magnetic methods.

CO302.2: Learn the working of different types of gravimeters and magnetometers.

CO302.3: Plan the gravity and magnetic surveys including airborne and magnetic gradient surveys, corrections applied to gravity and magnetic data.

CO302.4: Interpret the gravity and magnetic data, applications of gravity and magnetic methods in geophysical exploration.

Special Notes:

(i) Nine questions will be set and students will attempt five questions. Question no. I will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. I, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit – I: Basic Principles

Principles of Gravity and Magnetic methods, concept of Geoid, Spheroid, a review of magnetic field of the Earth, relation between gravity and magnetic potential, variation of gravity with elevation and depth, determination of density, isostasy and gravity, Magnetization of rocks-Dia, Para- and Ferromagnetism, Magnetic susceptibility of rocks and their ranges, Artificial versus natural source Methods.

Unit-II : Instrumentation

Gravity Prospecting Instruments: Absolute versus Relative measurements of Gravity, Pendulum apparatus, stable and unstable gravimeters, calibration of gravimeters, LaCoste-Romberg gravimeter, Worden gravimeter. Magnetic Prospecting Instruments: Fluxgate magnetometers, Proton precession magnetometers, optical pumping instruments, Schmidt's horizontal and vertical magnetometers.

UNIT-III: Gravity and Magnetic Surveys:

Gravity survey on land: setting up of a base station, tide and drift corrections, the reduction of gravity data: the latitude adjustment, the elevation adjustment, the excess mass adjustment, terrain correction, Derivation of expressions for Bouguer correction and Terrain correction, Gravity anomalies: Bouguer anomaly, Free air anomaly and Isostatic anomaly, Gravity anomaly and isostasy, Plan of conducting ground magnetic surveys, corrections applied to magnetic data, Airborne magnetic surveys and magnetic gradient surveys.

UNIT-IV: Interpretation

Separation of residual and regional anomalies: Graphical method, direct computation, second derivative method, polynomial fitting method, wavelength filtering, downward continuation, depth rules, gravitational and magnetic attraction of structures with various simple shapes, estimation of anomalous mass, ambiguity in gravity interpretation, model analysis, step model, ribbon model, Applications of gravity and magnetic methods in oil and mineral exploration.

Recommended Books:

- (1) Basic Exploration Geophysics: Robinson
- (2) Applied Geophysics: Telford et al.
- (3) Introduction to Geophysical Prospecting: Dobrin & Saviet
- (4) Geophysical prospecting for oil: Nettleton

- (5) Introduction to Geophysical Exploration: Keary & Brooks
- (6) Gravity and Magnetic methods of prospecting: B.S. Rama Rao & IVR Murthy

GP-303: Groundwater Geophysics

Max. Marks: 60

Time: 3 hours

Credits : 4

Course Outcomes:

After the completion of the course, the students will be able:

- CO303.1:** To understand the basic concept of Geohydrology, Hydrogeophysics, hydrological cycle, distribution of water etc.
- CO303.2:** To understand about the hydrological properties of water bearing materials and groundwater flow characteristics.
- CO303.3:** To understand about the classification of water bearing rocks, groundwater exploration and management, watershed characterization etc.
- CO304.4:** To apply geological and geophysical methods for groundwater exploration and to learn various groundwater quality parameters.

Special notes:

Nine questions will be set and the students will attempt five questions. Question No.1 will be compulsory and based on the conceptual aspects of the whole syllabus. It can have five to ten parts. Answers should not be in yes/no. In addition to question No. 1, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Concept and Processes

Concept of geohydrology and hydrogeophysics, hydrology in relation to other sciences, hydrosphere, hydrologic cycle, surface and subsurface distribution of water, origin of ground water, springs, hydrometeorology, precipitation, evaporation, evapotranspiration, seepage, infiltration and runoff and methods of measurement

Unit-II: Hydrological Properties

Hydrological properties of water bearing materials: porosity, void ratio, permeability, transmissivity, storativity, specific yield, specific retention, diffusivity, field and laboratory method for determining permeability, movement of ground water and aquifer performance tests, Darcy's Law and its range of validity, theory of groundwater flow under steady and unsteady conditions, determination of transmissivity and storativity by discharge methods.

Unit-III: Aquifers and Well Development

Mode of occurrence of ground water, classification of rocks with respect to their water bearing characteristics, aquifers, Aquiclude, aquitards, classification of aquifers, remote sensing studies for water resources evaluation. groundwater exploration and management, water balance studies, hydrograph analysis, conjunctive and consumptive use of ground water, water well drilling, development of wells, concept of artificial recharge, Watershed characterization and management.

Unit-IV: Geophysical Methods and Groundwater Characteristics

Monitoring the health of groundwater reservoir, Use of IP for groundwater contamination, Groundwater exploration: surface geological and geophysical methods of exploration and subsurface geophysical methods; Hydro-geochemistry: Physical and Chemical characteristics of groundwater, classification of groundwater in respect to domestic, irrigation and industrial use, pollution of groundwater.

Recommended Books:

1. Groundwater hydrology (John Wiley and Sons), David K. Todd
2. Principles of Hydrology, Ward
3. Handbook of Applied Hydrology, V.T. Chow
4. Introduction to groundwater Hydrology, Heath & Trainer

5. Hydrology. O. Meinzer
6. Hydrogeology (John Wiley and Sons). Davis, S.N., Dewiest, J.R.N.
7. Groundwater (Tata McGraw Hill), Tolman, C.F.
8. Groundwater (Wiley Eastern Ltd.) H.M. Raghunath
9. Basic Exploration Geophysics. Robinson
10. Hydrogeophysics (Kluwer Publishers), Y.Rubin and S. Hubbard
11. Karanth: Development, Assessment and Management of Water Resources

GP 304: Electrical Prospecting

Credits : 4

Max. Marks: 60
Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to

CO304.1: Learn about the basics of Electrical prospecting.

CO304.2: Understand the Electrode Configurations, Induced Polarization and Self Potential method.

CO304.3: Understand the basics of D.C. Resistivity method, acquisition and processing.

CO304.4: Capable of Interpretation of Electrical resistivity Data.

Special Notes:

Nine questions will be set and students will attempt five questions. Question No.1 is compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answer should not be in yes and no. In addition to Question 1, there will be four-unit question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Introduction to electrical methods

A rapid review of the method and techniques of electrical prospecting and their classifications. Electrical properties of rocks, electrical properties of rock and their measurement, anisotropy and its effect on electrical fields. The geoelectric section and geological section. Basic concept on natural electric field.

Unit-II: Induced Polarization and Self Potential method

S.P. Method: Origin of self potential, theoretical and experimental basis of S.P. method, field of polarized conductor, sphere and cylinder, determination of ore body parameter, downward continuation of S.P. data

I.P method: Sources of I.P, Membrane and electrode potential, time domain and frequency domain measurement of IP, chargeability, percent frequency effect and metal factor, dipole theory of I.P., transformation of time domain to frequency domain data.

Unit-III: Resistivity Methods

D.C. resistivity method, fundamental laws, different electrode configurations and their geometrical factors, Choice of method and choice of site for Electrical Surveys, Presentation of measured data. The potential distribution at the surface of horizontally stratified earth, Kernel function and its relation to subsurface parameters, Principle of equivalence, Principle of superposition and Principle of suppression.

Unit-IV: Interpretation of Electrical resistivity Data

Apparent resistivity function, computation of apparent resistivity model curves, vertical electrical sounding and horizontal profiling techniques, Interpretation of resistivity sounding data, Asymptotic method, Complete curve matching, auxiliary point method, equivalent curve matching using maxima and minima, Dar Zurruck curve, Direct interpretation method, electrical profiling near a vertical contact, dyke, sphere, application of linear filter theory for resistivity interpretation.

Recommended Books :

1. Electrical method of geophysical prospecting: Keller, G.V. and Frish Knecht,
2. Geosounding principles: Koefoed, O.
3. The application of Kernel functions in interpreting geoelectrical measurements, Geoexploration monograph series no. 2 Gebruder, Brorntraegr, Berlin : Koefoed, O.
4. Direct current geoelectric sounding: Bhattacharya, B.K. and Patra, H.P.
5. Principles of direct current prospecting Gebruder: Kunetz, G.
6. Interpretation theory in applied geophysics, Mg Graw Hill Co. N.York
7. Kaufman and Keller, The Magnetic Sounding Methods: Grant, F.S. and West, G.B.,
8. Geoelectromagnetism: Wait, J.R.,
9. Time varying geoelectric sounding: Patra and Mallick, K.

GP-305: Geophysical Lab-III

Max. Marks: 60

Time: 3 hours

Credits : 4

Course Outcomes:

On completion of this course, the students will be able to:

CO305.1: Understand the working of earthquake instruments.

CO305.2: Locate the earthquake epicentre and compute fault plane solution from earthquake data.

CO305.3: Learn to use various software for processing the data for ex. SEISAN, MatLab.

CO305.4: Estimate the source parameters, b-value, Poisson probability, and magnitude of earthquakes.

1. Exposure to earthquake instruments available in the department
2. Identification of seismic phases on seismograms
3. Location of epicenters
4. Fault plane Solutions
5. Frequency magnitude analysis of earthquake data
6. Estimation of decay constant (p-value) from aftershocks data
7. Estimation of b-value from earthquake data.
8. Estimation of source parameters of earthquakes.
9. Estimation of magnitudes of earthquake
10. Estimation of Poisson probability for earthquake occurrences
11. Draw isoseismal lines and prepare intensity map from given data.
12. Exposure to seismological soft wares like PITSA, SEISAN etc.

GP-306: Geophysical Lab-IV

Max. Marks: 60

Time: 3 hours

Credits : 4

Course Outcomes:

On completion of this course, the students will be able to:

CO306.1: Solve geophysical problems based on Gravity, Magnetic and Electrical methods.

CO306.2: Learn acquisition, processing and interpretation of gravity, magnetic and electrical data.

CO306.3: Communicate effectively, demonstrate and understanding of geophysical knowledge.

CO306.4: Tackle the issues of professional geophysical practices.

1. Exposure to the electrical, magnetic and gravity instruments available in the department
2. Interpretation of VES data using partial curve matching, computer programs and filtering techniques
3. Preparing electrical sections and correlation with lithological logs
4. Reduction of gravity data, Applications of drift correction, Free air correction, Bouguer correction.
5. Calculation of Free Air Anomalies & Bouguer anomalies and their interpretation
6. Estimation of Bouguer density using Nettleton method
7. Calculation of Gravity and Magnetic effects due to simple shapes bodies.
8. Reduction of magnetic data
9. Interpretation of magnetic data using various techniques

OE-306: Dynamics of the Earth

Credits : 2

Max. Marks: 35

Time: 2 hours

Course Outcomes:

On completion of this course, the students will be able to:

CO206.1: Acquiring knowledge about the solar system and evolution of the earth.

CO206.2: Learn about the gravity and magnetic field of the Earth to enhance the understanding of geophysical knowledge.

Special Notes:

Five questions will be set and students will attempt three questions. Question No. 1 will be compulsory of 20 marks and based on the conceptual aspects of the whole syllabus. The answers should not be in yes/no. In addition to question no. 1, there will be two units in the question paper each containing two questions of 15 marks each belonging to two units in the syllabus. Students will select one question from each unit.

Unit-I:

Origin and age of the solar system and the Earth, Evolution of Earth from its origin to the present, Continental drift and sea-floor spreading, Plate-tectonic theory and interactions of different types of plate boundaries, Earth's internal and external structure and composition, variation of seismic velocity, density, temperature and pressure from surface to the centre of the Earth. Rheological properties of Earth, evolution, structure and composition of Earth's atmosphere.

Unit-II:

The gravity field of the Earth, shape and size of the Earth, Gravity anomalies, theory of isostasy and its significance in distribution of land and ocean, origin of the Earth's magnetic field, thermal structure of the Earth, global seismicity, characteristics of earthquakes: origin, distribution, causes and results. Interior of the Earth based on seismic waves. Geodynamics of Indian subcontinent, origin and tectonics of the Himalaya.

Recommended Books:

1. Lowrie, W., Fundamentals of Geophysics, 2nd Edition, Cambridge University Press, 2007.
2. Lillie, R. J., Whole Earth Geophysics: An introduction textbook for geologist and geophysicists, Prentice Hall, New Jersey.
3. Davies, G. F., Dynamic Earth: Plates, Plumes and Mantle Convection, Cambridge University Press, 2000.
4. Fowler, C. M. R., The Solid Earth: An introduction to global Geophysics, 2nd Edition, Cambridge, University Press, 2004.
5. Stacey, F. D., and Davis, P., Physics of the Earth, 4th Edition, Cambridge University Press, 2008.
6. Bott, M. H. P., The interior of the Earth, 2nd Edition, Edward Arnold, London, 1982

GP-401: Petrophysics And Well Logging

Credits: 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

After completion of this course, the students will be able to:

CO401.1: Develop knowledge about the well logging technique and petrophysical properties of reservoirs

CO401.2: Learn lithological logs (spontaneous and Gamma-Gamma ray logging)

CO401.3: Understand the porosity logs for the determination of different types of porosities of rocks.

CO401.4: Learn different kinds of electrical and resistivity logging techniques for the determination of saturation of hydrocarbon

Special Notes:

Nine questions will be set and students will attempt five questions. Question No.1 is compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answer should not be in yes and no. In addition to Question 1, there will be four unit question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Basics of Petrophysics and Formation Evaluation

Well logging - objectives and its place in geoexploration Formation evaluation: Hydrocarbon volume calculation; Porosity: controls on porosity, porosity determination from core; Permeability: controls on permeability and ranges, determination of permeability, permeability porosity relationship; Coring: Preservation and Handling; Electrical properties of rocks: Formation resistivity factor (FR); correlations of FR with porosity, cementation, water saturation and permeability. Wire-line logging: representation of log, tools characteristics; borehole environment, invasion and drilling mud

Unit-II: Spontaneous Potential (SP) and Natural Gamma Ray Logs

Introduction about SP logging, Principle, measurement tool, log presentation, factors affecting amplitude of SP, calculation of shale volume and other uses Fundamentals of radioactivity, scattering and attenuation, Gamma ray logging: principle, tool calibration, log representation, depth of investigation, bed resolution, calculation of shale volume, lithology identification and other uses

Unit-III: Porosity Logs

Acoustic Log: Principles; acoustic logging tools; log representation, depth of investigation and vertical resolution, logging problems, uses of acoustic logging, Formation Density Log: principle; measurement tools and operation; calibration of tool, log characteristics- depth of investigation and bed resolution; uses of formation density logging;

Neutron Log: Theory: neutron emission, scattering and absorption, Hydrogen Index, neutron logging tools, Log representation, Calibration, depth of investigation and vertical resolution; Uses of Neutron logging

Unit-IV: Electrical Resistivity Logs and other logs

Concept of resistivity, resistivity of rocks, variation of formation fluid resistivity with temperature, Archie's first and second law, Hingle and Pickett plots, Saturation of Moveable Hydrocarbons. Resistivity logging: response of tool, resistivity tools: old and modern, spherically focused log, micro-resistivity logs, proximity log, induction log, depth of investigation and bed resolution, log representation, uses of resistivity log Nuclear Magnetic Resonance (NMR) Logging: background, need of NMR logging, log representation and interpretation; Caliper logging, temperature logging, dipmeter logging, LWD

Recommended Books:

1. Standard Methods of Geophysical Formation Evaluation: James K. Hallenborg
2. Practical Formation Evaluation: Robert C. Ransom
3. The geological Interpretation of Well Logs : Malcolm Rider

4. Well Logging for Earth Scientists: Darwin V. Ellis

5. Petrophysics- Theory and Practice of Measuring Reservoir Rock and fluid Transport Properties: Djebbar Tiab and Erle C. Donaldson

GP-402 Physical Oceanography and Marine Geophysics

Max. Marks: 60

Time: 3 hours

Credits: 4

Course Outcomes:

On completion of this course, the students will be able to

CO402.1: Understand the physical properties, movement, and pollution in ocean waters.

CO402.2: Derive equation of motion for ocean waters and understand all the component forces.

CO402.3: Know the resource potential of land below ocean waters and the geophysical signatures in areas of continental margins.

CO402.4: Know the geophysical studies for volcanism, seismicity, crustal deformation and learn about the resource potential in Indian continental margins.

Special Notes:

Nine questions will be set and students will attempt five questions. Question No.1 is compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answer should not be in yes and no. In addition to Question 1, there will be four unit question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit

Unit-I: Physical Oceanography

Physical properties of seawater and methods of determination, distribution of salinity in the oceans, factors affecting salinity, water masses and water type, TS Diagram, Circulation of currents in major ocean waves. Tides: Dynamical and equilibrium theory of tides. Marine pollution, steps to control marine pollution, Laws of seas, Coastal zone management

Unit-II: Dynamical Oceanography

Equation of motion in a rotating and translating coordinate system, Coriolis force term and other terms, Nonlinear term in equation of motion, Brunt Viasala frequency, Geopotential surface and isobaric surface, wind driven ocean circulation, Ekman Solution, Sverdrup's Solution, Vorticity.

Unit-III: Marine exploration

Resource potential for offshore areas, Geophysical continental margins, type of continental margins, geophysical evidences for evolution of Atlantic type continental margins, Characteristic geophysical signatures for transitional crust, isostatic 2D gravity anomalies, sea floor magnetic anomalies and their interpretation.

Unit-IV:

Geophysical studies for active continental margins, Seismicity, volcanism, heat flow studies, seismic surveys along island arc-trench areas, seismic expression for subduction and crustal deformation, paired gravity anomalies over island arc trench areas and their interpretation. Geophysical exploration for continental Margins of India and Andman shelves, brief review on the hydrocarbon exploration for the Indian continental margin. . Review of basins in India: Assam, Krishna-Godavari, Cambay and Bombay offshore basins.

Recommended Books:

1. The Earth, Tarbuck and Lutgens
2. Descriptive Physical oceanography, Pickard Lmerv
3. Estuaries- Introduction, Dyer
4. Oceanography, Ross
5. Dynamical Ocenography, Pond and Pickard
6. The Sea, Hill
7. Nettleton, Gravity and Magnetism in Oil prospecting
8. McQuillin and Ardu, Exploring the geology of shelf area

GP-403: Seismic Prospecting

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to

CO403.1: Understand the fundamentals of seismic methods in oil and gas exploration.

CO403.2: Design seismic acquisition survey and understand various types of seismic sources.

CO403.3: Design a sequence for processing the seismic data at hand and understand the theory of each processing step.

CO403.4: Gain knowledge of seismic interpretation using concept of amplitude variation with offset (A.V.O.) and pattern recognition.

Special Notes:

Nine questions will be set and students will attempt five questions. Question No.1 is compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answer should not be in yes and no. In addition to Question 1, there will be four unit question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit

Unit-I: Fundamental Of Prospecting

Motivation for Seismic Prospecting, Oil Exploration, Mining and Engineering Application, Principles and Physical Basis of Seismic prospecting: Types of Elastic Waves, Reflection, Refraction and Transmission Coefficients, Expression for wave velocities, Factors affecting wave velocities in Rocks.

Unit-II: Data Acquisition

Seismic Sources: Explosive and Non-Explosive Sources, Seismic Refraction Method: Travel Time Equation for Simple one layer case and for variable velocity case. Expressions for dipping layer and faulted bed cases. Gardener delay time method. Hidden layer problems. Field techniques for refraction survey, fan shooting. Seismic Reflection Method: The travel time equations for horizontally layered medium, Expression for dipping interfaces, Field techniques for reflection survey: Split Spread, End on Spread, Broad side configurations. 2D/3D configurations, Common depth point technique, Presentation formats for Seismograms, Selection of field survey parameters.

Unit-III: Seismic Data Processing

Data processing sequence, Static and Dynamic Correction, weathering and datum corrections, CDP stacking, Migration and depth section preparation.

Velocity depth determination: Velocity-depth relation for measurements in boreholes, velocity depth relation from surface observations, the T^2-X^2 method, the $T-\Delta T$ method, the hyperbola method.

Noise Elimination method: The structure of noise and its classification using frequency and spatial filters(arrays), Multiples identification, Suppression of multiples, VSP.

Unit-IV: Seismic Data Interpretation

Mapping of Hydrocarbon bearing and water bearing structures, geological interpretation, Structural and Stratigraphic traps, direct detection of hydrocarbons, pattern recognition, Seismic attribute analysis.

Recommended Books:

1. Dobrin, M.B Introduction to Geophysical Prospecting
2. W.M.Telford et al Applied eophysics
3. Keary and Brooks Introduction to Geophysical Exploration
4. Waters, R.H.. Reflection Seismology
5. Robinson Basic Exploration Geophysics

6. Sheriff, R.E	Seismic Stratigraphy
7. Nelson, H.R	New technologies in Exploration Geophysics
8. Lavergne, M.	Seismic Methods

GP-404: Geophysical Inversion

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to:

CO404.1: Differentiate between forward and inverse problems. Ability to formulate inverse problems and solution of linear inverse problems.

CO404.2: Get acquainted with the techniques of Finite difference method and Finite element method.

CO404.3: Acquire the knowledge about the techniques for checking the quality of solution of inverse problems, the Singular Value Decomposition and techniques to solve non-linear inverse problems.

CO404.4: Learn about global optimization techniques and statistical approach of inverse problems.

Special Notes:

(i) Nine questions will be set and students will attempt five questions. Question no. I will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. I, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Introduction

Forward problems versus Inverse problems, continuous inverse problem, discrete inverse problem, formulation of inverse problems and their reduction to a matrix problem, linear inverse problems, classification of inverse problems, L1 norm inversion, least squares solution and minimum norm solution, concept of norms, concept of 'a priori' information, constrained linear least squares inversion, review of matrix theory, Geophysical inverse problems.

Unit-II: Finite difference and Finite Element Method

Introduction to finite difference method, forward, backward and central difference method, Application of finite difference method for solving Helmholtz equation.

Introduction to finite element method, various steps, simple examples showing application of finite element method.

Unit-III: Non-Linear Inversion

Model and Data spaces, householder transformation, data resolution matrix, model resolution matrix, checkerboard resolution test, eigen values and eigen vectors, singular value decomposition (SVD), generalised inverses, Non-linear inverse problems, Gauss Newton method, steepest descent (gradient) method, Marquardt-Levenberg method, Earthquake location problem, tomography problem, Inversion of gravity profiles due to simple geometrical shape, Applications of non-linear inversion techniques in seismology.

Unit-IV: Global Optimization Techniques:

Probabilistic approach of inverse problems, maximum likelihood and stochastic inverse methods, Backus-Gilbert method, Global optimization techniques: genetic algorithm: Heat Bath algorithm, Metropolis algorithm, simulated annealing methods, neighbourhood algorithm, examples of applying global optimization techniques.

Recommended Books:

- (1) Geophysical data analysis: Discrete inverse theory: William Menke
- (2) Deconvolution & Inversion: V.P. Dimri
- (3) Geophysical Data analysis: Understanding Inverse problem theory & Practice: Max A. Meju
- (4) Time series analysis and inverse theory for Geophysicists: David Gubbins
- (5) Inverse problem theory methods for data fitting and model parameter estimation : I. Tarantola

GP-405: Geophysical Lab-V

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to:

CO405.1: Solve geophysical problems using Seismic principles and its techniques/tools to explore interior of earth.

CO405.2: Inculcate research aptitude to enhance the understanding of geophysical knowledge.

CO405.3: Analyse and interpret the geophysical data to communicate effectively and demonstrate for understanding of geophysical knowledge.

CO405.4: Tackle the issues of professional geophysical practices to be used in Industry.

1. Seismic Survey using engineering seismograph
2. Two layer and three layer problems of seismic refraction method for horizontal and dipping interface
3. Identification of faults on seismic refraction data
4. Static and Dynamic corrections to seismic data
5. NMO stretching effect
6. Interpretation of reflection data using $T^2 - X^2$ method, $T-\Delta T$ method etc.
7. Estimation of different types of velocities in Seismic method
8. Exposure to seismic data processing

GP-406: Geophysical Lab-VI

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to:

CO406.1: Solve geophysical problems using inversion techniques/tools.

CO406.2: Communicate effectively, demonstrate and understanding of geophysical knowledge.

CO406.3: Analyse and interpret the geophysical data.

CO406.4: Tackle the issues of professional geophysical practices.

Exercises based on:

- (1) Eigen values and Eigen vectors
- (2) Formulation & Solution of inverse problems
- (3) Linear estimation of parameters
- (4) Constrained and Unconstrained least square inversion
- (5) SVD analysis
- (6) Different techniques of Geophysical Inversion

GP-407: Geophysical Field Training-I

Credits: 4

Max Marks: 100

Time : 30 Minutes per student

Course Outcomes:

After completion of this course, the students will be able to

CO407.1: Inculcate the sense of scientific discussion and research aptitude.

CO407.2: Develop practical knowledge about different geophysical methods with perspective to future research.

CO407.3: Hands-on practice to different geophysical instruments and learning their operations in the field.

CO407.4: Exposure of latest geophysical techniques and software as well as developing concepts of data acquisition, processing and interpretation.

GP-501: Near. Surface Geophysics

Max. Marks: 60

Time: 3 hours

Credits : 4

Course Outcomes:

On completion of this course, the students will be able to:

CO501.1: Learn about the concept and fundamentals of near surface geophysics.

CO501.2: Understand the different applications of geophysical methods to Environmental and Engineering studies.

CO501.3: Learn about the basic of GPR data acquisition, processing and interpretation.

CO501.4: Understand the GIS Applications in Near surface Geophysics.

Special Notes:

Nine questions will be set and students will attempt five questions. Question no. I will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. I, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Introduction

Man and Environment, Near Surface Geophysics: Introduction, Practitioners and Users, Traditional and Emerging views of Near Surface- Geophysics, Concepts and Fundamentals, Special Challenges associated with near Surface Geophysics. Rock Physics Principles for Near-Surface Geophysics: Description of the Geological Material, Conditions in the Near Surface of the Earth, Density, Electrical Properties, Elastic Wave Velocities.

Unit-II: Geophysical Techniques in Near Surface studies

Review of Seismic, Gravity, Magnetic and Electrical methods, Applications of these methods to Environmental and Engineering studies: Delineation of structural trends, contacts and faults, microgravity detection of subsurface voids and cavities, detection of Archaeological objects, Mapping of fracture zones, reflection profiling in ground water studies, dam site investigations, evaluation of aquifer potential, Investigation of waste dump sites.

Unit-III: Ground-Penetrating Radar

Introduction, Electromagnetic Theory, Physical properties, EM wave properties, GPR Instrumentation, Survey Design, Data processing, Interpretation, Case Studies and Pit falls.

Unit-IV: GIS Applications in Near Surface Geophysics

Concept of Digital Image in Remote Sensing, Image preprocessing, rectification, enhancements and analysis, Digital Image processing procedures, Band ratioing and NDVI, GIS applications in integrated ground water resources mapping, site suitability studies and utilities management, GIS applications for engineering, environmental problems, landfill sites and solid waste management,

Recommended Books:

1. Near-Surface Geophysics Edited by Dwain K. Butler
2. Applied Geophysics by W. M. Telford et al.
3. Experiments in Engineering Geology by KVGK Gokhale and D M Rao
4. Geotechnical and Environmental Geophysics Edited by Stanley H.Ward
5. Environmental and Engineering Geophysics, P.V.Sharma

GP-502: Electromagnetic and Magnetotelluric Methods

Credits: 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to:

CO502.1: Learn about the basic of Electromagnetic method.

CO502.2: Understand the data acquisition, processing and interpretation of various electromagnetic methods.

CO502.3: Learn about the basic of Magnetotelluric method, data acquisition and processing.

CO502.4: Capable of Interpretation of Magnetotelluric Data and its applications.

Special Notes:

Nine questions will be set and students will attempt five questions in all. Question No.1 is compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answer should not be in yes and no. In addition to Question 1, there will be four-unit question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I

EM Principle: Maxwell's equations, electromagnetic potential and wave equations, attenuation of EM field, depth of penetration, dip and tilt angles, electromagnetic field due to straight wire, rectangular and circular loops, elliptical polarizations, amplitude and phase relations, real and imaginary (quadrature) components. Transient electromagnetic methods (TEM), transient emf and magnetic field behaviour due to various conductors; current density in half space by rectangular loop with time, toroidal and poloidal induction in a conductive zone, various time domain systems frequency sounding and geometric sounding, advantage of time domain methods over frequency domain methods.

Electromagnetic properties of rocks and minerals

Unit-II

EM Prospecting and Interpretation: various EM methods: Dip angle methods-fixed vertical loop transmitter, two frame method, Turam method, Moving source-receiver methods- horizontal loop (Slingram) method, AFMAG and VLF methods, Airborne EM systems- rotary field method, EM profiling and sounding. Marine Electromagnetic Methods, EM modelling.

Unit-III

MT Principle: Origin and sources of MT signal, interaction with the earth-uniform earth, horizontal layers, anisotropy, inhomogeneity, impedance tensor and tipper, topographic and regional effects, static shift. Data processing and analysis: auto and cross spectra, solution to the impedance and tipper equations, local and remote references, errors and noise. Robust and hybrid processing.

Unit-IV

MT Interpretation and uses: interpretation of MT data over a two layered earth, strike, rotation swift strike, polar diagram, tipper, skew, ellipticity, TE and TM modes, 1D and 2D interpretation, imaging continental lower crust, MT study over cratons. Mapping structures for petroleum exploration, geothermal mapping, exploration for sulphides, gold, uranium. Detecting water and subsurface structures.

Recommended Books:

1. Nabighian, M. N., 1988, Electromagnetic Methods in Geophysics, Volume 1, SEG Publication.
2. Nabighian, M. N., 1991, Electromagnetic Methods in Geophysics, Volume 2, Parts A and B, SEG Publication.
3. MICHAEL S. ZHDANOV, Geophysical Electromagnetic Theory and Methods
4. Grant, F. S., and West, G. F., Interpretation Theory in Applied Geophysics
5. Telford et. al: Applied Geophysics
6. Patra & Mallick: Geosounding Principles Vol.II
7. Geoelectromagnetism: Wait, J.R.,

GP-503: Geophysical Lab-VII

Max. Marks: 60

Time: 3 hours

Credits: 4

Course Outcomes:

After completion of this course, the students will be able to

- CO503.1:** Get practical exposure to the processing and interpretation of different types of logs and designing of filters.
- CO503.2:** Hands-on exercise to interpret lithological logs to delineate permeable and impermeable zones.
- CO503.3:** Interpret resistivity and porosity logs to delineate water bearing and oil/gas bearing zones.
- CO503.4:** Get exposure of latest geophysical softwares for signal processing and imaging the seismic sections.

(A) Exercises based upon:

- (i) SP log
- (ii) Natural Gamma Log
- (iii) Caliper and Temperature Log
- (iv) Resistivity Log
 - (a) Micro log
 - (b) latero log
 - (c) induction log
- (v) Porosity Logs:
 - (a) Neutron log
 - (b) Acoustic log
 - (c) Density log
- (vi) Computation of formation factor and water saturation.

(B) Exercises based on

- (i) Design of optimum wiener filter
- (ii) Exercises on Seismic Signal Processing softwares like PITSA, GEODEPTH, FOCUS etc

GP-504: Geophysical Lab-VIII

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to

CO504.1: Demonstrate and apply geophysical knowledge as a member/leader of the team.

CO504.2: Capable of identifying, formulating and analysing the given geophysical problem.

CO504.3: Develop critical thinking and develop skills to write a project report.

CO504.4: Communicate effectively, demonstrate and understanding of geophysical knowledge.

Problems/Case studies based on Geophysical Methods including:

- (i) Seismology
- (ii) Exploration Seismology
- (iii) Seismic Signal Processing
- (iv) Gravity & Magnetic Methods
- (v) Electrical Methods
- (vi) Geophysical Well logging
- (vii) Remote Sensing & GIS

GP-506: Computational Seismology

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to:

CO506.1: Understand the concepts and simulating techniques of earthquake strong ground motions.

CO506.2: Understand the wave attenuation, Quality factor (Q) and techniques of determining Q and earthquake source parameters.

CO506.3: Understand the concepts of earthquake hazard, probabilistic and deterministic approach, microzonation and site amplification functions.

CO506.4: Understand the seismic tomography, velocity analysis, seismicity parameters, fractals, ray tracing, GPS, anisotropy and time predictable model.

Special Notes:

(i) Nine questions will be set and students will attempt five questions. Question no. I will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. I, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit I Strong motion seismology

Concept of strong motion: Characteristics of earthquake strong ground motion, time domain and frequency domain parameters of strong ground motion, strong motion array and recorder, dynamics of vibration, vibration of a single degree of freedom system, earthquake response spectra, Strong motion networks in India

Modelling of strong ground motion: Stochastic modelling technique, concept of dynamic corner frequency, Empirical Greens function technique, Semi empirical technique and Composite source modelling technique, hybrid technique, point and finite fault sources, Simulation of earthquake strong ground motions at bedrock and at surface level.

Unit II Attenuation Studies

Wave attenuation: geometrical spreading, scattering and intrinsic attenuation, Quality factor Q and its estimation using frequency domain methods, origin of coda waves, coda-Q and its estimation, Q estimation from different parts of seismograms, estimation of frequency independent and frequency dependent Q using strong ground motion, simultaneous estimation of source parameters and Q, concept of 3-D Q and its estimation.

Unit III Engineering seismology

Concept of earthquake hazard, vulnerability and risk, probabilistic versus deterministic approach of estimating earthquake hazard, seismic quiescence/gaps, Regression analysis for estimating peak ground motion, microzonation, Different techniques of estimating site amplification functions using microtremors and earthquake waveforms, Applications in hydrocarbon detection, concept of earthquake resistant design, Indian earthquake hazard scenario.

Unit IV: Selected Topics

Seismic tomography – Methods, regional and local tomography, 3-D velocity analysis, Receiver functions, Seismicity based studies- b-value, fractal and multifractal analysis, Dq-q analysis, self similarity, Ray tracing, Anisotropy, Time predictable model, GPS based studies in seismology.

RECOMMENDED BOOKS

- (1) Quantity Seismology: Aki and Richards

- (2) Introduction to seismology: Peter M. Shearer
- (3) Modern Global Seismology: Lay & Wallace
- (4) Earthquake Hazard Analysis: L. Reiter
- (5) An introduction to seismology, earthquakes and Earth structure: Stein & Wysession

GP-513: Seismic Data Analysis and Reservoir Geophysics

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to

CO513.1: Understand the sequence of seismic data processing.

CO513.2: Understand the technique of seismic deconvolution and seismic migration in data processing.

CO513.3: Understand the concepts of seismic modeling in application to the seismic reservoir.

CO513.4: Understand the various seismic reservoir exploration and surveillance techniques: A.V.O. analysis, 4D monitoring, and 4C analysis.

Special Notes:

(i) Nine questions will be set and students will attempt five questions. Question no. I will be compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answers should not be in yes/no. In addition to question no. I, there will be four units in the question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit.

Unit-I: Introduction

Objectives of Seismic Signal Processing, Seismic Resolution, Basic data processing sequence: CMP sorting, Velocity analysis, residual statics corrections, Normal-Moveout Correction, Moveout stretch, Noise and Multiple Attenuation, f-k filtering, τ -p filtering, Dip-Moveout correction, CMP stacking, post stack processing.

Unit-II: Seismic Deconvolution and Seismic Migration

The convolutional Model, Inverse Filtering, Optimum Wiener filters, Predictive deconvolution in practice, The problem of nonstationarity: Time-Variant deconvolution, gated Wiener deconvolution, Homomorphic deconvolution, Minimum and Maximum Entropy Deconvolution, Inverse Q Filtering, Fresnel Zone, Seismic Migration: Mathematical foundation of migration, Migration using wave equation, Kirchhoff's theory, Pre and Post stack time and depth migration

Unit-III: Seismic Modeling

The role of Seismic Modeling, Concept and example of Physical Models, Seismic Modeling Approaches, Forward Seismic Modeling, Inverse Seismic Modeling, Application of GLI technique, Modeling pitfalls, Ray Tracing using Snell's Law, and Ray-bending.

Unit-IV: Reservoir Geophysics

Reservoir Management, Geophysical Method for Reservoir Surveillance, Analysis of AVO, Acoustic Impedance Estimation, 4-D Seismic Method, Interpretation with SH-wave, 4-C Seismic Method. Unconventional energy sources: Shale gas; Coal Bed Methane; Gas Hydrates.

Recommended Books:

1. Seismic Data Analysis, Vol. I&II, ÖZYILMAZ.
2. Reservoir Geophysics, Robert E. Sheriff.
3. Seismic Modeling of Geologic Structures, Stuart W. Fagin.
4. Introduction to Seismic Inversion Method, Brian H. Russell

GP-517: Artificial Intelligence & Machine Learning In Geophysics

Credits : 4

Max. Marks: 60

Time: 3 hours

Course Outcomes:

On completion of this course, the students will be able to

CO517.1: Understand basic concepts of machine learning and artificial intelligence.

CO517.2: Understands the concept of seismic methods and know similarity and differences between Inversion and Artificial Intelligence.

CO517.3: Use Python programming language for application in machine learning and artificial intelligence.

CO517.4: Understand the application of machine learning and artificial intelligence in seismic processing and seismic interpretation.

Special Notes:

Nine questions will be set and students will attempt five questions. Question No.1 is compulsory and based on the conceptual aspects of the whole syllabus. It can have 5 to 10 parts. The answer should not be in yes and no. In addition to Question 1, there will be four unit question paper each containing two questions belonging to four units in the syllabus. Students will select one question from each unit

Unit-I: Fundamentals of Machine Learning

Introduction to Artificial Intelligence and Machine Learning. Machine Learning: Supervised Learning: Classification and Regression, k-Nearest Neighbors, Neural Networks (Deep Learning). Unsupervised Learning: Dimensionality reduction, Feature extraction, Clustering: k-Means clustering.

Unit-II: Review of Seismic Methods

Seismic data analysis: Signal processing, Data processing sequence, Deconvolution, Filtering, Normal moveout correction. Reservoir geophysics: Amplitude variation with offset, Seismic attribute analysis, Full waveform inversion. Geophysical Inversion versus Machine Learning: similarity and differences.

Unit-III: Machine Learning with Python

Introduction to Python. Python 3.7, scikit-learn, Libraries and tools: NumPy, SciPy, matplotlib, pandas, Jupyter notebook. Control flow tools, Data Structures, Modules, Input and Output, Errors and Exceptions, Classes, Standard Library, Virtual environment and packages. Machine Learning with Python.

Unit-IV: Application in Geophysics

Machine Learning Applications: First break picking, Seismic deconvolution, N.M.O. correction in τ - p domain. Reservoir characterization: Direct hydrocarbon indicator, Pattern recognition, Principle component analysis, Thin bed identification for shale gas, Data driven amplitude variation with offset, Rock physics analysis.

Recommended Books:

1. Anthony Croft et al.	Engineering Mathematics
2. Martin C. Brown	Python the complete reference
3. R. Nageshwara Rao	Core Python Programming

GP-601: Dissertation

Credits: 16

Max. Marks: 400

Time : 30 Minutes per student

Course Outcomes:

On completion of this course, the students will be able to

CO601.1: Demonstrate and apply geophysical knowledge as a member/leader of the team to solve a minor research problem.

CO601.2: Capable of identifying, formulating and analysing the given geophysical problem.

CO601.3: Develop critical thinking and develop skills to write a Dissertation report.

CO601.4: Communicate effectively, demonstrate and understanding of geophysical knowledge.

Objective and Output:

Every student is required to undertake a project in the last semester. The project may be an experimental investigation, field work and laboratory studies, a theoretical investigation accompanied by computation work, data processing and analysis or combination of these. The exact nature of the project and the problem is decided by the chairperson of the department in consultation with faculty members and students. After the project is completed the students will submit two copies of dissertation based on the results obtained in the investigation. Finally the student is expected to defend his findings as embodied in his dissertation before a board of examinations and take an oral examination.

This will inculcate the research aptitude in the students.

GP- 602: Comprehensive Viva-Voce

Credits:4

Max. Marks: 100

Time : 30 Minutes per student

Course Outcomes:

On completion of this course, the students will be able to

CO602.1: Prepare themselves for the various competitive examinations held by various organizations including ONGC, GSI, GATE, CSIR-JRF-NET, Ground water boards etc.

CO602.2: Demonstrate comprehensive knowledge and understanding of the Geophysics discipline.

CO602.3: Communicate effectively the Geophysical knowledge.

Note:

Every student shall be required to appear for comprehensive viva-voce examination based on complete M.Tech. (Applied Geophysics) course before a committee of teachers of the department.

GP-603: Seminar

Credits: 4

Max. Marks: 100

Time : One Hour per student

Course Outcomes:

On completion of this course, the students will be able to

CO603.1: Communicate effectively on Geophysical topics.

CO603.2: Demonstrate comprehensive knowledge and understanding of the Geophysical principles.

CO603.3: Learn techniques for professional practices including writing a scientific report.

Objective and Output:

In order to inculcate sense of confidence and self reliance and with a view to train the student in the art of public speaking and self expression, each student is required to deliver a talk on a particular topic during sixth semester. The topic of the seminar is selected by the students under the advice of a teacher of the department. This is accompanied by a write up. Besides delivering a seminar talk a student is expected to attend all other seminars delivered by other students. The seminar shall be evaluated by a committee of the teachers of the department.

GP- 604: Geophysical Field Training-II

Credits:4

Max. Marks: 100

Time : 30 Minutes per student

Course Outcomes:

On completion of this course, the students will be able to

CO604.1: Learn practical knowledge of different instruments/Geophysical techniques and will be able to do the acquisition, processing and interpretation of Geophysical data. Prepare themselves for the industrial environment.

CO604.2: To develop critical thinking and skills to write the project report.

CO604.3: To work effectively as an individual as well as team work.

CO604.4: Communicate effectively and demonstrate the geophysical knowledge.

CO-PO mapping matrix for the course GP-101 (Mathematical Methods in Geophysics)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO101.1	3	2	2	2	-	2	1	1	1	1	1
CO101.2	3	2	2	2	-	2	1	1	1	1	1
CO101.3	3	2	2	2	-	2	1	1	1	2	2
CO101.4	3	1	2	2	-	2	1	1	1	1	1
Average	3	1.8	2	2	-	2	1	1	1	1.3	1.3

CO-PSO mapping matrix for the course GP-101 (Mathematical Methods in Geophysics)

COs#	PSO1	PSO2	PSO3	PSO4
CO101.1	3	2	3	2
CO101.2	3	2	3	2
CO101.3	3	2	3	3
CO101.4	3	2	3	2
Average	3	2	3	2.3

CO-PO mapping matrix for the course GP-102: Solid Earth Geophysics

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO102.1	3	1	2	1	1	1	1	1	2	1	1
CO102.2	3	1	2	1	1	1	1	1	2	1	1
CO102.3	3	1	2	2	1	2	1	1	2	1	1
CO102.4	3	2	2	2	1	2	1	1	2	1	1
Average	3	1.3	2	1.5	1	1.5	1	1	2	1	1

CO-PSO mapping matrix for the course GP-102: Solid Earth Geophysics

COs#	PSO1	PSO2	PSO3	PSO4
CO102.1	3	1	3	1
CO102.2	3	2	2	2
CO102.3	3	1	3	1
CO102.4	3	2	2	3
Average	3	1.5	2.5	1.8

CO-PO mapping matrix for the course GP-103 (Numerical Methods and Computer Programming)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO103.1	3	3	2	1	1	1	1	1	3	1	3
CO103.2	3	3	2	1	1	1	2	1	3	1	2
CO103.3	3	3	2	1	1	2	2	1	3	1	2
CO103.4	3	3	2	1	1	3	3	1	3	1	2
Average	3	3	2	1	1	1.8	2	1	3	1	2.3

CO-PSO mapping matrix for the course GP-103 (Numerical Methods and Computer Programming)

COs#	PSO1	PSO2	PSO3	PSO4
CO103.1	1	3	3	3
CO103.2	3	2	2	3
CO103.3	3	2	2	3
CO103.4	3	2	3	3
Average	2.5	2.3	2.5	3

CO-PO mapping matrix for the course GP-104 (Basic Geology)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO104.1	3	1	2	--	1	1	--	--	2	1	1
CO104.2	3	1	2	--	1	1	--	1	2	1	1
CO104.3	3	1	2	--	1	1	--	1	2	1	1
CO104.4	3	1	2	--	1	1	--	1	2	1	1
Average	3	1	2	--	1	1	--	1	2	1	1

CO-PSO mapping matrix for the course GP-104 (Basic Geology)

COs#	PSO1	PSO2	PSO3	PSO4
CO104.1	2	2	2	2
CO104.2	2	2	2	2
CO104.3	2	2	2	2
CO104.4	2	2	2	2
Average	2	2	2	2

CO-PO mapping matrix for the course GP-105 (Geology Lab.)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO105.1	3	1	1	1	1	2	1	1	2	1	1
CO105.2	3	2	3	1	2	2	2	1	2	1	2
CO105.3	3	2	2	2	2	2	2	1	2	1	2
CO105.4	3	3	2	3	1	2	2	1	2	1	2
Average	3	2	2	1.8	1.5	2	1.8	1	2	1	1.8

CO-PSO mapping matrix for the course GP-105 (Geology Lab.)

COs#	PSO1	PSO2	PSO3	PSO4
CO105.1	2	1	3	1
CO105.2	1	2	3	1
CO105.3	1	2	2	3
CO105.4	3	3	2	3
Average	1.8	2	2.5	2

CO-PO mapping matrix for the course GP-106 (Computer Lab.)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO106.1	3	2	2	2	2	2	2	2	3	1	2
CO106.2	3	2	2	2	2	3	2	2	3	1	2
CO106.3	3	3	2	3	2	2	2	2	3	1	2
CO106.4	3	3	2	3	2	2	2	3	3	1	2
Average	3	2.5	2	2.5	2	2.3	2	2.3	3	1	2

CO-PSO mapping matrix for the course GP-106 (Computer Lab.)

COs#	PSO1	PSO2	PSO3	PSO4
CO106.1	1	2	3	3
CO106.2	2	2	2	3
CO106.3	2	2	2	3
CO106.4	2	2	3	3
Average	1.8	2	2.5	3

CO-PO mapping matrix for the course GP-201 (Remote Sensing and GIS)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO201.1	3	1	2	1	1	1	1	-	2	1	1
CO201.2	3	1	2	1	1	1	2	-	2	1	1
CO201.3	3	1	2	1	1	1	2	-	2	1	1
CO201.4	3	1	2	2	1	1	2	-	2	1	1
Average	3	1	2	1.3	1	1	1.8	-	2	1	1

CO-PSO mapping matrix for the course GP-201 (Remote Sensing and GIS)

COs#	PSO1	PSO2	PSO3	PSO4
CO201.1	2	2	1	1
CO201.2	2	2	1	3
CO201.3	2	2	1	2
CO201.4	2	2	2	2
Average	2	2	1.8	2

CO-PO mapping matrix for the course GP-202 (Advanced Computing)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO202.1	3	2	2	3	2	2	2	2	2	1	1
CO202.2	3	2	2	3	2	2	2	2	2	1	1
CO202.3	3	2	2	3	2	2	2	2	2	1	1
CO202.4	3	2	2	2	2	2	3	2	2	1	1
Average	3	2	2	2.8	2	2	2.3	2	2	1	1

CO-PSO mapping matrix for the course GP-202 (Advanced Computing)

COs#	PSO1	PSO2	PSO3	PSO4
CO202.1	2	3	2	1
CO202.2	2	3	2	1
CO202.3	2	3	2	1
CO202.4	2	3	2	2
Average	2	3	2	1.3

CO-PO mapping matrix for the course GP-203 (Geophysical Signal Processing)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO203.1	3	2	2	2	1	2	1	1	2	1	1
CO203.2	3	2	2	1	1	2	1	1	2	1	1
CO203.3	3	2	2	2	1	2	3	1	2	1	1
CO203.4	3	2	2	1	1	2	3	1	2	1	1
Average	3	2	2	1.5	1	2	2	1	2	1	1

CO-PSO mapping matrix for the course GP-203 (Geophysical Signal Processing)

COs#	PSO1	PSO2	PSO3	PSO4
CO203.1	3	2	3	2
CO203.2	3	2	3	2
CO203.3	3	2	3	2
CO203.4	3	2	3	2
Average	3	2	3	2

CO-PO mapping matrix for the course GP-204 (Geophysical Fields and Waves)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO204.1	3	1	2	1	1	2	--	--	2	1	1
CO204.2	3	1	2	1	1	1	--	--	2	1	1
CO204.3	3	1	2	1	1	2	1	--	2	1	1
CO204.4	3	1	2	1	1	1	1	--	2	1	1
Average	3	1	2	1	1	1.5	1	--	2	1	1

CO-PSO mapping matrix for the course GP-204 (Geophysical Fields and Waves)

COs#	PSO1	PSO2	PSO3	PSO4
CO204.1	2	2	2	1
CO204.2	2	2	2	1
CO204.3	2	2	2	2
CO204.4	2	2	2	2
Average	2	2	2	1.5

CO-PO mapping matrix for the course GP-205 (Geophysical Lab.-I)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO205.1	2	3	--	2	2	3	--	2	1	1	2
CO205.2	2	2	--	2	2	3	--	3	2	1	2
CO205.3	2	1	2	2	2	3	1	1	2	1	2
CO205.4	2	1	2	2	2	3	1	1	2	1	2
Average	2	1.8	2	2	2	3	1	1.8	1.8	1	2

CO-PSO mapping matrix for the course GP-205 (Geophysical Lab.-I)

COs#	PSO1	PSO2	PSO3	PSO4
CO205.1	2	2	2	2
CO205.2	2	2	2	2
CO205.3	2	2	2	2
CO205.4	2	2	2	2
Average	2	2	2	2

CO-PO mapping matrix for the course GP-206 (Geophysical Lab. – II)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO402.1	3	2	2	2	2	3	2	1	2	1	1
CO402.2	3	2	2	2	2	3	2	1	2	1	1
CO402.3	3	2	2	2	2	3	2	1	2	1	1
CO402.4	3	2	2	2	2	3	2	1	2	1	1
Average	3	2	2	2	2	3	2	1	2	1	1

CO-PSO mapping matrix for the course GP-206 (Geophysical Lab. – II)

COs#	PSO1	PSO2	PSO3	PSO4
CO402.1	3	2	3	3
CO402.2	3	2	3	3
CO402.3	3	2	3	3
CO402.4	3	2	3	3
Average	3	2	3	3

CO-PO mapping matrix for the course GP-207 (Geological Field Training)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO207.1	3	3	2	2	3	3	2	1	2	1	2
CO207.2	3	1	2	2	3	3	3	1	2	1	2
CO207.3	3	3	2	2	3	3	2	1	1	1	2
CO207.4	3	1	2	2	3	1	2	2	3	1	3
Average	3	2	2	2	3	2.5	2.3	1.3	2	1	2.3

CO-PSO mapping matrix for the course GP-207 (Geological Field Training)

COs#	PSO1	PSO2	PSO3	PSO4
CO207.1	2	2	1	1
CO207.2	2	2	1	2
CO207.3	1	3	2	2
CO207.4	1	1	2	1
Average	1.5	2	1.5	1.5

CO-PO mapping matrix for the course GP-301 (Seismology)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO301.1	3	3	2	2	--	1	2	2	3	1	3
CO301.2	3	3	2	1	--	1	2	1	3	1	2
CO301.3	3	3	2	1	1	2	2	2	3	1	2
CO301.4	3	3	2	2	1	3	2	3	3	1	2
Average	3	3	2	1.5	1	1.8	2	2	3	1	2.3

CO-PSO mapping matrix for the course GP-301 (Seismology)

COs#	PSO1	PSO2	PSO3	PSO4
CO301.1	3	2	3	3
CO301.2	3	3	2	3
CO301.3	2	2	2	3
CO301.4	2	2	3	3
Average	2.5	2.3	2.5	3

CO-PO mapping matrix for the course GP-302 (Gravity and Magnetic Prospecting)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO302.1	3	1	2	1	--	1	1	1	3	1	3
CO302.2	3	-	2	1	--	--	2	1	3	1	2
CO302.3	3	2	2	1	--	2	2	1	3	1	2
CO302.4	3	2	2	1	--	3	3	1	3	1	2
Average	3	1.7	2	1	--	2	2	1	3	1	2.3

CO-PSO mapping matrix for the course GP-302 (Gravity and Magnetic Prospecting)

COs#	PSO1	PSO2	PSO3	PSO4
CO302.1	1	1	3	3
CO302.2	3	2	2	3
CO302.3	3	2	2	3
CO302.4	3	2	3	3
Average	2.5	1.8	2.5	3

CO-PO mapping matrix for the course GP-303 (Groundwater Geophysics)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO303.1	3	1	2	1	1	1	1	2	2	1	1
CO303.2	3	1	2	1	1	1	1	2	2	1	1
CO303.3	3	1	2	1	1	1	2	2	2	1	1
CO303.4	3	1	2	1	1	1	2	2	2	1	1
Average	3	1	2	1	1	1	1.5	2	2	1	1

CO-PSO mapping matrix for the course GP-303 (Groundwater Geophysics)

COs#	PSO1	PSO2	PSO3	PSO4
CO303.1	3	1	2	2
CO303.2	3	2	2	1
CO303.3	3	1	2	1
CO303.4	3	2	2	2
Average	3	1.5	2	1.5

CO-PO mapping matrix for the course GP-304 (Electrical Prospecting)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO304.1	3	2	2	2	1	2	1	1	2	1	1
CO304.2	3	2	2	2	1	2	1	1	2	1	1
CO304.3	3	2	2	2	1	2	2	2	2	1	1
CO304.4	3	2	2	2	1	2	2	2	2	1	1
Average	3	2	2	2	1	2	1.5	1.5	2	1	1

CO-PSO mapping matrix for the course GP-304 (Electrical Prospecting)

COs#	PSO1	PSO2	PSO3	PSO4
CO304.1	3	2	3	1
CO304.2	3	2	3	2
CO304.3	3	2	3	3
CO304.4	3	2	3	3
Average	3	2	3	2.2

CO-PO mapping matrix for the course GP-305 (Geophysical Lab. – III)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO306.1	3	3	2	3	2	2	2	1	1	1	1
CO306.2	3	3	1	2	2	3	2	1	2	1	1
CO306.3	3	3	1	1	2	2	2	1	1	1	2
CO306.4	3	3	2	1	2	2	2	1	2	1	1
Average	3	3	1.5	1.8	2	2.3	2	1	1.5	1	1.3

CO-PSO mapping matrix for the course GP-305 (Geophysical Lab. – III)

COs#	PSO1	PSO2	PSO3	PSO4
CO306.1	3	2	3	2
CO306.2	3	2	3	3
CO306.3	3	2	2	3
CO306.4	3	2	2	3
Average	3	2	2.5	2.8

CO-PO mapping matrix for the course GP-306 (Geophysical Lab. – IV)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO306.1	2	1	2	3	1	2	2	1	3	1	2
CO306.2	2	2	2	2	1	3	2	1	3	1	2
CO306.3	2	2	2	2	1	2	2	1	3	1	2
CO306.4	2	1	2	1	1	2	2	3	3	1	1
Average	2	1.5	2	2	1	2.3	2	1.5	3	1	1.8

CO-PSO mapping matrix for the course GP-306 (Geophysical Lab. – IV)

COs#	PSO1	PSO2	PSO3	PSO4
CO306.1	3	3	3	2
CO306.2	3	3	3	3
CO306.3	3	3	3	2
CO306.4	2	3	2	1
Average	2.8	3	2.8	2

CO-PO mapping matrix for the course GP-401: Petrophysics and Well logging

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO401.1	3	1	2	1	1	2	1	1	2	1	2
CO401.2	3	1	2	2	1	2	1	1	2	1	2
CO401.3	3	1	2	1	1	2	1	1	2	1	2
CO401.4	3	1	2	2	1	2	1	1	2	1	2
Average	3	1	2	1.5	1	2	1	1	2	1	2

CO-PSO mapping matrix for the course GP-401: Petrophysics and Well logging

COs#	PSO1	PSO2	PSO3	PSO4
CO401.1	3	2	3	2
CO401.2	3	2	3	2
CO401.3	3	2	3	2
CO401.4	3	2	3	2
Average	3	2	3	2

CO-PO mapping matrix for the course GP-402 (Physical Oceanography and Marine Geophysics)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO402.1	3	1	2	2	1	3	1	1	2	1	1
CO402.2	3	1	2	2	1	3	1	1	2	1	-
CO402.3	3	1	2	2	1	3	1	1	2	1	1
CO402.4	3	1	2	2	1	3	1	1	2	1	1
Average	3	1	2	2	1	3	1	1	2	1	1

CO-PSO mapping matrix for the course GP-402 (Physical Oceanography and Marine Geophysics)

COs#	PSO1	PSO2	PSO3	PSO4
CO402.1	3	2	3	3
CO402.2	3	2	3	3
CO402.3	3	2	3	2
CO402.4	3	2	3	2
Average	3	2	3	2.5

CO-PO mapping matrix for the course GP-403 (Seismic Prospecting)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO404.1	3	1	2	1	1	2	1	1	2	1	1
CO404.2	3	1	2	1	1	1	1	1	2	1	1
CO404.3	3	2	2	1	1	2	3	1	2	1	1
CO404.4	3	2	2	1	1	1	3	1	2	1	1
Average	3	1.5	2	1	1	1.5	2	1	2	1	1

CO-PSO mapping matrix for the course GP-403 (Seismic Prospecting)

COs#	PSO1	PSO2	PSO3	PSO4
CO404.1	3	2	3	3
CO404.2	3	2	3	3
CO404.3	3	2	3	3
CO404.4	3	2	3	3
Average	3	2	3	3

CO-PO mapping matrix for the course GP-404 (Geophysical Inversion)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO404.1	3	2	1	2	--	2	2	1	3	--	1
CO404.2	3	2	1	2	--	2	2	1	3	--	1
CO404.3	3	2	1	2	--	2	3	1	3	2	2
CO404.4	3	2	1	2	--	3	3	1	3	2	2
Average	3	2	1	2	--	2.3	2.5	1	3	2	1.5

CO-PSO mapping matrix for the course GP-404 (Geophysical Inversion)

COs#	PSO1	PSO2	PSO3	PSO4
CO404.1	3	1	1	1
CO404.2	3	2	1	2
CO404.3	3	3	2	3
CO404.4	3	3	2	3
Average	3	2.3	1.5	2.3

CO-PO mapping matrix for the course GP-405 (Geophysical Lab.-V)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO405.1	3	3	2	3	2	2	2	2	3	1	2
CO405.2	3	3	2	2	2	2	2	2	3	1	2
CO405.3	3	2	3	3	2	2	2	2	3	1	2
CO405.4	3	2	3	2	2	3	2	2	3	1	2
Average	3	2.5	2.5	2.5	2	2.3	2	2	3	1	2

CO-PSO mapping matrix for the course GP-405 (Geophysical Lab.-V)

COs#	PSO1	PSO2	PSO3	PSO4
CO405.1	3	3	2	3
CO405.2	2	3	3	3
CO405.3	3	2	2	3
CO405.4	2	2	3	3
Average	2.5	2.5	2.5	3

CO-PO mapping matrix for the course GP-406 (Geophysical Lab.-VI)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO406.1	3	2	1	3	1	2	2	1	3	--	1
CO406.2	3	2	3	1	1	2	2	1	3	1	2
CO406.3	3	2	2	3	1	2	2	1	3	3	2
CO406.4	2	2	1	1	1	2	3	3	3	1	1
Average	2.8	2	1.8	2	1	2	2.3	1.5	3	1.7	1.5

CO-PSO mapping matrix for the course GP-406 (Geophysical Lab.-VI)

COs#	PSO1	PSO2	PSO3	PSO4
CO406.1	2	3	2	2
CO406.2	2	3	3	1
CO406.3	3	2	2	2
CO406.4	1	3	2	2
Average	2	2.8	2.3	1.8

CO-PO mapping matrix for the course GP-407: Geophysical Field Training-I

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO407.1	3	3	3	3	2	2	1	2	1	2	2
CO407.2	3	2	2	3	2	1	1	2	1	2	2
CO407.3	3	2	2	3	2	2	1	2	1	2	2
CO407.4	3	2	2	3	2	1	1	2	1	2	2
Average	3	2.3	2.3	3	2	1.5	1	2	1	2	2

CO-PSO mapping matrix for the course GP-407: Geophysical Field Training-I

COs#	PSO1	PSO2	PSO3	PSO4
CO407.1	3	3	2	3
CO407.2	3	2	2	3
CO407.3	3	2	2	3
CO407.4	3	2	2	3
Average	3	2.3	2	3

CO-PO mapping matrix for the course GP-501 (Near Surface Geophysics)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO501.1	3	2	2	1	1	2	1	1	2	1	1
CO501.2	3	2	2	2	1	2	1	1	2	1	1
CO501.3	3	2	2	2	1	2	2	1	2	1	1
CO501.4	3	2	2	2	1	2	2	1	2	1	1
Average	3	2	2	1.8	1	2	1.5	1	2	1	1

CO-PSO mapping matrix for the course GP-501 (Near Surface Geophysics)

COs#	PSO1	PSO2	PSO3	PSO4
CO501.1	3	2	3	1
CO501.2	3	2	3	1
CO501.3	3	2	3	3
CO501.4	3	2	3	3
Average	3	2	3	2

CO-PO mapping matrix for the course GP-502 (Electromagnetic and Magnetotelluric Methods)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO502.1	3	2	2	1	1	2	1	1	2	1	1
CO502.2	3	2	2	1	1	2	2	1	2	1	1
CO502.3	3	2	2	1	1	2	2	1	2	1	1
CO502.4	3	2	2	1	1	2	2	1	2	1	1
Average	3	2	2	1	1	2	1.7	1	2	1	1

CO-PSO mapping matrix for the course GP-502 (Electromagnetic and Magnetotelluric Methods)

COs#	PSO1	PSO2	PSO3	PSO4
CO502.1	3	2	3	1
CO502.2	3	2	3	3
CO502.3	3	2	3	3
CO502.4	3	2	3	3
Average	3	2	3	2.5

CO-PO mapping matrix for the course GP-503: Geophysical Lab-VII

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO503.1	3	2	2	3	2	2	2	1	2	1	2
CO503.2	3	2	2	3	2	1	1	1	2	1	2
CO503.3	3	2	2	3	2	2	2	1	2	1	2
CO503.4	3	2	2	3	2	1	1	1	2	1	1
Average	3	2	2	3	2	1.5	1.5	1	2	1	1.8

CO-PSO mapping matrix for the course GP-503: Geophysical Lab-VII

COs#	PSO1	PSO2	PSO3	PSO4
CO503.1	3	3	2	3
CO503.2	3	3	2	3
CO503.3	3	3	2	3
CO503.4	3	3	2	3
Average	3	3	2	3

CO-PO mapping matrix for the course GP-504 (Geophysical Lab.- VIII)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO504.1	3	2	2	1	3	1	--	1	3	--	3
CO504.2	3	3	2	3	--	2	1	1	3	1	1
CO504.3	3	2	1	2	--	3	3	2	3	1	--
CO504.4	2	1	3	1	2	1	2	1	3	1	2
Average	2.8	2	2	1.8	2.5	1.8	2	1.3	3	1	2

CO-PSO mapping matrix for the course GP-504 (Geophysical Lab. -VIII)

COs#	PSO1	PSO2	PSO3	PSO4
CO504.1	3	1	3	2
CO504.2	3	3	2	2
CO504.3	1	3	3	2
CO504.4	2	2	3	1
Average	2.3	2.3	2.8	1.8

CO-PO mapping matrix for the course GP-506 (Computational Seismology)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO506.1	3	2	1	2	1	2	2	1	3	1	2
CO506.2	3	2	1	2	1	2	2	1	3	1	2
CO506.3	3	2	1	2	1	2	2	1	3	1	2
CO506.4	3	2	1	2	1	2	2	1	3	1	2
Average	3	2	1	2	1	2	2	1	3	1	2

CO-PSO mapping matrix for the course GP-506 (Computational Seismology)

COs#	PSO1	PSO2	PSO3	PSO4
CO506.1	3	3	3	2
CO506.2	3	3	2	2
CO506.3	3	3	2	2
CO506.4	3	3	2	2
Average	3	3	2.3	2

CO-PO mapping matrix for the course GP-513 (Seismic Data Analysis and Reservoir Geophysics)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO513.1	3	3	2	3	2	2	2	1	2	1	1
CO513.2	3	3	2	3	2	3	3	1	2	1	3
CO513.3	3	3	2	3	2	2	2	1	3	1	1
CO513.4	3	3	2	3	2	3	3	1	2	1	3
Average	3	3	2	3	2	2.5	2.5	1	2.3	1	2

CO-PSO mapping matrix for the course GP-513 (Seismic Data Analysis and Reservoir Geophysics)

COs#	PSO1	PSO2	PSO3	PSO4
CO513.1	3	2	2	3
CO513.2	3	3	2	3
CO513.3	3	2	2	3
CO513.4	3	3	2	3
Average	3	2.5	2	3

CO-PO mapping matrix for the course GP-517 (Artificial Intelligence & Machine Learning in Geophysics)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO517.1	3	2	1	3	2	2	2	1	2	1	1
CO517.2	3	2	2	3	2	2	2	1	2	1	1
CO517.3	3	2	2	3	2	2	2	1	2	1	1
CO517.4	3	2	2	3	2	2	2	1	2	1	1
Average	3	2	1.8	3	2	2	2	1	2	1	1

CO-PSO mapping matrix for the course GP-517 (Artificial Intelligence & Machine Learning in Geophysics)

COs#	PSO1	PSO2	PSO3	PSO4
CO517.1	2	2	2	2
CO517.2	2	3	3	3
CO517.3	2	2	1	1
CO517.4	2	3	2	2
Average	2	2.5	2	2

CO-PO mapping matrix for the course GP-601 (Dissertation)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO601.1	3	3	2	3	3	3	2	2	3	1	2
CO601.2	3	3	2	3	2	3	2	2	3	2	2
CO601.3	3	3	2	3	3	3	2	2	3	1	2
CO601.4	3	3	3	3	2	3	2	2	3	2	2
Average	3	3	2.3	3	2.5	3	2	2	3	1.5	2

CO-PSO mapping matrix for the course GP-601 (Dissertation)

COs#	PSO1	PSO2	PSO3	PSO4
CO601.1	3	3	3	3
CO601.2	3	3	3	3
CO601.3	3	3	3	3
CO601.4	3	3	3	3
Average	3	3	3	3

CO-PO mapping matrix for the course GP-602 (Comprehensive Viva-Voce)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO602.1	3	--	2	1	1	--	2	1	2	1	1
CO602.2	3	--	2	1	1	--	2	1	2	1	1
CO602.3	2	--	3	--	1	--	2	1	2	1	1
Average	2.7	--	2.3	1	1	--	2	1	2	1	1

CO-PSO mapping matrix for the course GP-602 (Comprehensive Viva-Voce)

COs#	PSO1	PSO2	PSO3	PSO4
CO602.1	2	2	3	2
CO602.2	2	2	3	2
CO602.3	2	2	3	2
Average	2	2	3	2

CO-PO mapping matrix for the course GP-603 (Seminar)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO603.1	3	2	3	1	2	1	2	1	3	2	1
CO603.2	3	2	3	2	2	1	2	2	3	2	1
CO603.3	3	3	1	2	2	2	2	3	3	3	1
Average	3	2.3	2.3	1.7	2	1.3	2	2	3	2.3	1

CO-PSO mapping matrix for the course GP-603 (Seminar)

COs#	PSO1	PSO2	PSO3	PSO4
CO603.1	2	3	3	2
CO603.2	3	3	3	2
CO603.3	2	3	3	2
Average	2.3	3	3	2

CO-PO mapping matrix for the course GP-604 (Geophysical Field Training- II)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO604.1	3	2	2	2	1	2	3	1	2	1	2
CO604.2	3	2	2	2	2	2	3	1	2	1	2
CO604.3	3	2	2	2	3	2	3	1	2	1	2
CO604.4	3	2	2	2	2	2	3	1	2	1	2
Average	3	2	2	2	2	2	3	1	2	1	2

CO-PSO mapping matrix for the course GP-604 (Geophysical Field Training- II)

COs#	PSO1	PSO2	PSO3	PSO4
CO604.1	3	2	2	3
CO604.2	3	2	2	3
CO604.3	3	2	2	3
CO604.4	3	2	2	3
Average	3	2	2	3

Table 1: CO-PSO-PO mapping matrix

Course code	PO#											PSO#			
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4
GP-101	3	1.8	2	2	--	2	1	1	1	1.3	1.3	3	2	3	2.3
GP-102	3	1.3	2	1.5	1	1.5	1	1	2	1	1	3	1.5	2.5	1.8
GP-103	3	3	2	1	1	1.8	2	1	3	1	2.3	2.5	2.3	2.5	3
GP-104	3	1	2	--	1	1	--	1	2	1	1	2	2	2	2
GP-105	3	2	2	1.8	1.5	2	1.8	1	2	1	1.8	1.8	2	2.5	2
GP-106	3	2.5	2	2.5	2	2.3	2	2.3	3	1	2	1.8	2	2.5	3
GP-201	3	1	2	1.3	1	1	1.8	--	2	1	1	2	2	1.8	2
GP-202	3	2	2	2.8	2	2	2.3	2	2	1	1	2	3	2	1.3
GP-203	3	2	2	1.5	1	2	2	1	2	1	1	3	2	3	2
GP-204	3	1	2	1	1	1.5	1	--	2	1	1	2	2	2	1.5
GP-205	2	1.8	2	2	2	3	1	1.8	1.8	1	2	2	2	2	2
GP-206	3	2	2	2	2	3	2	1	2	1	1	3	2	3	3
GP-207	3	2	2	2	3	2.5	2.3	1.3	2	1	2.3	1.5	2	1.5	1.5
GP-301	3	3	2	1.5	1	1.8	2	2	3	1	2.3	2.5	2.3	2.5	3
GP-302	3	1.7	2	1	--	2	2	1	3	1	2.3	2.5	1.8	2.5	3
GP-303	3	1	2	1	1	1	1.5	2	2	1	1	3	1.5	2	1.5
GP-304	3	2	2	2	1	2	1.5	1.5	2	1	1	3	2	3	2.3
GP-305	3	3	1.5	1.8	2	2.3	2	1	1.5	1	1.3	3	2	2.5	2.8
GP-306	2	1.5	2	2	1	2.3	2	1.5	3	1	1.8	2.8	3	2.8	2
GP-401	3	1	2	1.5	1	2	1	1	2	1	2	3	2	3	2
GP-402	3	1	2	2	1	3	1	1	2	1	1	3	2	3	2.5
GP-403	3	1.5	2	1	1	1.5	2	1	2	1	1	3	2	3	3
GP-404	3	2	1	2	--	2.3	2.5	1	3	2	1.5	3	2.3	1.5	2.3
GP-405	3	2.5	2.5	2.5	2	2.3	2	2	3	1	2	2.5	2.5	2.5	3
GP-406	2.8	2	1.8	2	1	2	2.3	1.5	3	1.7	1.5	2	2.8	2.3	1.8
GP-407	3	2.3	2.3	3	2	1.5	1	2	1	2	2	3	2.3	2	3
GP-501	3	2	2	1.8	1	2	1.5	1	2	1	1	3	2	3	2
GP-502	3	2	2	1	1	2	1.8	1	2	1	1	3	2	3	2.5
GP-503	3	2	2	3	2	1.5	1.5	1	2	1	1.8	3	3	2	3
GP-504	2.8	2	2	1.8	2.5	1.8	2	1.3	3	1	2	2.3	2.3	2.8	1.8
GP-506	3	2	1	2	1	2	2	1	3	1	2	3	3	2.3	2
GP-513	3	3	2	3	2	2.5	2.5	1	2.3	1	2	3	2.5	2	3
GP-517	3	2	1.8	3	2	2	2	1	2	1	1	2	2.5	2	2
GP-601	3	3	2.3	3	2.5	3	2	2	3	1.5	2	3	3	3	3
GP-602	3	--	2.3	1	1	--	2	1	2	1	1	2	2	3	2
GP-603	3	2.3	2.3	1.7	2	1.3	2	2	3	2.3	1	2.3	3	3	2
GP-604	3	2	2	2	2	2	3	1	2	1	2	3	2	2	3

A. Method of Attainment of COs, PSOs & POs:

The attainment of COs can be measured on the basis of the results of internal assessment and semester examination. The attainment is measured on scale of 3 after setting the target for COs attainment. Table 2 shows the CO attainment levels assuming the set target of 60% marks:

Table 2: CO Attainment Levels for internal assessment

Attainment Level	
1 (low level of attainment)	60% of students score more than 60% of marks in class tests of a course.
2 (Medium level of attainment)	70% of students score more than 60% of marks in class tests of a course.
3 (High level of attainment)	80% of students score more than 60% of marks in class tests of a course.

A proper mapping of course outcomes with assessment methods should be defined before measuring the attainment level. The questions in tests for internal assessment are based on COs. The class test – I is based on first two COs (i.e. G101.1 and G101.2) of a course with equal weightage given to both COs. Similarly class test – II is based on next two COs (i.e. G101.3 and G101.4) of a course with equal weightage given to these two COs. For each internal assessment test, the percentage of students attaining the target level of CO is estimated and average percentage will decide the attainment level of COs. Following steps will be followed for determining the attainment level in internal assessment of a course.

- Estimate the %age of students scoring set target (say 60%) or more in the question(s) of test -I based on first CO i.e. G101.1
- Estimate the %age of students scoring set target (60%) or more in the question(s) of test -I based on second CO i.e. G101.2
- Estimate the %age of students scoring set target (60%) or more in the question(s) of test -II based on third CO i.e. G101.3
- Estimate the %age of students scoring set target (60%) or more in the question(s) of test -II based on the fourth CO i.e. G101.4
- Take average of the percentages obtained above.
- Determine the attainment level i.e. 3, 2 or 1 as per scale defined in table 2.

Note:

- In case of practical course, the CO attainment level for internal assessment is based on the seminar delivered by the students. The seminar is based on all COs of the practical courses.*
- For the courses of field training, the CO attainment level is based on end semester examination only.*
- For the courses in the VIth semester of M.Sc. Tech. (Applied Geophysics) programme, the CO attainment level is based on end term exams only.*

For determining the attainment levels for end semester examination, it is assumed that questions in the end term examination are based on all COs of the course. Attainment levels for end semester examination of a course can be determined after the declaration of the results. The CO attainment levels for end semester examination are given in Table 3.

Table 3: CO Attainment Levels for End Semester Examination(ESE)

Attainment Level	
1 (Low level of attainment)	60% of students obtained letter grade of A or above (for CBCS programs) or score more than 60% of marks (for non-CBCS programs) in ESE of a course.
2 (Medium level of attainment)	70% of students obtained letter grade of A or above (for CBCS programs) or score more than 60% of marks (for non-CBCS programs) in ESE of a course.
3 (High level of attainment)	80% of students obtained letter grade of A or above (for CBCS programs) or score more than 60% of marks (for non-CBCS programs) in ESE of a course.

Overall CO Attainment level of a Course:

The overall CO attainment level of a course can be obtained as:

$$\text{Overall CO attainment level} = 50\% \text{ of CO attainment level in Internal assessment} + 50\% \text{ of CO Attainment level in End semester examination.}$$

The overall COs attainment level can be obtained for all the courses of the program in a similar manner.

B. Attainment of POs:

The overall attainment level of POs is based on the values obtained using direct and indirect methods in the ratio of 80:20. The direct attainment of POs is obtained through the attainment of COs. The overall CO attainment value as estimated above and CO-PO mapping value as shown in Table 1 are used to compute the attainment of POs. PO attainment values obtained using direct method can be written as shown in the Table 4.

Table 4: PO Attainment Values using Direct Method

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
G101												
G102												
G103												
G104												
-												
-												
G406												
Direct PO attainment	Average of above values	Average of above values	Average of above values	--	--	--	--	--	--	--	--	Average of above values

The PO attainment values to be filled in above table can be obtained as follows:

For G101-PO1 Cell:

PO1 attainment value = (Mapping factor of G101-PO1 from Table 1 × Overall CO attainment value for the course G101)/3

For G104-PO1 Cell:

PO1 attainment value = (Mapping factor of G104-PO1 from Table 1 × Overall CO attainment value for the course G104)/3

Similarly values for each cell of Table 4 can be obtained. The direct attainment of POs is average of individual PO attainment values.

In order to obtain the PO attainment using indirect method, a student exit survey based on the questionnaire of POs may be conducted at end of last semester of the program. The format for the same is given in Table 5. Average of the responses from the outgoing students for each PO is estimated.

The overall PO attainment values are obtained by adding attainment values estimated using direct and indirect methods in the proportion of 80:20 as follows:

Overall attainment value for PO1 =

$0.8 \times \text{average attainment value for PO1 using direct method (from table 4)}$

+

$0.2 \times \text{average response of outgoing students for PO1}$

Similarly overall attainment value can be obtained for each PO.

Table 5: Questionnaire for indirect measurement of PO attainment
(For outgoing students)

At the end of my degree program I am able to:

	Please tick any one		
Demonstrate comprehensive disciplinary knowledge I have gained during course of study	3	2	1
Develop research aptitude. Capability for asking relevant/appropriate questions. Capable of identifying, formulating and analyzing the research problems and to draw conclusions from analysis of research problems.	3	2	1
Communicate effectively on	3	2	1

general and scientific topics with the scientific community and with society at large.			
Apply knowledge to solve scientific and other problems	3	2	1
Learn and work effectively as an individual and as a member or leader in team(s) and in multidisciplinary settings. Facilitate cooperative or coordinated efforts on the part of a group and act together as a group or as a team.	3	2	1
Apply critical thinking and analytical reasoning. Use disciplinary and research based knowledge including design of experiments, analysis and interpretation of data to provide valid conclusions.	3	2	1
Use and learn techniques, skills and modern tools for scientific practices.	3	2	1
To apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.	3	2	1
Acquire knowledge and skills including learning 'How to learn' that are necessary for participating in learning activities throughout life.	3	2	1
Demonstrating the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism and adopting objective, unbiased and truthful actions in all aspects of work.	3	2	1
To demonstrate knowledge and understanding of the scientific principles and apply these as a member / leader of a team to manage projects	3	2	1
3: Strongly Agree; 2: Agree; 1: Average			

Overall PO attainment values can be written as shown in Table 6:

Table 6: Overall PO attainment Values

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Direct PO attainment												
Indirect PO attainment												
Overall PO attainment												
Target	2	2	2	2	2	1.5	2	2	2	2	1.5	1.5

The overall PO attainment values obtained above are compared with set target. The set target for each PO may be different and can be finalized by the staff councils of the departments/institutes. If overall PO attainment value is less than the set target value then an action plan may be prepared for improvement in the subsequent academic session.

C. Attainment of PSOs:

The overall attainment level of PSOs is based on the values obtained using direct and indirect methods in the ratio of 80:20. The direct attainment of PSOs is obtained through the attainment of COs. The overall CO attainment value as estimated above and CO-PSO mapping value as shown in Table 1 are used to compute the attainment of PSOs. PSO attainment values obtained using direct method can be written as shown in the Table 7.

Table 7: PSO Attainment Values using Direct Method

	PSO1	PSO2	PSO3	PSO4
GP101				
GP102				
GP103				
GP104				
-				
-				
GP604				
Direct PSO attainment	Average of above values	Average of above values	Average of above values	Average of above values

The PSO attainment values to be filled in above table can be obtained as follows:

For GP101-PSO1 Cell:

PSO1 attainment value = (Mapping factor of GP101-PSO1 from Table 1 × Overall CO attainment value for the course GP101)/3

For GP104-PSO1 Cell:

PSO1 attainment value = (Mapping factor of GP104-PSO1 from Table 1 × Overall CO attainment value for the course GP104)/3

Similarly values for each cell of Table 7 can be obtained. The direct attainment of PSOs is average of individual PSO attainment values.

In order to obtain the PSO attainment using indirect method, a student exit survey based on the questionnaire of PSOs may be conducted at end of last semester of the program. The format for the same is given in Table 8. Average of the responses from the outgoing students for each PSO is estimated.

The overall PSO attainment values are obtained by adding attainment values estimated using direct and indirect methods in the proportion of 80:20 as follows:

Overall attainment value for PSO1 =

$0.8 \times \text{average attainment value for PSO1 using direct method (from table 7)}$

+

$0.2 \times \text{average response of outgoing students for PSO1}$

Similarly overall attainment value can be obtained for each PSO.

**Table 8: Questionnaire for indirect measurement of PSO attainment
(For outgoing students)**

At the end of my degree program I am able to:

	Please tick any one		
Understand the interior of Earth using latest Geophysical knowledge pertaining to various sub-fields within the discipline of Applied Geophysics.	3	2	1
Gain analytical ability, research aptitude and relevant skills useful for professional life.	3	2	1
To demonstrate and communicate Geophysical knowledge, understanding of Geophysical techniques/principles and apply the same to solve geophysical problems relevant	3	2	1

to society.			
Learn the techniques of data acquisition, data processing and data interpretation for Geophysical methods and their applications for the benefit of society.	3	2	1
3: Strongly Agree; 2: Agree; 1: Average			

Overall PSO attainment values can be written as shown in Table 9:

Table 9: Overall PSO attainment Values

	PSO1	PSO2	PSO3	PSO4
Direct PSO attainment				
Indirect PSO attainment				
Overall PSO attainment				
Target	2	2	2	2

The overall PSO attainment values obtained above are compared with set target. The set target for each PSO may be different and can be finalized by the staff councils of the departments/institutes. If overall PSO attainment value is less than the set target value then an action plan may be prepared for improvement in the subsequent academic session.

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

(“A++” Grade, NAAC Accredited)



Scheme of Examination for Post Graduate Programme

Post Graduate Diploma in Health, Safety and Environment

as per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme

With Internship and CBCS-LOCF

With effect from the session 2025-26

**INSTITUTE OF ENVIRONMENTAL STUDIES
FACULTY OF LIFE SCIENCE**

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119

HARYANA, INDIA

Kurukshetra University, Kurukshetra

**Scheme of Examination for Post Graduate Diploma in Health, Safety and Environment
as per NEP 2020 Curriculum and Credit Framework for Postgraduate Programmes
(CBCS LOCF) with effect from the session 2025-26**

Framework-2 Scheme-P

Semester	Course Type	Course Code	Nomenclature of course	Theory (T)/ Practical (P)	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
						Total	L	T	P	Total				
1	CC-1	P25-HST-101	Introduction to Health, Safety and Environment	T	4	26	4	0	0	4	30	70	100	3
	CC-2	P25-HST-102	Industrial Hygiene and Occupational Health	T	4		4	0	0	4	30	70	100	3
	CC-3	P25-HST-103	Environmental Pollution and Control	T	4		4	0	0	4	30	70	100	3
	CC-4	P25-HST-104	Environmental Management	T	4		4	0	0	4	30	70	100	3
	PC-1	P25-HST-105	Practical-I	P	4		0	0	8	8	30	70	100	4
	PC-2	P25-HST-106	Practical-II	P	4		0	0	8	8	30	70	100	4
	SEMINAR	P25-HST-107	Seminar	S	2		0	0	0	2	0	50	50	1
2	CC-5	P25-HST-201	Safety at Workplace	T	4	26	4	0	0	4	30	70	100	3
	CC-6	P25-HST-202	Legal and Socio-economic Aspects of Health, Safety and Environment - Part I	T	4		4	0	0	4	30	70	100	3

CC-7	P25-HST-203	Legal and Socio-economic Aspects of Health, Safety and Environment - Part II	T	4		4	0	0	4	30	70	100	3
CC-8	P25-HST-204	Industrial and Occupational Hazard and Risk - Analysis and Management	T	4		4	0	0	4	30	70	100	3
PC-3	P25-HST-205	Practical-III	P	4		0	0	8	8	30	70	100	4
PC-4	P25-HST-206	Practical-IV	P	4		0	0	8	8	30	70	100	4
CHM	M24-CHM-201	Constitutional, Human and Moral Values, and IPR	T	2		2	0	0	2	15	35	50	3
Internship	P25-INT-200	An internship course of 4 Credits of 4-6 weeks duration during summer vacation after IInd semester is to be completed by every student. Internship can be either for enhancing the employability or for developing the research aptitude.								50	50	100	

Table-1

Course composition- Theory/Theory +Tutorial			
Course Credit	Internal Assessment marks	End term exam marks	Total marks
2	15	35	50
4	30	70	100

Table-2: Course composition- Theory+Practical

Course Credit	Theory		Practical		Total marks
Theory +Practical	Internal Assessment marks	End term exam marks	Internal Assessment marks	End term exam marks	
1+1	10	20	5	15	50
2+0	15	35	-	-	50
3+1	20	50	10	20	100
4+0	30	70	-	-	100
0+4	NA	NA	30	70	100

Table- 3

Total Internal Assessment Marks (Theory)	Class Participation	Seminar/Presentation/Assignment/Quiz/class test, etc.	Mid-Term Exam
10	4	0	6
15	4	4	7
20	5	5	10
30	5	10	15

Table -4

Total Internal Assessment Marks (Practicum)	Class Participation	Seminar/Demonstration/Viva-Voce/Lab record, etc.	Mid-Term Exam
5	0	5	0
10	5	5	0
30	5	10	15

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Syllabus of Examination for Post Graduate Programme

Post Graduate Diploma in Health, Safety and Environment

**as per NEP 2020
Curriculum and Credit Framework for Postgraduate Programme**

**With Internship and CBCS-LOCF
With effect from the session 2025-26**

**INSTITUTE OF ENVIRONMENTAL STUDIES
FACULTY OF LIFE SCIENCE**

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119

HARYANA, INDIA

Session: 2025-26			
Part A - Introduction			
Name of Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	I st semester		
Name of the Course	Introduction to Health, Safety and Environment		
Course Code	P25-HST-101		
Course Type	CC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)	Nil		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Have knowledge of the different safety equipments and their uses, and safety measures in different facilities. CLO 2: Acquire knowledge of the accidents, types and their preventive measures. CLO 3: Understand the health and welfare facilities required and available in different facilities. CLO 4: Have knowledge of Principles and Practices used for Prevention & Control of Environment Protection at different facilities.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to safety equipments and their uses. Introduction of first aid, Road safety. Knowledge of General Safety, Occupational health and hygiene.		15
II	Health: Cleanness, Disposal of Waste, Ventilation and Temperatures, Dust & Fumes, Drinking Water, Lighting, Latrines & Urinals. Safety: Fencing of machineries, Work on or near machinery in motion, Hoists and lifts, Pressure plants, Floors, Stairs and means of escape, Protection against fumes & gases, Safety offers.		15
III	Accident: Definition of Accidents, Classification of Accidents, Need for the Analysis of Accidents, Methods Adopted for Reducing Accidents, Investigation of Accidents, Safety Slogans. Welfare: Washing facilities in Dry clothing, Storing, Sitting, First Aid Appliances, Canteen, Shelters for rest & lunch, Crèches.		15
IV	Environment Protection: Safety and Protection of existing environment.		15

Principles & Practices used for Prevention & Control of Pollution: Water, Air, Soil and Noise. Introduction to Hazardous Waste Management.			
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Simon Watson Pain. (2018). Safety, Health and Environmental Auditing - A Practical Guide. CRC Press.			
2. K.T. Narayanan. (2017). Safety, Health and Environment Handbook. McGraw Hill Education.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	I st semester		
Name of the Course	Industrial Hygiene and Occupational Health		
Course Code	P25-HST-102		
Course Type	CC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)	Nil		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Recognize effective industrial hygiene practices and aspects of chemical hazards that ensure a safer and healthier workplace for workers. CLO 2: Equips students with the training to use personal protection devices required for the protection of individuals from health injuries during specific types of industrial work. CLO 3: Acquire knowledge and practical skills related to identifying and addressing common health issues specific to various occupations. CLO 4: Have knowledge about periodic medical examinations of workers and understanding of the application of Ergonomics for Industrial Safety.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Industrial Hygiene: Definition, control methods, substitution, changing the process, isolation, wet method, local exhaust ventilation, personal hygiene, housekeeping and maintenance, waste disposal, special control measures. Chemical hazards: Introduction, dangerous properties of chemicals, dust, gases, fumes, mist, vapors, smoke, and aerosols; Route of entry to the human system, recognition, evaluation, and control of basic hazards. Concept of dose-response relationship, biochemical action of toxic substances; Concept of threshold, limit values, personnel exposure monitoring; work environment monitoring, biological sampling and analysis.		15
II	Personal Protective Equipment: Need, selection, applicable standards, supply, use, care, and maintenance of respiratory and non-respiratory personal		15

	protective equipments. Respiratory personal protective devices: Classification of respiratory personal protective devices. Selection of respiratory personal protective devices. Non-respiratory personal protective devices: Head protection, ear protection, face and eye protection, hand protection, foot protection, body protection. Instructions and training in the use, maintenance and care of self-containing breathing apparatus. Testing Procedures and Standards.	
III	Occupational Health: Definition, Aims and Scope. Common Occupational Disease: Occupations involving risk of contacting diseases (mode of causation of the diseases and its effects, and diagnostic methods), Biological monitoring (method of prevention, compensation for occupational diseases), Evaluation of injuries, Occupational Health Management Services at the workplace, List of notifiable diseases in Schedule III of Factories Act - 1948. Occupational Health Hazards: Adverse health effects of noise, vibration, cold, heat stress, improper illumination, thermal radiation, ionizing and non-ionising radiations. Permissible threshold exposure limits: short-term and long-term effects of exposures, preventive and control measures.	15
IV	Diagnostic Measures: Pre-employment and periodic medical examination of workers. Medical surveillance for control of occupational diseases and health records. Fundamentals of First-Aid-Burns, Fractures, Suffocation, Toxic Ingestion - Bleeding Wounds and Bandaging, Artificial Respiratory Techniques. Ergonomics: Introduction, Aims and Scope, Man-machine (Job), Environment System, Constituents of Ergonomics, Application of Ergonomics in Industry for Safety, Health and Environment. Industrial Hygiene: Definition, control methods, substitution, changing the process, isolation, wet method, local exhaust ventilation, personal hygiene, housekeeping and maintenance, waste disposal, special control measures.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory		➤ Theory:
30		70
• Class Participation:		Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:		
• Mid-Term Exam:		
		5
		10
		15
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Reed, S., Pisaniello, D., & Benke, G. (Eds.). (2020). Principles of Occupational Health and Hygiene: An Introduction. Routledge.		
2. Cavallari, J., Zwack, L., & Roelofs, C. (2024). Industrial hygiene and the physical work environment. In: L. E. Tetrick, G. G. Fisher, M. T. Ford, & J. C. Quick (Eds.), Handbook of occupational health psychology. Third Ed., American Psychological Association.		
3.Yamamoto, D. P. (2020). Industrial Hygiene: A Foundational Role in Total Exposure Health. In Total Exposure Health. CRC Press.		
4.Cohrssen, B. (Ed.). (2021). Patty's Industrial Hygiene, Volume 1: Hazard Recognition. John Wiley & Sons.		
5. Friend, M. A., Kohn, J. P. (2007). Fundamentals of occupational safety and health. Eih Ed., Rowman & Littlefield Publishing.		
6. Spellman, F. R. (2017). Industrial hygiene simplified: A guide to anticipation, recognition, evaluation, and control of workplace hazards. Bernan Press.		

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Part A - Introduction			
Name of Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	I st semester		
Name of the Course	Environmental Pollution and Control		
Course Code	P25-HST-103		
Course Type	CC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)	Nil		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop an understanding of the sources, parameters, standards and treatment for water quality. CLO 2: Learn the standards and fate of different Air pollutants along with their impacts and emission control devices. CLO 3: Provide insight in to the sources, types, parameters, standards of noise pollution and its control measures. CLO 4: Provide insight in to the sources, types, parameters, effects of soil pollution and its prevention and control measures.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Water Pollution and Water Quality Control: Water Resources, Sources and types of water pollutants, Water Quality Parameters, Standards, Treatment of Water (Domestic and Industrial): Primary (Screening, Grit Chamber, Equalization Basins, Primary Settling, Sedimentation with Coagulation and Flocculation) and Secondary Treatment Systems (Activated Sludge Process, Trickling Filter, RBC, Oxidation Ponds, Nitrogen and Phosphorous Removal).		15
II	Air Pollution and air Quality Control: Type of Pollutants, Chemical Composition. Sources and Effects of Major Air Pollutants- CO, SOx, NOx, Hydrocarbons, Ozone, Photochemical Oxidants, Lead, Particulate Matter. Emission Controls: Control Devices for Particulate Pollutants - Gravity Settling Chambers, Centrifugal Separators, Wet Scrubber, Electrostatic precipitator, Fabric filters, Control devices for Gaseous Pollutants- Adsorption, Absorption, Condensation and Combustion. Introduction to Indoor Air Pollution.		15

III	Noise Pollution and its Control: Sources and types of noise pollution, Noise measuring instruments and measuring procedure, Noise standards and limits, auditory and non auditory effect of Noise Pollution on human health, prevention and control measures of noise.	15
IV	Soil Pollution and its Control: Sources and types of soil pollution, parameters of soil pollution, Techniques for monitoring of soil pollution, effect of Pollution on soil, effect of soil Pollution on ecosystem, Risk associated with soil pollution, Prevention and control of soil pollution.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
•Class Participation:	5	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.:	10	
•Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Mackenzie L. Davis and David A. Cornwell. (Eds.). (2008). Introduction to Environmental Engineering. Fourth Ed., McGraw-Hill Book.		
2. Nemerow, N. L. (2009). Environmental Engineering: Water, Wastewater, Soil and Groundwater Treatment and Remediation. Sixth Ed., Hoboken: Wiley.		
3. Pierzynski, G.M., Vance, G.F. and Sims, J.T. (2000). Soils and Environmental Quality. Second Ed., CRC press, New York.		
4. Singh, J.S., Singh, S.P. and Gupta, S.R. (2015). Ecology, Environment and Resource Conservation, S. Chand Publishing, New Delhi.		
5. Vallero, D. A. (2014). Fundamentals of air pollution. Academic press.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	I st semester		
Name of the Course	Environmental Management		
Course Code	P25-HST-104		
Course Type	CC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)	Nil		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Assess the life cycle of industrial products and industrial waste management. CLO 2: Provide insight in to the pollution control methodologies in industries and protect the environment for sustainable growth of society. CLO 3: Apply the concepts and principles of environmental management systems, environmental impact assessment and environmental economics. CLO 4: Study the quality and EMS standards and the concept of ergonomics.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Sustainable Development: Concept of Sustainable Development and its Role in Building of Environment, Background, Life Cycle Assessment, Source Reduction, Collection and Transfer Operations, Recycling and Composting, Discarded Materials, Waste to Energy Combustion, Landfills, Hazardous Waste Management.		15
II	Pollution Control in Process Industries - Pollution Control Methodologies: Pollution Control in Process Industries like Cement, Paper, Petroleum - Petroleum Products, Textile, Tanneries, Thermal Plants. Hazardous Waste Treatment Technologies, Physical Treatment - Sedimentation, Adsorption, Aeration. Ion Exchange, Electro Dialysis. Chemical Treatment-Precipitation, Biological Remediation Techniques, Incineration and Land Disposal. Eco-Friendly Energy and Environment.		15
III	Environmental Management System: EIA - Introduction, Need and Scope, Process and Methodologies, EMP and DMP needs with HAZAN and HAZOP Studies, Environmental Economics: Rules of Taxation, Cess, Water Charges, Biodiversity Damage Assessment and Price Evaluation.		15

IV	OHSAS Standard, ISO 14000 Series, ISO 9001. Applied Ergonomics: Load Carrying, Hand tools and their use, Machine Controls and Displays, Heat, Noise, Emergencies, General upkeep, welfare.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Mackenzie L. Davis and David A. Cornwell. (Eds.). (2008). Introduction to Environmental Engineering. Fourth Ed., McGraw-Hill Book.		
2. Nemerow, N. L. (2009). Environmental Engineering: Water, Wastewater, Soil and Groundwater Treatment and Remediation. Sixth Ed., Hoboken: Wiley.		
3. Whitelaw, K. (2012). ISO 14001 environmental systems handbook. Routledge.		
4. Harris, J.M., Wise, T.A., Gallagher, K.P. and Goodwin, N.R. (2001). A Survey of Sustainable Development: Social and Economic Dimensions. Island Press, Washington, D.C.		

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Part A–Introduction			
Name of the Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	I st semester		
Name of the Course	Practical-I		
Course Code	P25-HST-105		
Course Type	PC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Have knowledge of the different safety measures to be applied in different situations/facilities. CLO 2: Understand the health and welfare facilities required and available and Practices used for Prevention & Control of Environment Protection in different facilities. CLO 3: Have knowledge of effective industrial hygiene control and occupational health hazards measures. CLO 4: Equip students to use personal protection devices and techniques used to protect from health injuries at workplace.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End-Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	4 hours		
Part B-Contents of the Course			
Practicals			Contact Hours

1. To understand about the safety measures for prevention of road accidents. 2. To make a list of possible risk in working laboratory and suggest safety measures for its prevention. 3. To study about the safety measures for protection against fumes and gases. 4. To calculate the air quality index of a given area. 5. To understand about First Aid appliances. 6. Study of respiratory personal and non-respiratory protective devices and their usage in industry. 7. Study of industrial hygiene control methods. 8. Study of preventive and control measures of occupational health hazards. 9. Occupational health management services at the workplace - A case study. 10. Evaluation of Environmental Stress (Heat) and Physical Fitness Test (PFI Test).	120		
Suggested Evaluation Methods			
Internal Assessment: 30	End Term Examination: 70		
➤ Practicum	30	➤ Practicum	70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Safety, Health and Environmental Auditing - A Practical Guide. (2018). Simon Watson Pain, CRC Press.			
2. Spellman, F. R. (2017). Industrial hygiene simplified: A guide to anticipation, recognition, evaluation, and control of workplace hazards. Bernan Press.			

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Part A–Introduction			
Name of the Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	I st semester		
Name of the Course	Practical-II		
Course Code	P25-HST-106		
Course Type	PC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Assess the water and air quality in environment. CLO 2: Measure the noise and soil quality in environment. CLO 3: Assess the pollution control in different industries. CLO 4: Assess the EMS implementation in industries.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End-Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	4 hours		
Part B-Contents of the Course			
Practicals			Contact Hours

1. Monitor the criterion pollutants of air quality parameters (PM _{2.5} , SO _x , NO _x) at different locations and compare it with NAAQS. 2. Analyze the water quality parameters such as pH, EC, TDS, turbidity, and DO (Dissolved Oxygen) and Compare the results with water quality standards (WHO or regional standards). 3. Assessment of heavy metal toxicity in given water sample 4. Analyse the soil quality parameters such as pH, EC, TDS, salinity and nutrient availability in soil samples. 5. To calculate the noise using sound level meter. 6. Assessment of pollution control in Industries. 7. Life Cycle assessment case study of an industrial product. 8. EMS implementation in an industry - a case study. 9. Study of pollution related taxation and penalties. 10. Visit a process industry and analyze their pollution control measures and working.		120	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Rice, E. W., Bridgewater, L. and American Public Health Association (Eds.). (2012). Standard methods for the examination of water and wastewater (Vol. 10). Washington, DC: American Public Health Association.			
2. Bartram, J. and Ballance, R. (1996). Water quality monitoring: a practical guide to the design and implementation of freshwater quality studies and monitoring programmes. CRC Press.			
3. Jones, J. (2018). Soil analysis handbook of reference methods. CRC press.			
4. Harris, J.M., Wise, T.A., Gallagher, K.P. and Goodwin, N.R. (2001). A Survey of Sustainable Development: Social and Economic Dimensions. Island Press, Washington, D.C.			

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Name of the Programme	Post Graduate Diploma in Health, Safety and Environment
Semester	Ist Semester
Name of the Course	SEMINAR
Course Code	P25-HST-107
Course Type: (CC/DEC/PC/Seminar/CHM/OEC/EEC)	SEMINAR
Level of the course	400-499
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Demonstrate a sound technical knowledge of the seminar topic. CLO 2: Improves his/her presentation skills and develop confidence.
Credits	Seminar
	2
Teaching Hours per week	2
Max. Marks	50
Internal Assessment Marks	0
End Term Exam Marks	50
Examination Time	1 hour
Instructions for Examiner: Evaluation of the seminar will be done by the internal examiner(s) on the parameters as decided by staff council of the department. There will be no external examination/viva-voce examination.	

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Part A - Introduction			
Name of Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	II nd semester		
Name of the Course	Safety at Workplace		
Course Code	P25-HST-201		
Course Type	CC-5		
Level of the course	400-499		
Pre-requisite for the course (if any)	Nil		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Articulate the importance of workplace safety, identify potential hazards, and formulate and implement effective safety policies tailored to specific industries. CLO 2: Assess and manage safety risks associated with the formation of dust, gases, and vapour clouds in industrial processes. CLO 3: Identify various causes of fire incident and their prevention measures. CLO 4: Formulate comprehensive fire emergency action plans, considering various components and stakeholders.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Workplace Safety, Safety Management, Safety Policy, Safety Committee, Safety Review, Responsibility of Management, Safety Officers, Duties & Responsibilities, Safety Targets; Motivation & Communication as part of Safety Programme. Safety in Boilers; Engineering Industry, Textile Industry, Electrical Safety: Electrical Hazard, Static Electricity. Safety precautions in use of Boilers. Preservations of boilers when not in use. Steam pressure. Pressure gauge, Treatment of feed water. Safety in the use of Machines, Safety precautions while using Hand Tools & Power Tools, Selection, Maintenance & Care of Hand and power tool.		15
II	Chemicals & Colour Codes: UN & other classification of chemicals & colour coding, Safety in chemical industry; Safety in case of Emissions and Dispersion, Liquid Discharge, Gas Discharge and leakage; Safety related to Excavation. Precautions in processes and operations involving Explosive, Toxic		15

	Substances, Dusts, Gases, Vapour Clouds Formation and Combating, Workplace Exposure Limits, Control Measures.	
III	Chemistry, classification and causes of fire, factors contributing towards fire. Determination of fire load. Prevention of fire: Design of building plant, exits, fire resistant building materials; Fire extinguisher types and usage; Emergency exits and evacuation routes; emergency lighting and alarm systems, fire suppression systems, BLEVE (Boiling liquids expanding vapour explosion).	15
IV	Components of fire emergency action plan. Deflagration and detonation. Assessment of fire explosion and toxicity index, Dow & Mond, dispersion, Probability analysis, modelling. Pressure vessels fired and unfired, codes of practices governing their safety. Assessment of reliability of vessels, test checks. Inspection techniques for plants, reaction vessels, check list for routine inspection, checklist for specific maintenance and break down. Corrosion and erosion, location, causes, inspection and prevention; Emergency evacuation procedures; communication protocols during a fire emergency.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Industrial Safety Management: Hazard Identification and Risk Control. L. M. Deshmukh. McGraw Hill, ISBN: 9780070617681		
2. Chemical Process Industry Safety. K. S. N. Raju. McGraw Hill, ISBN: 9789332902787		
3. Industrial Accident Prevention: A Safety Management Approach. H. W. Heinrich, D. Petersen, N. R. Roos. McGraw-Hill, ISBN: 9780070280618		
4. Safety, Health and Environment Handbook. (2017). K.T. Narayanan. McGraw Hill Education.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	II nd semester		
Name of the Course	Legal and Socio-economic Aspects of Health, Safety and Environment - Part I		
Course Code	P25-HST-202		
Course Type	CC-6		
Level of the course	400-499		
Pre-requisite for the course (if any)	Nil		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Acquire values and attitude towards various constitutional framework governing worker's safety and security in India. CLO 2: Acquire values and attitude towards various constitutional framework governing security of worker's employment and insurance issues. CLO 3: Have in-depth knowledge of various legislations related to handle explosions and accidents in India. CLO 4: Acquire knowledge about the Occupational Health & Safety measures followed for workers in India as per International standards.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Provisions under the Act and Rules made there-under with Amendments from time-to-time: The Factories Act, 1948; Dock Workers (Safety, Health and Welfare) Act, 1986; Workmen's Compensation Act, 1923; Public Liability Insurance Act, 1991.		15
II	The Building and other Construction Worker's Welfare Cess Act 1996 & Cess Rules 1998; The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998; Employees State Insurance Act, 1948; Employees State Insurance Central Rules, 1950; Employees State Insurance General Regulations, 1950; Contract Labour (Abolition and Regulation) Act, 1970.		15
III	Indian Boilers Act, 1923 with allied Regulations, 1961, Indian Electricity Act, 2003 and Rules, 1956; Indian Explosives Act, 1884 and Rules, 2008; Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996.		15

IV	Socio-economic Aspects: Social Accountability 8000 Standard. ILO - Introduction, Convention and Recommendation concerning Occupational Health & Safety. Welfare offers, Right & Obligation of workers.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
•Class Participation:	5	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.:	10	
•Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. R.K. Jain and Sunil S. Rao, Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi (2006).		
2. K.T. Narayanan, Safety, Health and Environment Handbook, McGraw Hill Education (2017).		
3. P. Leelakrishnan, Environmental Law in India, Lexis Knowledge (2021).		

Session: 2025-26			
Part A - Introduction			
Name of Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	II nd semester		
Name of the Course	Legal and Socio-economic Aspects of Health, Safety and Environment - Part II		
Course Code	P25-HST-203		
Course Type	CC-7		
Level of the course	400-499		
Pre-requisite for the course (if any)	Nil		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Acquire values and attitude towards various policies and constitutional framework governing environmental Protection in India. CLO 2: Understand management rules of different types of waste in India. CLO 3: Have in-depth knowledge of various legislations related to manage hazardous materials in India. CLO 4: Understand social welfare efforts in India.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	The Insecticides Act, 1968 and Rules, 1971; Atomic Energy (Radiation Protection) Rules, 2004; Static and Mobile Pressure Vessel (Unfired) Rules, 2016; The Environment (Protection) Act, 1986; EIA Notification, 2006.		15
II	The Water (Prevention and Control) Act, 1974; The Air (Prevention and Control of Pollution) Act, 1981; The Noise Pollution (Regulation and Control) Rules, 2000; Solid Waste (Management) Rules, 2016; e-waste (Management) Rules, 2022; Biomedical Waste (Management) Rules, 2016.		15
III	The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989; Gas Cylinders Rules, 2016; Calcium Carbide Rules, 1987; Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016.		15
IV	Welfare & Training: General Provision, Drinking Water, Sanitary & Washing, Cloakrooms, Facilities for Food & Drink, Shelters & Living Accommodation.		15
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70

• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. R.K. Jain and Sunil S. Rao, Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi (2006). 2. K.T. Narayanan, Safety, Health and Environment Handbook, McGraw Hill Education (2017). 3. P. Leelakrishnan, Environmental Law in India, Lexis Knowledge (2021).		

Session: 2025-26			
Part A - Introduction			
Name of Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	II nd semester		
Name of the Course	Industrial and Occupational Hazard and Risk - Analysis and Management		
Course Code	P25-HST-204		
Course Type	CC-8		
Level of the course	400-499		
Pre-requisite for the course (if any)	Nil		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Identify, analyse and control hazard at workplace using various techniques. CLO 2: Identify, analyse and control risk at workplace and use of various risk analysis techniques. CLO 3: Review and learn from historical industrial and occupational accidents through various techniques. CLO 4: Identify and analyse various types of hazardous chemicals/substances during the transportation and study their safety precautions.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	HAZARD and HAZOP: Introduction to Hazard, Causes, Identification, Evaluation & Control of Hazard. HAZOP Analysis, Sources for Information on Hazard Evaluation. Hazards in process of melting (furnaces), casing, and forging with example cases. Major chemical and radioactive disasters.		15
II	Study of Risk at work site and preparation and initiation of reports: Definition of Risk, Risk analysis. Introduction to Failure, Mode and Effect Analysis (FMEA) and Maximum Credible Accident Analysis (MCAA), Fault Tree Analysis (FTA), Event Tree Analysis (ETA) with example of each analysis technique.		15
III	Techniques for reviewing and learning major accidents: Management Oversight and Risk Tree (MORT), Incident Recall Technique (IRT), Critical Incident Review Technique (CIRT), Root cause analysis Technique (RCAT) with example of each technique.		15
IV	Risk Analysis Exercise: Chemical-Compatibility and Transportation: chemicals compatibility considerations, transportation of chemicals, toxic / flammable / explosive / radioactive substances by all modes – safety precautions. Use of		15

material Safety Data Sheets.		Total Contact Hours		60
Suggested Evaluation Methods				
Internal Assessment: 30			End Term Examination: 70	
➤ Theory	30	➤ Theory:	70	
•Class Participation:	5	Written Examination		
•Seminar/presentation/assignment/quiz/class test etc.:	10			
•Mid-Term Exam:	15			
Part C-Learning Resources				
Recommended Books/e-resources/LMS:				
1. Industrial Safety Management: Hazard Identification and Risk Control. L. M. Deshmukh. McGraw Hill.				
2. Chemical Process Industry Safety. K. S. N. Raju. McGraw Hill.				
3. Industrial Accident Prevention: A Safety Management Approach. H. W. Heinrich, D. Petersen, N. R. Roos. McGraw-Hill.				

Session: 2025-26			
Part A–Introduction			
Name of the Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	II nd semester		
Name of the Course	Practical-III		
Course Code	P25-HST-205		
Course Type	PC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Have knowledge of safety audit and emergency plan and accident control system in industries. CLO 2: Implement precautionary measures in industries using explosive materials in their operation. CLO 3: Equip students about the occupational health and safety (OHS) legislation. CLO 4: Have knowledge of the Government acts and rules meant to protect the employment and conditions of service and welfare of the workers.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End-Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	4 hours		
Part B-Contents of the Course			
Practicals			Contact Hours

1. Carry out a plant safety inspection with the help of check list and prepare a safety audit report. 2. Study of fire risk management including fire emergency action plan in an industry. 3. Study of precautions in processes and operations of different explosives. 4. Study of BLEVE (Boiling liquids expanding vapour explosion) scenario- A case study. 5. Study of accident control system. 6. A National case study on a chemical accident. 7. Study of present state of occupational health and safety (OHS) legislation in India. 8. Study of a case to protect the employment and conditions of service of the building and other construction workers as per The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998 Act. 9. Study of a case for the welfare of the building and other construction workers as per The Building and other Construction Worker’s Welfare Cess Act 1996 & Cess Rules 1998. 10. Compensation - fixation and payment to workers by industry as per Workmen’s Compensation Act - A case study.	120		
Suggested Evaluation Methods			
Internal Assessment: 30			
End Term Examination: 70			
➤ Practicum	30	➤ Practicum	70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. R.K. Jain and Sunil S. Rao, Industrial Safety, Health and Environment Management Systems, Khanna publishers , New Delhi (2006).			
2. Industrial Safety Management: Hazard Identification and Risk Control. L. M. Deshmukh. McGraw Hill.			
3. Industrial Accident Prevention: A Safety Management Approach. H. W. Heinrich, D. Petersen, N. R. Roos. McGraw-Hill.			

Session: 2025-26			
Part A–Introduction			
Name of the Programme	Post Graduate Diploma in Health, Safety and Environment		
Semester	II nd semester		
Name of the Course	Practical-IV		
Course Code	P25-HST-206		
Course Type	PC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Have knowledge about the different legislative Acts and Rules to prevent and control environmental pollution and waste management. CLO 2: Have knowledge about the different legislative Acts and Rules to prevent and control radiation and chemical hazard. CLO 3: Equip the students to conduct hazard analysis and modelling. CLO 4: Equip the students with different risk analysis methods.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End-Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	4 hours		
Part B-Contents of the Course			
Practicals			Contact Hours

1. Study of a violation case of EIA Notification, 2006. 2. Study of stages of GRAP in Delhi-NCR. 3. Study of hazardous waste management in an industry. 4. Study of a case for the facilities for shelters & living accommodation for workers in an industry. 5. Study of biomedical waste management in a hospital. 6. Computer-aided hazard analysis and modelling. 7. Conduct a general risk assessment of a work place using matrix and prepare a report. 8. Implementing practical usages of safety equipments and accessories. 9. To prepare material safety data sheet for any particular hazardous substance. 10. To study potential errors or faults using FMEA.	120		
Suggested Evaluation Methods			
Internal Assessment: 30	End Term Examination: 70		
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. P. Leelakrishnan. (2021). Environmental Law in India, Lexis Knowledge. 2. L. M. Deshmukh. (2014). Industrial Safety Management: Hazard Identification and Risk Control. McGraw Hill. 3. H. W. Heinrich, D. Petersen, N. R. Roos. (1980). Industrial Accident Prevention: A Safety Management Approach. McGraw-Hill.			

Session: 2025-26	
Name of the Programme	Post Graduate Diploma in Health, Safety and Environment
Semester	II nd semester
Name of the Course	Internship
Course Code	P25-INT-200
Course Type: (CC/DEC/PC/Seminar/CHM/OEC/EEC)	Internship
Level of the course	400-499
Course Learning Outcomes (CLO). After completing this course, the learner will be able to:	CLO 1: Demonstrate a sound technical knowledge and research aptitude in the concerned subject/discipline. CLO 2: Improves his/her technical skills and enhances employability skills.
Credits	Internship
	4
Teaching Hours per week	
Max. Marks	100
Internal Assessment Marks	50
End Term Exam Marks	50
Examination Time	
Instructions for Examiner: Evaluation of the Internship will be done by the internal and external examiner on the parameters as decided by staff council of the department. There will be internal and external examination/viva-voce examination.	

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

("A++" Grade, NAAC Accredited)



Syllabus for Post Graduate Programme

M.Sc. MICROBIOLOGY (3rd and 4th semester)

**as per NEP 2020
Curriculum and Credit Framework for Postgraduate Programme**

**CBCS-LOCF
With effect from the session 2025-26**

**DEPARTMENT OF MICROBIOLOGY
FACULTY OF LIFE SCIENCES**

**KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA**

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	3		
Name of the Course	Microbial biotechnology & industrial microbiology-I		
Course Code	M24-MIC-301		
Course Type	CC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	CO1. Student will be able to describe industrially important microbes, their selection, and strain improvement methods. CO2. Student will be able to explain fermenter design, types of fermentation, and microbial growth kinetics. CO3. Student will be able to interpret bioprocess control parameters and downstream processing techniques. CO4. Student will be able to describe microbial applications in food, biofertilizers, and biocontrol products.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to industrial microbiology: Historical Development and significance for microbial products and fermentation processes. Criteria, sources and isolation of industrially important microorganisms. Biosynthetic pathways and regulation for metabolic products of industrially important microorganisms. Culture collection and methods of preservation for microbial cultures. Selection and strain improvement for overproduction of microbial metabolites for industrial applications (mutant selection, protoplast fusion, recombination and Recombinant DNA technology).		15
II	Fermenter design and technologies: Basic components of a fermenter, fermenter construction materials, designing of laboratory and industrial scale fermenters, types of impellers, baffle and spargers, foam controller, types of fermenters like stirred tank, bubble column, airlift, packed beds, fluidized beds, perfusion cultures, Immobilized cell reactor, photo-bioreactors and animal cell culture bioreactor, Single use bioreactor. Different types of sterilization strategies, sterilization of large-scale bioreactors, sterilization innovations (Plasma sterilization, UV-C sterilization, Continuous sterilization) Fundamentals of fermentation systems: Types of Fermentation, Substrates for industrial fermentation, Submerged and solid-state fermentation, batch cultivation, continuous cultivation and fed-batch cultivation. Multistage chemostat and feedback systems. Monod kinetics of microbial growth, growth and non-growth associated product formation, product formation kinetics.		15

III	Bioprocess instrumentation and control parameters: Measurement of various control parameters in bioreactor like pH, dissolved oxygen, temperature, antifoam, principles of feed back control, PID control, respiratory quotient, effect of dissolved oxygen on microbial production processes, effect of foam and anti-foam on oxygen transfer, oxygen mass transfer coefficient, measurement of KLa values using sulfite oxidation techniques, gassing-out techniques, fluid rheology, newtonian and non-newtonian fluids, bingham plastic, pseudo plastic, power number, Reynolds number. Downstream processing: Downstream processing for filtration (DSP) cell disruption, liquid liquid extraction, solvent recovery, supercritical fluid extraction, various chromatography techniques in product recovery, diafiltration, ultrafiltration and reverse osmosis, drying (lyophilization and spray drying), whole broth processing and crystallization, upstream processing and product recovery.	15
IV	Use of whole cells for food related purpose: •Single Cell Protein production •Yeast Production •Production of microbial insecticides •Production of Biofertilizers.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Stanbury, P. F., Whitaker, A., & Hall, S. J. (2016). <i>Principles of fermentation technology</i> (3rd ed.). Butterworth-Heinemann. • Shuler, M. L., Kargi, F., & DeLisa, M. P. (2017). <i>Bioprocess engineering: Basic concepts</i> (3rd ed.). Pearson Education. • Okafor, N., & Okeke, B. C. (2017). <i>Modern industrial microbiology and biotechnology</i> (2nd ed.). CRC Press. • El-Mansi, E. M. T., Bryce, C. F. A., Demain, A. L., & Allman, A. R. (Eds.). (2012). <i>Fermentation microbiology and biotechnology</i> (3rd ed.). CRC Press. • Glazer, A. N., & Nikaido, H. (2007). <i>Microbial biotechnology: Fundamentals of applied microbiology</i> (2nd ed.). Cambridge University Press. • Walsh, G. (2014). <i>Pharmaceutical biotechnology: Concepts and applications</i> (2nd ed.). John Wiley & Sons. • Crommelin, D. J. A., Sindelar, R. D., & Meibohm, B. (2019). <i>Pharmaceutical biotechnology: Fundamentals and applications</i> (5th ed.). Springer. • Crueger, W., & Crueger, A. (2005). <i>Biotechnology: A textbook of industrial microbiology</i> (2nd Indian ed.). Panima Publishing Corporation. • Srivastava, M. L. (2008). <i>Fermentation technology: Principles and applications</i> (1st ed.). Alpha Science International. • Bhatia, R. K., & Walia, A. (Eds.). (2024). <i>Advancements in microbial biotechnology for soil health</i>. Springer Nature. • Verma, P. (Ed.). (2024). <i>Industrial microbiology and biotechnology: A new horizon</i>. Springer. • Wenli, Z. (2023). <i>Fermentation technology and microbial proteins</i>. LAP Lambert Academic Publishing. • Maddela, N. R., Laldinsangi, C., Chhipa, H., & Khan, A. (Eds.). (2024). <i>Microbial biotechnology for bioenergy</i>. Elsevier.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	3		
Name of the Course	Immunology & Virology		
Course Code	M24-MIC-302		
Course Type	CC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	CO1. Student will be able to describe the fundamental concept in immunology like immunity and antibodies. CO2. Student will be able to describe the immune responses and immunological disorders. CO3 Student will be able to describe the principle of virus classification, list the virus families, and virus replication. CO4. Student will be able to describe how viruses are grown and vaccines are made.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Immunity: Innate immunity, factors affecting innate immunity. Acquired immunity- natural and artificial immunity, active and passive immunity. Humoral and cell-mediated immune response; Innate immune response and pattern recognition. Antigen, hapten and adjuvants. Lymphoid organs and cells of immune system. Immunoglobulins: types, structure and functions. Immune response: Cellular and humoral immune response. Brief account of Complement system and Major histocompatibility complex. Cell signaling through MAP kinases and NF- κ B.	15	
II	Molecular mechanisms responsible for generating diversity of antibodies and T cell receptors. Genetic organization of MHC-I and MHC-II complex. Hybridoma technology and monoclonal antibodies, and its applications. Mechanisms of autoimmunity; Immune checkpoints, Autoimmune components of diabetes mellitus (DM), multiple sclerosis (MS), pernicious anemia; Infections leading to autoimmune diseases. Immunodeficiency diseases. Comparative study of Type I-V hypersensitivities with examples. Tumor antigens, immune response to tumors and immunotherapy of tumors.	15	
III	Classification, Properties of viruses, Morphology and Structure of viruses- Capsid and its symmetry with special reference to bacteriophage, Lytic and lysogenic cycle. Viroids and Prions, Virus genome types. Double stranded DNA (dsDNA). Gapped DNA genomes. Single-stranded (ssDNA) genomes. Double stranded RNA (dsRNA). Single stranded RNA (ssRNA): (+) strand RNA. Single stranded (+) sense RNA with DNA intermediate. Single stranded RNA (-) sense. Principal events involved in replication: Adsorption, penetration, uncoating nucleic acid and protein synthesis, intracellular trafficking, assembly, maturation and release, viral-host interaction, Host response to viral infection.	15	

IV	Virus growth: Primary cell, Diploid cell strains, Continuous cell lines. One step growth curve, Detection of virus growth in cell culture. Techniques for visualization and enumeration of viral particles, assays for virus estimation. Vaccines & Anti-Viral drugs: Herd Immunity. Requirement of an effective vaccine. Different ways of making vaccine. Inactivated vaccine. Subunit vaccines. Subunit vaccines. Live attenuated vaccines. Polio eradication. Anti-Viral drugs. Search for antiviral drugs. The path for drug discovery. Mechanism based screens. Cell based screen. Antiviral screening. Resistance to antiviral drugs.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Carter JB & Saunders VA. Virology-Principles and Applications, John Wiley and Sons.		
2. Flint S.J., Enquist L.W., Racaniello V.R., and Skalka A.M. Principles of Virology: Molecular Biology, Pathogenesis and Control of Animal Viruses. 2nd edition. ASM Press.		
3. Dimmock N., Easton A. and Leppard K. Introduction to Modern Virology. 5th edition. Blackwell Publishing.		
4. Kuby Immunology by J.A. Owen, J. Punt, S.A. Stranford. 7th edition. WH Freeman. 2013.		
5. Abbas A.K., Lichtman A.H., Pillai S. Cellular and Molecular Immunology. 9th edition. Saunders Elsevier.		
6. Murphy K. and Casey W. Janeway's Immunobiology. 9th edition. Garland Science Publishing.		
7. Delves P.J., Martin S.J., Burton D.R., Roitt I.M.. Roitt's Essential Immunology. 13th edition. Blackwell Publishing		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	3		
Name of the Course	Environmental Microbiology		
Course Code	M24-MIC-303		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	CO1. Student will be able to describe microbial diversity and methods for studying environmental microbes. CO2. Student will be able to explain microbial communities in soil, water, and air, including biofilms and microbial interactions. CO3. Student will be able to describe microbial adaptations in extreme environments and their role in biogeochemical cycles. CO4. Student will be able to identify microbial indicators and apply tools for environmental monitoring and public health safety.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Fundamentals of Environmental Microbiology Definition, scope, and importance of environmental microbiology. Cultivation-dependent and -independent methods for studying environmental microorganisms. Techniques for microbial community analysis: FAME, BIOLOG, 16S rRNA gene sequencing, slot-blot hybridization, fluorescent in-situ hybridization (FISH), and metagenomics of soil and aquatic sediments. Environmental sampling techniques: Methods for air, soil, water, and sediment sampling.		15
II	Microbial Habitats and Community Structures Aquatic microbiology: Microbial communities in freshwater, marine, estuarine, and groundwater ecosystems. Soil microbiology: Microbial diversity in bulk soil and rhizosphere; roles in soil structure, fertility, and nutrient cycling; rhizosphere interactions and plant-microbe symbiosis; microbial antagonism and endophytes. Air microbiology: Sources, dispersion, survival of airborne microorganisms, and their impact on human health and climate. Quorum sensing and quorum quenching: Microbial communication systems in environmental contexts. Biofilms: Formation, structure, ecological relevance, and resistance mechanisms.		15

III	Microbial Adaptations and Extreme Environments Microbial diversity in extreme environments: Occurrence, diversity, adaptations and biotechnological applications of oligotrophs, thermophiles, psychrophiles, organic solvent and radiation tolerants, metallophiles, acidophiles, alkaliphiles and halophiles. Microbial Ecology and Evolution: Population dynamics, community interactions, and evolutionary adaptations of microorganisms in response to environmental pressures. Horizontal gene transfer and microbial genome plasticity in natural ecosystems. Biogeochemical cycling of carbon, nitrogen, sulfur, and phosphorus: Microbial involvement and ecosystem implications.	15
IV	Environmental Monitoring and Public Health Microbiology Indicators of water and air quality: Coliforms, fecal bacteria, viruses. Microbial contamination in drinking water and its assessment using MPN, membrane filtration, and PCR-based methods. Biosensors: Types, working principles, and applications in environmental monitoring. Emerging environmental pathogens and dissemination of antibiotic resistance genes in ecosystems. Microbial risk assessment: Principles, methods, and applications in environmental health. Regulatory frameworks and standards: WHO, BIS, CPCB, and EPA guidelines for microbial quality of water and air..	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Atlas, R. M., & Bartha, R. (1997). <i>Microbial ecology: Fundamentals and applications</i> (4th ed.). Benjamin Cummings. • Varnam, A. H., & Evans, M. G. (2000). <i>Environmental microbiology</i> . Manson Publishing Ltd. • Hurst, C. J., Crawford, R. L., Garland, J. L., Lipson, D. A., Mills, A. L., & Stetzenbach, L. D. (Eds.). (2007). <i>Manual of environmental microbiology</i> (3rd ed.). ASM Press. • Mitchell, R., & Gu, J.-D. (Eds.). (2010). <i>Environmental microbiology</i> (2nd ed.). Wiley-Blackwell. • Maier, R. M., Pepper, I. L., & Gerba, C. P. (2015). <i>Environmental microbiology</i> (3rd ed.). Academic Press. • Jjemba, P. K. (2004). <i>Environmental microbiology: Principles and applications</i> . Science Publishers. • Kuhad, R. C., & Singh, A. (Eds.). (2007). <i>Lignocellulose biotechnology: Future prospects</i> . I.K. International. • Okafor, N. (2011). <i>Environmental microbiology of aquatic and waste systems</i> . Springer. • Kumar, V., Garg, V. K., Kumar, S., & Biswas, J. K. (Eds.). (2023). <i>Omics for environmental engineering and microbiology systems</i> (1st ed.). CRC Press. • Maddela, N. R., Eller, L. K. W., & Prasad, R. (Eds.). (2023). <i>Microbiology for cleaner production and environmental sustainability</i> (1st ed.). CRC Press. • Ivanov, V. (2024). <i>Environmental microbiology for engineers</i> (3rd ed.). CRC Press. • Goswami, D., Maheshwari, D. K., & Saraf, M. (Eds.). (2025). <i>Climate change and soil microorganisms for environmental sustainability</i> (1st ed.). Springer Nature. • Verma, P. (Ed.). (2024). <i>Industrial microbiology and biotechnology: A new horizon of the microbial world</i> (1st ed.). Springer. • Karnwal, A., & Al-Tawaha, A. R. M. S. (2022). <i>Environmental microbiology: Advanced research and multidisciplinary applications</i> . Bentham Science Publishers. • Shah, M. P. (Ed.). (2022). <i>Environmental microbiology: Emerging technologies</i> . De Gruyter.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	3		
Name of the Course	Food & Dairy Microbiology		
Course Code	M24-MIC-304		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	CO1. Student will be able to describe food microbes, growth factors, and detection methods. CO2. Student will be able to explain food spoilage and preservation techniques. CO3. Student will be able to describe fermented foods, probiotics, and their health benefits. CO4. Student will be able to identify food-borne diseases and food safety systems.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Food Microbiology: Principles, Practices, and Emerging Trends Development of food microbiology as a scientific discipline; scope and significance of food microbiology. Overview of food-associated microorganisms, including molds, yeasts, yeast-like fungi, and bacteria. Intrinsic and Extrinsic Factors affecting Microbial Growth in Foods: <i>Intrinsic factors:</i> Nutrient content, pH, moisture content/water activity, Redox potential, natural antimicrobial barriers, and antimicrobial substances. <i>Extrinsic factors:</i> Relative humidity, temperature, and gaseous atmosphere. Methods for Microbiological Examination of Food: Direct Examination, Enumeration Methods, Dye reduction test, electrical methods Rapid Methods for Detection of Specific Organisms and Toxins.		15
II	Microbial spoilage of foods: Principles and Sources of microbial food spoilage. Spoilage of cereals, sugar products, vegetables, fruits, meat and meat products, milk and milk products, fish and sea foods, poultry; spoilage of canned foods. Study of microorganisms responsible for spoilage and microbial succession during spoilage. Food preservation: General principles of food preservation, various classical physical, chemical, and biological methods of preservation. Emerging methods of food preservation, food protection with modified atmosphere		15

III	Fermented and Microbial Foods: Fermented dairy products such as yogurt, cheese, and kefir; fermented vegetable and cereal products including sauerkraut, kimchi, soy sauce, pickles, idli, dosa, bread, baker’s yeast, tempeh, and miso; fermented meat and fish products such as sausages and fermented fish. Edible mushrooms including <i>Agaricus</i>, <i>Volvariella</i>, and <i>Pleurotus</i>. Production and application of single-cell proteins (SCP). Health Aspects of Fermented Foods: Overview of prebiotics and probiotics, functional foods and their health benefits, safety issues, and quality control measures. Bioactive Compounds from Fermented Foods: Introduction to the concept and health relevance of bioactive compounds derived from fermented foods, including malt beverages, wines, distilled liquors, and vinegar.	15
IV	Food microbiology and public health- Food-borne diseases: Food hazards, Food-borne infections including bacterial, viral, and fungal infections. Bacterial food diseases: Various types and causes of food intoxication. Botulism, <i>Staphylococcal</i> food poisoning, <i>Clostridium perfringens</i> food poisoning, <i>Bacillus cereus</i> gastroenteritis, <i>Salmonellosis</i>, <i>Escherichia coli</i> diarrhoea: different pathotypes, <i>Vibrio cholerae</i>. Fungal poisoning: <i>Aspergillus</i>, <i>Penicillium</i>, <i>Claviceps</i>, <i>Fusarium</i>. Food-borne viruses. Concept and principles of quality assurance in food production; Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP), and Sanitation Standard Operating Procedures (SSOP). Quality systems including ISO 9001, ISO 22000, FSSC 22000, and HACCP-based food safety management. Role of indicator organisms and microbial criteria in quality assurance. Overview of food safety regulatory frameworks: FSSAI, FDA, EU standards. Role of GMO in food safety. Role of quality assurance personnel and training in maintaining food safety compliance.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
• Frazier, W. C., Westhoff, D. C., & Vanitha, K. N. (2013). <i>Food microbiology</i> (5th ed.). McGraw Hill Education. • Jay, J. M., Loessner, M. J., & Golden, D. A. (2005). <i>Modern food microbiology</i> (7th ed.). Springer. • Ray, B., & Bhunia, A. (2025). <i>Fundamental food microbiology</i> (6th ed.). CRC Press. • Adams, M. R., Moss, M. O., & McClure, P. (2024). <i>Food microbiology</i> (5th ed.). Royal Society of Chemistry. • Doyle, M. P., & Beuchat, L. R. (Eds.). (2012). <i>Food microbiology: Fundamentals and frontiers</i> (4th ed.). ASM Press. • Montville, T. J., Matthews, K. R., & Kniel, K. E. (2025). <i>Food microbiology: An introduction</i> (5th ed.). Wiley-Blackwell. • Doyle, M. P., Buchanan, R. L., & Diez-Gonzalez, F. (Eds.). (2012). <i>Food microbiology: Fundamentals and frontiers</i> (4th ed.). ASM Press. • Nehra, M., & Nain, V. (2024). <i>Handbook of industrial food microbiology</i>. Apple Academic Press. • Matthews, K. R., Kniel, K. E., & Critzer, F. J. (2024). <i>Food microbiology: An introduction</i> (5th ed.). Wiley-Blackwell.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	3		
Name of the Course	Agriculture Microbiology		
Course Code	M24-MIC-305		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	CO1: understand different MO present in soil ecosystem and their role and different interactions for sustainable agriculture alongwith beneficial attributes of PGPR. CO2: Understand the concept of plant nutrition by microbial inoculants through biological nitrogen fixation and mycorrhiza and other biofertilizers. CO3: understand role of microorganisms in different biotransformation and biodegradation strategies of different organic matter, organic polymers, and pesticides. They will gain basic idea of biogas, composting, vermicomposting. CO4: Understand mechanism of common plant diseases of cereals, vegetables and crops and will learn different biocontrol and transgenic approaches for protection of plant from diseases.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Soil microbial ecology: Soil biota, types of organisms in different soils; Soil microbial biomass; Factors influencing the soil microflora. Different Agriculturally important beneficial microorganisms – free living, symbiotic (rhizobial, mycorrhizal, actinorhizal), associative and endophytic nitrogen fixers including cyanobacteria. Microbial interactions: Different interfaces of interactions - Plant-microbe, microbe-microbe, soil-microbe, soil-plant-microbe interactions leading to symbiotic, associative, endophytic and pathogenic interactions, unculturable soil biota. Plant growth promoting rhizobacteria (PGPR). Mechanism of plant growth promotion by PGPR.		15
II	Introduction to biofertilizers- definition, types of biofertilizers; Characteristic features of the following biofertilizer organisms: <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Bacillus</i> , <i>Pseudomonas</i> , <i>Rhizobium</i> , <i>Frankia</i> , <i>Anabaena</i> and <i>Nostoc</i> . Mechanisms of action of different bio-inoculants for plant growth. Significance of biofertilizers. Mass scale production and quality control of bioinoculants. Biofertilizer inoculation and microbial communities in the soil. Biological nitrogen fixation- Biochemistry of N ₂ fixation, nif operon, mechanism of nitrogen fixation. Symbiotic nitrogen fixation: Rhizobium-Legume association, Actinorhizal associations, contribution of symbiotic nitrogen fixation. Denitrification. Phosphate solubilization and mobilization. Mycorrhizae- Ecto and endomycorrhizae, VAM and their importance in agriculture.		15
III	Microbial transformations of nitrogen, phosphorus, sulphur, iron and manganese in soil. Biochemical composition and biodegradation of soil organic matter and crop residues. Biodegradation of pesticides, Organic wastes and their use for production of biogas and manures. Microbial degradation of polymers: lignin, cellulose, hemicelluloses. Factors affecting the degradation of organic matter. Organic manures: Preparation, properties, and use in crop production, nutrient enriched compost, green manure; Composting, vermicomposting.		15

IV	Some important plant diseases and their etiological studies: diseases of some important cereals, vegetables and crops. Genetical basis of plant diseases: Genetics of host-pathogen interactions, resistance genes, resistance mechanism in plants, transgenic approach for plant protection. Biocontrol – Concept, types, mode of action, uses and practical constraints & applications of biocontrol agents. Biocontrol agent for sustainable agriculture. Different types of biocontrol agents. Biopesticides and bioherbicides, Biopesticides- classification, advantages. Major biopesticides based on bacteria, viruses & fungi (<i>Bacillus thuringiensis</i> (Bt) toxin, Boverin, DeVine, Collego).	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - Paul, E.A., & Frey, S. (2023). Soil Microbiology, Ecology and Biochemistry (5th ed.). Elsevier. ISBN: 9780128229415 - Varnam, A.H., & Evans, M.G. (2000). Environmental Microbiology. Manson Publishing Ltd. ISBN: 9781874545781 - Hurst, C.J., Crawford, R.L., Garland, J.L., Lipson, D.A., & Mills, A.L. (2007). Manual of Environmental Microbiology (3rd ed.). ASM Press. ISBN: 9781555813796 - Spencer, J.F.T., & Ragout de Spencer, A.L. (2004). Environmental Microbiology: Methods and Protocols. Humana Press. ISBN: 9781588291165 - Burlage, R.S., Atlas, R.M., Stahl, D., Geesey, G., & Sayler, G. (1998). Techniques in Microbial Ecology. Oxford University Press. ISBN: 9780195092233 - Gaur, A.C. (2006). Handbook of Organic Farming and Biofertilizers. Ambica Book Agency. ISBN: 9788187118039 - Alexander, M. (1977). Soil Microbiology. John Wiley & Sons. ISBN: 9780471027349 - Kosuge, T., & Nester, E.W. (1984). Plant-Microbe Interactions: Molecular and Genetic Perspectives (Vols. I–IV). McGraw Hill. - Pradhan, S. (2008). Soil Health Improvement by Biofertilizer. Biotech Books. ISBN: 9788189729301 - Pand, H., & Hota, D. (2010). Biofertilizer and Organic Farming. Gene Tech Books. ISBN: 9788189729349 - Sharma, A.K. (2002). Biofertilizer for Sustainable Agriculture. Agrobios. ISBN: 9788177541262 - Bergersen, F.J. (1980). Methods for Evaluating Biological Nitrogen Fixation. John Wiley & Sons. ISBN: 9780471045213 - Kannaiyan, S., Kumar, K., & Govindarajan, K. (2004). Biofertilizers Technology. Saujanya Books. ISBN: 9788189602451 - van Elsas, J.D., Trevors, J.T., Soares Rosado, A., & Nannipieri, P. (Eds.). (2019). Modern Soil Microbiology, Third Edition (3rd ed.). CRC Press. https://doi.org/10.1201/9780429059186		

Session: 2025-26				
Part A – Introduction				
Name of Programme		M.Sc. Microbiology		
Semester		3		
Name of the Course		Microbial pathogenesis & Epidemiology		
Course Code		M24-MIC-306		
Course Type		DEC-2		
Level of the course		500-599		
Pre-requisite for the course (if any)		NA		
Course Learning Outcomes (CLO)	CO1. Student will be able to understand the basics of classical and molecular microbial pathogenicity. CO2. Student will be able to understand the spread of microbes through body, their strategies and mechanism to cause the damage. CO3 Students will understand the emergence of new infections as well as various methods of molecular microbial epidemiology. CO4. Students will be able to understand the various mechanisms of antimicrobial resistance and new rapid diagnostic principles.			
Credits		Theory	Practical	Total
		4	0	4
Teaching Hours per week		4	0	4
Internal Assessment Marks		30	0	30
End Term Exam Marks		70	0	70
Max. Marks		100	0	100
Examination Time		3 hours		
Part B- Contents of the Course				
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.				
Unit	Topics			Contact Hours
I	Classical view of microbial pathogenicity: Define pathogenicity and virulence; Quantitative measures of pathogenicity: minimal lethal dose (MLD), LD50, ID50, TCID50. Virulence determinants: colonization, toxins, enzymes and invasiveness. Facultative / obligate intracellular pathogens. Molecular microbial pathogenicity: Molecular Koch’s postulates, multiplicity of virulence determinants, coordinated regulation of virulence genes, and environmental regulation of virulence determinants by two component signal transduction systems, antigenic variation; clonal and panmictic nature of microbial pathogens, type three secretion system (TTSS, T3SS), Role of biofilms and quorum sensing in microbial pathogenicity.			15
II	The spread of microbes through the body: direct and indirect spread, microbial factor promoting spread, spread via lymphatic, blood and via other pathways. Microbial strategies in relation to immune responses: Immune tolerance immune suppression, molecular mimicry, induction of ineffective antibodies antibody mopping, antigenic variation, avoidance of immune responses and interference to immune response induction. Mechanisms of tissue inquiry in relation to bacterial infection: infection with no cell or tissue damages, direct damage by micro-organisms, microbial toxins, extra cellular enzymes, indirect damage via inflammation, immune responses.			15

III	Emerging and re-emerging pathogens: Illustrate emerging and re-emerging pathogens using <i>V. cholerae</i> 0139, X-MDR <i>M. tuberculosis</i> , <i>Helicobacter pylori</i> , <i>Enterohaemorrhagic E. coli</i> (EHEC), <i>Cryptosporidium parvum</i> , Bird/swine flu, AIDS and Dengue Hemorrhagic Fever, opportunistic fungal pathogens. Mechanisms of emergence of new pathogens: horizontal gene transfer (HGT) and pathogenicity islands (PAI). Molecular microbial epidemiology: Objectives of microbial epidemiology. Biochemical and Immunological tools - biotyping, serotyping, phage typing, multilocus enzyme electrophoresis (MLEE); Molecular typing: RAPD, rep (REP, ERIC, BOX)-PCR, IS based typing, PFGE, AFLP, MLST, VNTR and whole genome sequence; Use of geographical information system (GIS) for microbial epidemiology.	15	
IV	Antimicrobial resistance (AMR): Recent concepts – Multidrug efflux pumps, extended spectrum beta-lactamases (ESBL), X-MDR <i>M. tuberculosis</i> , Methacillin-resistant <i>S. aureus</i> (MRSA), Role of integrons. Rapid diagnostic principles: Nucleic acid probes in diagnostic microbiology, nucleic acid amplification methods, Real-time PCR, Lateral flow assays, diagnostic sequencing and mutation detection, automated instruments for detection / diagnosis of infectious agents (BACTAC and Vitek-2, GeneExpert).	15	
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	Theory	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Carroll, K. C., Hobden, J. A., Miller, S., Morse, S. A., Mietzner, T. A., Detrick, B., ... & Mitchell, T. G. (2019). <i>Jawetz, Melnick, & Adelberg's Medical Microbiology</i> (28th ed.). McGraw-Hill Education.			
2. Edwards, D. J., & Holt, K. E. (2013). Beginner's guide to comparative genome analysis using next generation sequence data. <i>Microbial Informatics and Experimentation</i> , 3(1), 2. https://doi.org/10.1186/2042-5783-3-2			
3. Wilson, B. A., Salyers, A. A., Whitt, D. D., & Winkler, M. E. (2019). <i>Bacterial Pathogenesis: A Molecular Approach</i> (4th ed.). ASM Press.			
4. Locht, C., & Simonet, M. (2012). <i>Bacterial Pathogenesis: Molecular and Cellular Mechanisms</i> . Caister Academic Press.			
5. Persing, D. H., Tenover, F. C., Hayden, R. T., Levy, M., Miller, M. B., Nolte, F. S., Tang, Y. W., & van Belkum, A. (2016). <i>Molecular Microbiology: Diagnostic Principles and Practice</i> (3rd ed.). ASM Press.			
6. Nelson, K. E., & Williams, C. M. (2020). <i>Infectious Disease Epidemiology: Theory and Practice</i> (3rd ed.). Jones & Bartlett Learning.			

Session: 2025-26				
Part A – Introduction				
Name of the Programme		M.Sc. Microbiology		
Semester		3		
Name of the Course		Practical based on Papers M24-MIC-301& M24-MIC-302		
Course Code		M24-MIC-307		
Course Type		PC-5		
Level of the course		500-599		
Pre-requisite for the course (if any)		NA		
Course Learning Outcomes (CLO)		CO1. The student can isolate and screen industrially important microorganisms from soil and enhance their traits using UV mutagenesis. CO2. The student can perform microbial fermentation, enzyme production, partial purification, and analyze microbial growth kinetics and biomass estimation. CO3. The student can differentiate and count lymphocytes, neutrophils, monocytes, eosinophils, and basophils based on morphological and staining characteristics. CO4. The student can perform various immunological tests like immnodiffusion and agglutination reactions.		
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B- Contents of the Course				
Practicals				Contact Hours
Course Contents	1. Isolation and Screening of Industrially Important Microorganisms from Soil 2. Strain Improvement of Bacteria Using UV Mutagenesis 3. Batch Fermentation in Flask for Amylase Production by microbial isolate 4. Partial Purification of Enzymes Using Ammonium Sulfate Precipitation 5. Solid-State Fermentation for Enzyme Production Using Agro-Waste Substrates 6. Isolation and Growth Curve Analysis of yeast in Glucose Broth 7. Production and Biomass Estimation of Single Cell Protein Using Yeast 8. Enumeration of bacteriophage in a sample by plaque forming unit (PFU) 9. Determination of total leucocytes count 10. Determination of differential leucocytes count 11. Determination of total erythrocytes count 12. Ouchterlony Double Immunodiffusion technique 13. Radial Immunodiffusion technique 14. Agglutination reactions			120
Suggested Evaluation Methods				
Internal Assessment: 30			End Term Examination: 70	
➤ Practicum		30	➤ Practicum	70
• Class Participation:		5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:		10		
• Mid-Term Exam:		15		
Part C-Learning Resources				
Recommended Books/e-resources/LMS:				
- Cappuccino, J. G., & Welsh, C. T. (2023). <i>Microbiology: A laboratory manual</i> (12th ed.). Pearson Education. - Thompson, D. A. (2018). <i>Biochemistry lab manual</i> (3rd ed.). Independently published. - Segel, I. H. (1976). <i>Biochemical calculations: How to solve mathematical problems in general biochemistry</i> (2nd ed.). John Wiley & Sons. - Collee, J. G., Fraser, A. G., Marmion, B. P., & Simmons, A. (Eds.). (1996). <i>Mackie & McCartney practical medical microbiology</i> (14th ed.). Churchill Livingstone. - Atlas, R. M., Parks, L. C., & Brown, A. E. (1995). <i>Laboratory manual of experimental microbiology</i> (1st ed.). Mosby-Year Book, Inc..				

Session: 2025-26			
Part A – Introduction			
Name of the Programme		M.Sc. Microbiology	
Semester		3	
Name of the Course		Practical based on Papers M24-MIC 303/304 & M24-MIC-305/306	
Course Code		M24-MIC-308	
Course Type		PC-6	
Level of the course		500-599	
Pre-requisite for the course (if any)		NA	
Course Learning Outcomes (CLO)	CO1. The student will be able to Analyze environmental samples (water, air, soil, and plant) for microbial diversity and contamination. CO2 The student will be able to Assess antibiotic resistance and physiological adaptations in environmental isolates. OR CO1. The student will be able to check the fecal contamination, potability of the water. CO2. The student will be able to study the various other properties of environmental water. AND CO3. The student will be able to perform sterility testing of a sample and is acquainted with the resident microflora of skin and oral cavity. CO4. The student will be able to identify human pathogenic microorganisms on selective/ differential media following biosafety norms. OR CO3. Student will be able to isolate rhizospheric and non rhizospheric microorganism for different PGPR attributes. CO4. The student will be able to isolate the microorganism for cellulose degradation and will be able to identify pathogenic fungi from plants		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours	
Part B- Contents of the Course			
Practicals			Contact Hours
Course Contents	Based on M24-MIC-303 1. Analysis of Water Quality Using Most Probable Number (MPN) Method for Coliform Detection 2. Air Sampling and Enumeration of Airborne Microorganisms Using Settle Plate Method 3. Assessment of Antibiotic Resistance in Environmental Isolates Using the Kirby-Bauer Method 4. Observation of Rhizosphere Microflora and Root Nodule Bacteria from Leguminous Plants 5. Isolation and Enumeration of Soil extremophiles 6. Effect of Temperature or Salinity on Growth of extremophiles OR Based on M24-MIC-304 1. Isolation and Microscopic Observation of Spoilage Microorganisms from Fruits and Vegetables 2. Determination of pH, Moisture Content of Perishable Food Items 3. Enumeration of Total Viable Count (TVC) from Milk or Juice Samples 4. Dye Reduction Test (MBRT) to Determine Microbial Quality of Milk		120

	5. Detection of Coliforms in Food Samples. 6. Comparative Study of Microbial Load in Preserved vs. Fresh Foods 7. Detection of Pathogens from Food Samples Using Selective Media 8. Evaluation of Food Handlers’ Hygiene Through Swab Test and Microbial Load Assessment 9. Microbiological Quality Check of Packaged Drinking Water AND Based on M24-MIC-305 1. To demonstrate the reduction of nitrates to nitrogen gas (denitrification). 2. Isolation of rhizosphere and nonrhizosphere microflora. 3. Isolation of cellulose degrading and phosphate solubilizing microorganisms from soil. 4. Identification of pathogenic fungi: (a) <i>Puccinia</i>(b) <i>Colletotrichum</i>(c)<i>Phytophthora</i> 11. Isolation of Rhizobium from root nodules. 5. Isolation of antibiotic producing bacteria from soil. 6. Detection of siderophores produced by a given microorganism OR Based on M24-MIC-306 1. To study cultural characteristics of pathogenic bacteria on following selective/differential media: TCBS agar; Hektoen Enteric agar; XLD agar; Endo agar; Salmonella-Shigella agar; Deoxycholate citrate agar 2. To study pathogenicity of <i>Staphylococcus aureus</i> by coagulase test 3. To perform sterility testing of a sample. 4. To study resident microflora of skin. 5. To study resident microflora of oral cavity	
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
- Cappuccino, J. G., & Welsh, C. T. (2023). <i>Microbiology: A laboratory manual</i> (12th ed.). Pearson Education. - Thompson, D. A. (2018). <i>Biochemistry lab manual</i> (3rd ed.). Independently published. - Segel, I. H. (1976). <i>Biochemical calculations: How to solve mathematical problems in general biochemistry</i> (2nd ed.). John Wiley & Sons. - Collee, J. G., Fraser, A. G., Marmion, B. P., & Simmons, A. (Eds.). (1996). <i>Mackie & McCartney practical medical microbiology</i> (14th ed.). Churchill Livingstone. - Atlas, R. M., Parks, L. C., & Brown, A. E. (1995). <i>Laboratory manual of experimental microbiology</i> (1st ed.). Mosby-Year Book, Inc.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	3		
Name of the Course	General and Applied Microbiology		
Course Code	M24-OEC-332		
Course Type	OEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	• CLO1. Student will know the history and morphological features of bacteria. • CLO2. Student will know isolation and preservation of pure cultures. • CLO3 Students will know Rhizosphere, biofertilizers and modes of transmission of disease. • CLO4. Students will know about the control of microbes and use of GEMs.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	History, development, scope and applications of Microbiology. General methods of sterilization. Introduction to Microscopy: bright field microscopy, dark field microscopy, phase contrast microscopy, electron microscopy. Various methods of staining of bacteria (simple, negative and Gram) and fungus (mold and yeast). Whittaker system of classification.		8
II	Morphology & fine structure of bacterial: cell wall, cell membrane, flagella and capsules. Formation of spores. Bacterial growth curve and measurement. Nutritional requirements and nutritional types of bacteria. Pure culture techniques –pour plate, spread plate, streak plate and serial dilution agar plate method. Preservation of microbial culture –serial subculture, at very low temperature, overlaying culture with mineral oil, lyophilization or freeze drying, in liquid nitrogen.		7
III	Rhizosphere & Rhizoplane micro-organisms and its significance. Biofertilizers and its examples. Nitrogen fixing bacteria: Symbiotic & non-symbiotic. Modes of transmission of disease: air, water, soil, contact, animals. Coliforms as the biological indicators of water safety and their assessment.		8
IV	Control of microbes in food by physical methods: temperature, irradiation, filtration, osmotic pressure. Use of Genetically Engineered Micro-organisms (GEMs) (a) Production of antibiotics: Penicillin (b) Biopesticides: Bt toxin, Boverin, DeVine (c) Control of pollution: degradation of xenobiotic compound		7

		Total Contact Hours	30
Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
➤ Theory	15	➤ Theory:	35
• Class Participation:	4	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	4		
• Mid-Term Exam:	7		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Stanier, R. Y., Ingraham, J. L., Wheelis, M. L., & Painter, P. R. (1986). <i>General microbiology</i> (5th ed.). Macmillan Education.			
2. Tortora, G. J., Funke, B. R., & Case, C. L. (2019). <i>Microbiology: An introduction</i> (13th ed.). Pearson Benjamin Cummings.			
3. Madigan, M. T., Martinko, J. M., Stahl, D. A., & Clark, D. P. (2021). <i>Brock biology of microorganisms</i> (16th ed.). Pearson.			
4. Collee, J. G., Fraser, A. G., Marmion, B. P., & Simmons, A. (Eds.). (1996). <i>Mackie & McCartney practical medical microbiology</i> (14th ed.). Churchill Livingstone.			
5. Atlas, R. M., Parks, L. C., & Brown, A. L. (1995). <i>Laboratory manual of experimental microbiology</i> (1st ed.). Mosby-Year Book, Inc.			
6. Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2008). <i>Prescott, Harley, and Klein's microbiology</i> (7th ed.). McGraw-Hill Education.			
7. Arora, D. R., & Arora, B. (2015). <i>Medical parasitology</i> (5th ed.). CBS Publishers & Distributors.			

Session: 2025-26			
Part A – Introduction			
Name of Programme		M.Sc. Microbiology	
Semester		4	
Name of the Course		Bioinformatics and Computational Biology	
Course Code		M24-MIC-401	
Course Type		CC-11	
Level of the course		500-599	
Pre-requisite for the course (if any)		NA	
Course Learning Outcomes (CLO)	CO1. Student is able to understand the basics of bioinformatics like file formats, databases, etc. CO2. Student is able to understand the basic alignments tools like BLAST, PAM, etc CO3 Students will gets familiar with different types multiple sequence alignment tools for analysis and will get to know about the basics of genome and transcriptome. CO4. Students will be able to understand the various methods of phylogenetic analysis.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction, overview and needs of bioinformatics technology. Biological databases – nucleic acid, genome, protein sequence and structure, gene expression databases, Database of metabolic pathways, SNP, chemical, metabolic pathways, signalling pathways, general human genetics, cancer gene. Mode of data storage - File formats - FASTA, Genbank and Uniprot, Data submission & retrieval from NCBI, EMBL, DDBJ, Uniprot, PDB.		15
II	Introduction to sequence alignment and its applications. Pair wise sequence alignment: Concept of global and local alignment, Dot Plot, algorithm for pair wise sequence alignment (Needleman Wunsch, Smith-watterman methods). Introduction to BLAST: types of BLAST, algorithm of BLAST and interpretation of its result. Substitution matrices: Introduction to substitution matrices: PAM and BLOSUM matrices, concept of log odd ratio.		15
III	Multiple sequence alignment: Local and Global Sequence alignment, pairwise and multiple sequence alignment. Methods of multiple sequence alignment, Tools of MSA– ClustalW, TCoffee; Position specific scoring matrices, introduction to consensus sequences, motifs and profiles. Significance of alignments: E value, Scores Diversity of Genomes: Viral, prokaryotic & eukaryotic genomes. Basic concepts of Genome, transcriptome, proteome.		15
IV	Phylogenetic Analysis: Introduction to phylogenetic analysis and its application. Types of phylogenetic trees, Different approaches of phylogenetic tree construction - UPGMA, Neighbour joining, Maximum Parsimony, Maximum likelihood. Genome Annotation: Concept of genome annotation, methods of gene identification. Tools of gene identification: GenScan, Grail, GeneID and Glimmer.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Baxevanis, A. D., & Ouellette, B. F. F. (2018). <i>Bioinformatics: A practical guide to the analysis of genes and proteins</i> (4th ed.). Wiley.			
2. Rastogi, S. C., Mendiratta, N., & Rastogi, P. (2006). <i>Bioinformatics: Methods and applications – Genomics, proteomics and drug discovery</i> (2nd ed.). Prentice Hall India. (No newer edition found.)			
3. Lesk, A. M. (2019). <i>Introduction to bioinformatics</i> (5th international student ed.). Oxford University Press.			
4. Primrose, S. B., & Twyman, R. M. (2002). <i>Principles of genome analysis and genomics</i> (3rd ed.). Wiley.			
5. Attwood, T. K., & Parry-Smith, D. J. (1999). <i>Introduction to bioinformatics</i> (1st ed.). Prentice Hall.			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	4		
Name of the Course	Microbial biotechnology & Industrial microbiology-II		
Course Code	M24-MIC-402		
Course Type	CC-12		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	CO1. Student will be able to describe microbial production of alcohols, acids, enzymes, and amino acids. CO2. Student will be able to explain microbial production of antibiotics, alkaloids, and vaccines. CO3. Student will be able to analyse waste valorisation, biomass utilization, and circular bioeconomy concepts. CO4. Student will be able to describe microbial roles in biofuels, biomining, and use of AI in bioprocessing.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	430
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Alcohol based fermentation industry - Production of Beer, wines and sprits - Production of Vinegar Biotechnological application of microbes in commercial production of : - Organic acids: Citric, lactic and acetic acid. - Microbial enzymes: Cellulases, amylases, proteases and lipases. - Amino acids: Glutamic acid, lysine.		15
II	Production of Metabolites of medical importance - Production of Antibiotics - Production of Ergot Alkaloids - Microbial biotransformation of steroids and sterols - Production of Vaccines		15
III	Industrial Waste Valorisation and Circular Bioeconomy Utilization of agro-industrial residues such as molasses, bagasse, fruit peels, whey, and spent grains in microbial fermentation processes; Role of microbial consortia and specific strains in efficient substrate utilization. Pretreatment of lignocellulosic biomass (physical, chemical, biological methods) for enhancing accessibility of cellulose and hemicellulose; Application of microbial consortia in aerobic and anaerobic wastewater treatment systems; Role of bacteria, fungi, and archaea in removal of pollutants and recovery of resources. Concept of circular bioeconomy in industrial microbiology; Integration of waste reduction, resource recovery, and sustainable microbial processing.		15

IV	Bioenergy and Emerging Industrial Applications Microbial systems for bioethanol production from sugars, starch, and lignocellulosic. Biogas generation using anaerobic digestion of organic waste; Methanogenesis by archaea; Microbial electrochemical systems: Working principles of microbial fuel cells (MFCs) and microbial electrolysis cells (MECs); Role of electrogenic bacteria; Applications in waste-to-energy conversion. Application of microbes in the mining industry: Bioleaching and biomining of metals like copper, gold, and uranium; Mechanisms of microbial oxidation and metal solubilization; Emerging trends in industrial microbiology: Use of artificial intelligence (AI), sensors, and automation tools for monitoring microbial fermentation; Predictive modeling, data analytics, and real-time process optimization in large-scale bioprocessing.	15		
Total Contact Hours		60		
Suggested Evaluation Methods				
Internal Assessment: 30		End Term Examination: 70		
➤ Theory		30	➤ Theory:	70
• Class Participation:		5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:		10		
• Mid-Term Exam:		15		
Part C-Learning Resources				
Recommended Books/e-resources/LMS: • Stanbury, P. F., Whitaker, A., & Hall, S. J. (2016). <i>Principles of fermentation technology</i> (3rd ed.). Butterworth-Heinemann. • Shuler, M. L., Kargi, F., & DeLisa, M. P. (2017). <i>Bioprocess engineering: Basic concepts</i> (3rd ed.). Pearson Education. • Okafor, N., & Okeke, B. C. (2017). <i>Modern industrial microbiology and biotechnology</i> (2nd ed.). CRC Press. • El-Mansi, E. M. T., Bryce, C. F. A., Demain, A. L., & Allman, A. R. (Eds.). (2012). <i>Fermentation microbiology and biotechnology</i> (3rd ed.). CRC Press. • Glazer, A. N., & Nikaido, H. (2007). <i>Microbial biotechnology: Fundamentals of applied microbiology</i> (2nd ed.). Cambridge University Press. • Walsh, G. (2014). <i>Pharmaceutical biotechnology: Concepts and applications</i> (2nd ed.). John Wiley & Sons. • Crommelin, D. J. A., Sindelar, R. D., & Meibohm, B. (2019). <i>Pharmaceutical biotechnology: Fundamentals and applications</i> (5th ed.). Springer. • Crueger, W., & Crueger, A. (2005). <i>Biotechnology: A textbook of industrial microbiology</i> (2nd Indian ed.). Panima Publishing Corporation. • Srivastava, M. L. (2008). <i>Fermentation technology: Principles and applications</i> (1st ed.). Alpha Science International. • Bhatia, R. K., & Walia, A. (Eds.). (2024). <i>Advancements in microbial biotechnology for soil health</i>. Springer Nature. • Verma, P. (Ed.). (2024). <i>Industrial microbiology and biotechnology: A new horizon</i>. Springer. • Wenli, Z. (2023). <i>Fermentation technology and microbial proteins</i>. LAP Lambert Academic Publishing. • Maddela, N. R., Laldinsangi, C., Chhipa, H., & Khan, A. (Eds.). (2024). <i>Microbial biotechnology for bioenergy</i>. Elsevier.				

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	4		
Name of the Course	Microbial Genomics and Proteomics		
Course Code	M24-MIC-403		
Course Type	DEC-3		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	CO1. Will have gathered understanding of diversity of viral, prokaryotic, eukaryotic genomes and their organization, sequencing strategies, also the knowledge of current techniques in genomic and interactomics along with current concepts in gene organization, challenges in gene prediction, primer designing. CO2. Will be familiar with various (online as well as standalone) tools available for protein structure visualization. CO3 Students will understand the basis of protein classification in databases like CATH and SCOP. CO4. Will understand the details of primary, secondary and tertiary structure of proteins, knowledge of domains, motifs and folds, strategies on protein structure prediction, Protein modeling approaches and rational drug designing and discovery		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Genomics and Gene Annotation: Organization and structure of prokaryotic and eukaryotic genomes; Genome annotation and databases; Automated in-silico methods of finding gene and relevant features; Genome Sequencing using first and second generation sequencing methods; Advantages of genome sequencing projects in modern biological research. Genomics Analysis: Diversity and features of completed genomes: Viral, prokaryotic (<i>E. coli</i>) and eukaryotic genomes (<i>Arabidopsis</i> , Human). Codon bias and optimization. Primer designing. Gene prediction methods. Techniques used in genomics and transcriptomics: NGS, Microarray, RNAseq.		15
II	Protein structure and proteomics: Hierarchy and features of protein structure: primary, secondary, tertiary and quaternary structures. Structural classes, motifs, folds and domains. Modelling of tertiary structure of protein in presence and absence of template. Energy minimizations and evaluation by Ramachandran plot. Proteome, interactome, 2-D gel electrophoresis, MALDI-TOF spectrometry, STRING, MMDB. Computer aided drug discovery.		15
III	Protein Structure Databases: Different databases of macro-molecular biomolecules; Accessing and mining protein structure classification databases such as SCOP, CATH; Tools for viewing and interpreting macromolecular structures. Protein Structure Comparison: Various algorithms and programs for superimposition of structures; RMSD calculations, multiple structure alignment methods such as DALI and VAST.		15

IV	Protein Structure Prediction &Molecular Modeling: Principles of secondary and tertiary structure predictions; <i>Ab-initio</i> and homology based methods of secondary and tertiary structure predictions; Homology modeling; Threading and <i>ab-initio</i> protein structure prediction. Inferring Function from Protein Sequence &Structure: Using evolutionary information; Gene neighborhood; Phylogenetic profiles; Gene fusion; Catalytic templates; Prediction and analysis of binding cavities for function prediction.		15
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS: ❑ Haubold, B., & Wiehe, T. (2006). <i>Introduction to computational biology: An evolutionary approach</i> (1st ed.). Springer International. ❑ Lesk, A. M. (2014). <i>Introduction to bioinformatics</i> (3rd ed.). Oxford University Press India. ❑ Ewens, W. J., & Grant, G. R. (2010). <i>Statistical methods in bioinformatics: An introduction</i> (2nd ed.). Springer-Verlag ❑ Mount, D. W. (2004). <i>Bioinformatics: Sequence and genome analysis</i> (2nd ed.). Cold Spring Harbor Laboratory Press. ❑ Baxevanis, A. D., & Ouellette, B. F. F. (2005). <i>Bioinformatics: A practical guide to the analysis of genes & proteins</i> (2nd ed.). John Wiley & Sons. ❑ Zimmermann, K. H. (2005). <i>An introduction to protein informatics</i> (1st ed.). Springer International. ❑ Krane, D. E. (2003). <i>Fundamental concepts of bioinformatics</i> (1st ed.). Pearson Education. ❑ Burkowski, F. J. (2001). <i>Structural bioinformatics: An algorithmic approach</i> (1st ed.). Chapman & Hall/CRC.			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	4		
Name of the Course	Bioremediation and Waste Management		
Course Code	M24-MIC-404		
Course Type	DEC-3		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	CO1. Student will be able to explain the principles and types of bioremediation and the role of microbes, plants, and fungi. CO2. Student will be able to classify waste types and evaluate sustainable waste management methods. CO3. Student will be able to assess microbial and nanotech-based approaches for pollutant bioremediation. CO4. Student will be able to analyze the role of biosensors, circular economy, and policies in waste management.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Fundamentals of Bioremediation Definition, scope, and significance of bioremediation. Types of bioremediations: in situ and ex situ techniques. Principles and mechanisms of bioremediation: microbial metabolism of pollutants, enzymatic degradation pathways. Factors affecting microbial degradation of pollutants: pH, temperature, redox potential, bioavailability, nutrient limitation. Phytoremediation: Types (rhizofiltration, phytoextraction, Phyto stabilization) and role of plant-microbe interactions. Mycoremediation: Use of fungi in degradation of complex pollutants. Microbial consortia and genetically engineered microbes in bioremediation		15
II	Waste and its Management Approaches Classification of waste: Solid, liquid, biomedical, hazardous, e-waste, and radioactive waste. Sources, characteristics, and environmental impact of different types of wastes. Solid waste management composting, landfill development, incineration methods, composting and sustainable agriculture, biogas production, plastic degrading microorganisms as a tool for bioremediation, challenges in waste management. Sewage and wastewater microbiology: treatment processes (primary, secondary, tertiary), microbial flora involved. Sludge treatment and disposal. treatment of industrial effluents (distillery, textile, pulp and paper),		15
III	Bioremediation of Pollutants Bioremediation of hydrocarbons, xenobiotics and petroleum compounds: aerobic and anaerobic degradation. Bioremediation of heavy metals: microbial metal resistance mechanisms and biosorption. Bioremediation of pesticides, herbicides, and industrial		15

	solvents. E-waste: Global trends and toxic components, e-waste recycling, nanoparticle for heavy metal recovery from e-waste, e-waste to profitable products, AI in smart bins for e-waste segregation.	
IV	Modern Tools, Risk, and Management Practices in Bioremediation Biosensors and bioindicators in environmental monitoring and bioremediation assessment. Nanobiotechnology in bioremediation: nano-remediation and engineered nanoparticles. Health hazards and ecological risks associated with bioremediation processes. Sustainable Waste Management Practices: Circular economy and zero-waste initiatives, waste to energy technologies, Role of policy and public awareness in waste management, Corporate Social Responsibility (CSR) in waste management Role of government programs and financial institutions in supporting waste management startups. Startups in e waste refurbishment.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - Alexander, M. (1999). <i>Biodegradation and bioremediation</i> (2nd ed.). Academic Press. - Evans, G. M., & Furlong, J. C. (2010). <i>Environmental biotechnology: Theory and application</i> (Reprint ed.). John Wiley & Sons. - Mohapatra, P. K. (2006). <i>Textbook of environmental microbiology</i>. I.K. International Publishing House. - Fulekar, M. H. (2010). <i>Bioremediation technology: Recent advances</i>. Springer. - Tchobanoglous, G., Theisen, H., & Vigil, S. A. (2003). <i>Integrated solid waste management: Engineering principles and management issues</i> (2nd ed.). McGraw-Hill Education. - Pepper, I. L., Gerba, C. P., & Gentry, T. J. (Eds.). (2015). <i>Environmental microbiology</i> (3rd ed.). Academic Press. - Singh, S. N. (Ed.). (2011). <i>Bioremediation: Applications for environmental protection and management</i>. Springer. - Varjani, S., Agarwal, A., & Ngo, H. H. (Eds.). (2020). <i>Bioremediation: Applications for environmental protection and management</i>. Springer. - Basu, A., Bhattacharya, A., & Mukherjee, S. (2022). <i>Nanotechnology in environmental science: Fundamentals and applications</i>. Wiley.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	4		
Name of the Course	Bioentrepreneurship and IPR		
Course Code	M24-MIC-405		
Course Type	DEC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	• CO1. Will have learnt the concepts of IPR and its protection. • CO2. Will have gathered understanding of protection of IP through Patents, Copyright and related rights, Trademarks, Geographical indications, Industrial designs and New Plant Varieties • CO3 Will get acquainted with Agreements, Treaties and Acts in relation to IP protection. • CO4. Will understand the licensing agreements and infringements of IPR Act and basics of entrepreneurship		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Intellectual Property: importance of IPR – patentable and non patentables. Trade secrets and know-how agreements. Utility models: Differences between a utility model and a patent. Types of inventions protected by a patent. Need for a patent. Relevance of IPR in Life Sciences. Grant of Patent and Patenting Authorities: Claims. Searching a patent, Drafting of a patent, Filing of a patent, Types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition; An introduction to Patent Filing Procedures.		15
II	Copyrights: Definition, need, coverage and duration. Related rights. Distinction between related rights and copyright. Rights covered by copyright. Trademarks: Definition. Rights of trademark, signs that can be used as trademarks, types of trademark. Protection and registration a trademark. Duration of protection. Well-known trademarks. Geographical indications: Definition. Need for Protection. Examples. Industrial design: Overview, kind, duration and need for protection provided by industrial designs. New Plant Varieties: Requirements, Rights of breeder, Extent and Duration, Examples. Biotechnology Research and Intellectual Property Rights Management		15
III	Agreements and Treaties: GATT, TRIPS Agreements; Role of Madrid Agreement; Hague Agreement; WIPO Treaties; Budapest Treaty on international recognition of the deposit of microorganisms; UPOV & Brene conventions. Patenting life – legal protection of biotechnological inventions – World Intellectual Property Rights Organization (WIPO). Patent Co-operation Treaty (PCT). Indian Patent Act 1970 & recent amendments.		15

IV	Patent licensing and agreement: Patent infringement- meaning, scope, litigation, case studies, Rights and Duties of patent owner. Commercializing Biotechnology Invention, Case studies of Biotechnology. Entrepreneurship: Selection of a product, line design and development processes, economics on material and energy requirement, stock the product and release the same for making etc. The basic regulations of excise: Demand for a given product, feasibility of its production under given constraints of raw material, energy input, financial situations export potential etc.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Wooley, D. P., & Byers, K. B. (Eds.). (2017). <i>Biological safety: Principles and practices</i> (5th ed.). ASM Press.		
2. Ramakrishna, B., & Kumar, H. S. A. (2023). <i>Fundamentals of intellectual property rights: For students, industrialists and patent lawyers</i> (1st ed.). Notion Press, India.		
3. Singh, K. K. (2016). <i>Biotechnology and intellectual property rights: Legal and social implications</i> (1st ed.). Springer India.		
4. Goel, D., & Parashar, S. (2022). <i>IPR, biosafety and bioethic</i> (1st ed.). Pearson Education, India.		
5. Kankanala, C. (2021). <i>Genetic patent law and strategy</i> (1st ed.). Manupatra Information Solutions Pvt. Ltd., India.		
6. Wadehra, B. L. (2020). <i>Law relating to patents, trade marks, copyright, designs and geographical indications</i> (latest ed.). Universal Law Publishing, India.		
7. Murray, T. M., & Mehlman, M. J. (2019). <i>Encyclopedia of ethical, legal and policy issues in biotechnology</i> . John Wiley & Sons, UK.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Microbiology		
Semester	4		
Name of the Course	Clinical and Pharmaceutical Microbiology		
Course Code	M24-MIC-406		
Course Type	DEC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO)	CO1. The student will be Apply key antimicrobial susceptibility testing methods to guide chemotherapy decisions. CO2. The student will be Utilize modern vaccine technologies and transgenic models, considering ethical research practices. CO3. The student will be Implement sterilization and disinfection protocols for pharmaceutical microbiological quality control. CO4. The student will be Ensure compliance with GMP and regulatory standards in sterile product manufacturing and testing.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Laboratory tests in chemotherapy: Susceptibility tests: Micro-dilution and macro-dilution broth procedures. Susceptibility tests: Diffusion test procedures. Susceptibility tests: Tests for bactericidal activity. Automated procedures for antimicrobial susceptibility tests. Transgenic animals:-Development, applications. Ethics in Research:-Ethical issues pertaining to animal study, handling and disposal of 10 radioactive waste and pathogenic micro-organisms.		15
II	Modern approaches to live virus vaccines, live bacterial vaccines and their application against tumor antigens immune modifiers in vaccines. AIDS : HIV testing: product development strategies, approaches to HIV, vaccine design. Idiotypic vaccines and immune toxins Recombinant DNA vaccines. Adjuvants & their future development. Commercial & regulatory aspects of vaccines production and distribution		15
III	Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions Evaluation of bactericidal & Bacteriostatic. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators. Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification		15

IV	Microbiological Quality Control of Pharmaceuticals: Total viable count (TVC); Test for specified microorganisms (<i>E. coli</i> , <i>Salmonella</i>); Sterility testing (membrane filtration, direct inoculation); Pyrogen testing (Rabbit test, LAL assay). Good Manufacturing Practices (GMP): Aseptic techniques; Documentation and SOPs; Validation and calibration. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.	15	
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS: ❑ Riedel, S., Hobden, J. A., Miller, S., Morse, S. A., Mietzner, T. A., Detrick, B., ... Mejia, R. (2019). <i>Jawetz, Melnick & Adelberg's medical microbiology</i> (28th ed.). McGraw Hill Professional. ❑ Edward, D. J., & Holt, K. E. (2013). Beginner's guide to comparative genome analysis using next generation sequence data. <i>Microbial Informatics and Experimentation</i> , 3(2), Article 2. ❑ Wilson, B. A., Salyers, A. A., Whitt, D. D., & Winkler, M. E. (2019). <i>Bacterial pathogenesis: A molecular approach</i> (4th ed.). ASM Press. t ❑ Locht, C., & Simonet, M. (2012). <i>Bacterial pathogenesis: Molecular and cellular mechanisms</i> . Caister Academic Press. ❑ Persing, D. H., Tenover, F. C., Hayden, R. T., Leven, M., Miller, M. B., Nolte, F. S., Tang, Y. W., & van Belkum, A. (2016). <i>Molecular microbiology: Diagnostic principles and practice</i> (3rd ed.). ASM Press.			

Session: 2025-26				
Part A – Introduction				
Name of the Programme		M.Sc. Microbiology		
Semester		4		
Name of the Course		Practical based on Papers M24-MIC-401 to M24-MIC-402		
Course Code		M24-MIC-407		
Course Type		PC-7		
Level of the course		500-599		
Pre-requisite for the course (if any)		NA		
Course Learning Outcomes (CLO)		CO1. Student will learn about different protein database and protein modeling tools. CO2. Student will be able to do sequence alignments using BLAST and able to construct phylogenetic tree. CO3. The student will be able to Apply fermentation techniques for the microbial production of industrially important compounds like alcohol, acids, and amino acids. CO4. The student will be able to Perform qualitative assays for microbial enzymes and screen soil microbes for antibiotic production.		
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B- Contents of the Course				
Practicals				Contact Hours
Course Contents	1. Introduction to various protein databases. 2. To perform protein modeling using SWISS-MODEL. 3. Visualization of 3D structures of proteins. 4. Sequence retrieval using BLAST. 5. Sequence alignment & phylogenetic analysis using clustal omega & phylip. 6. To analyze the given 16srRNA sequences by using BLAST and construct a phylogenetic tree based on the comparison results. 7. Alcoholic Fermentation of Grape Juice for Wine Production Using Yeast 8. Production of Citric Acid Using Aspergillus niger in Submerged Fermentation 9. Qualitative Assay of cellulase Activity from Fungal or Bacterial Isolates 10. Screening of Soil Microorganisms for Antibiotic Production by Cross streak method 11. Production of Lactic Acid by Lactobacillus sp. in Glucose Broth 12. Qualitative Assay of Protease from Bacterial Isolates 13. Production of Glutamic Acid Using Fermentation of Sugar-Based Media			120
Suggested Evaluation Methods				
Internal Assessment: 30			End Term Examination: 70	
➤ Practicum		30	➤ Practicum	70
• Class Participation:		5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:		10		
• Mid-Term Exam:		15		
Part C-Learning Resources				
Recommended Books/e-resources/LMS:				
- Cappuccino, J. G., & Welsh, C. T. (2023). <i>Microbiology: A laboratory manual</i> (12th ed.). Pearson Education.				
- Thompson, D. A. (2018). <i>Biochemistry lab manual</i> (3rd ed.). Independently published.				
- Segel, I. H. (1976). <i>Biochemical calculations: How to solve mathematical problems in general biochemistry</i> (2nd ed.). John Wiley & Sons.				
- Collee, J. G., Fraser, A. G., Marmion, B. P., & Simmons, A. (Eds.). (1996). <i>Mackie & McCartney practical medical microbiology</i> (14th ed.). Churchill Livingstone.				
- Atlas, R. M., Parks, L. C., & Brown, A. E. (1995). <i>Laboratory manual of experimental microbiology</i> (1st ed.). Mosby-Year Book, Inc..				

Session: 2025-26				
Part A – Introduction				
Name of the Programme		M.Sc. Microbiology		
Semester		4		
Name of the Course		Practical based on Papers M24-MIC 403/404 to M24-MIC-405/406		
Course Code		M24-MIC-408		
		PC-8		
Course Type				
Level of the course		500-599		
Pre-requisite for the course (if any)		NA		
Course Learning Outcomes (CLO)	CO1. Will be acquainted with bioinformatics and its relation with molecular biology, genetics and genomics, various modes of data transfer and simultaneously learning the advantages of encrypted data transfer, gained an in-depth knowledge of primary, secondary and composite databases, organization of diverse types of biological databases. CO2. Will understand the details of domains, motifs and folds, homology modelling for protein structure prediction, proteomics, computer aided drug designing and discovery. OR CO1- The student will be able to Assess environmental samples for pollutants and isolate microorganisms capable of biodegradation. CO2- The student will be able to Demonstrate microbial applications in waste management, including composting, dye biosorption, and pesticide degradation. AND CO3. The student Will obtain information on IPR, its main components, various types of application for filing the patent. CO4. The student will be able to study and have the basic understanding of patent application. OR CO3. Student will be able to isolate rhizospheric and non rhizospheric microorganism for different PGPR attributes. CO4. The student will be able to isolate the microorganism for cellulose degradation and will be able to identify pathogenic fungi from plants			
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B- Contents of the Course				
Practicals				Contact Hours
Course Contents	Based on M24-MIC-403 1. Picking out a given gene from genomes using Genscan or other software's (promoter region identification, repeat in genome, ORF prediction). 2. Gene finding tools (Glimmer, GENSCAN), Primer designing, Genscan/Genetool. 3. Virtual screening of drugs.			120
	Based on M24-MIC-404 1. Water Quality Assessment: pH, Turbidity, and Temperature of Sewage/Drain Water 2. Isolation of Hydrocarbon-Degrading Bacteria from Oil-Contaminated 3. Soil Composting of Organic Kitchen Waste and Observation of Microbial Growth 4. Screening of Pesticide-Tolerant Soil Microorganisms 5. Demonstration of Pesticide Degradation by Soil Bacteria 6. Biosorption of Dyes using fungal mycelium 7. Detection of Coliforms in sewage water			

AND			
Based on M24-MIC-405 1. Study of steps of a patenting process and different forms of filing the patent. 2. Design a suitable strategy to protect a genetically modified organism. 3. Case studies related to patenting of biological material OR Based on M24-MIC-406 1. Perform broth microdilution and macrodilution to determine Minimum Inhibitory Concentration (MIC). 2. Test the efficacy of disinfectants using phenol coefficient and use-dilution methods. 3. Conduct membrane filtration and direct inoculation methods on sterile products (e.g., ophthalmic solutions). 4. Perform Total Viable Count (TVC) and test for specified microorganisms (e.g., E. coli, Salmonella). 5. Practice documentation, SOP writing, and validation protocols for aseptic processing as per ISO.			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
- Cappuccino, J. G., & Welsh, C. T. (2023). <i>Microbiology: A laboratory manual</i> (12th ed.). Pearson Education. - Thompson, D. A. (2018). <i>Biochemistry lab manual</i> (3rd ed.). Independently published. - Segel, I. H. (1976). <i>Biochemical calculations: How to solve mathematical problems in general biochemistry</i> (2nd ed.). John Wiley & Sons. - Collee, J. G., Fraser, A. G., Marmion, B. P., & Simmons, A. (Eds.). (1996). <i>Mackie & McCartney practical medical microbiology</i> (14th ed.). Churchill Livingstone. - Atlas, R. M., Parks, L. C., & Brown, A. E. (1995). <i>Laboratory manual of experimental microbiology</i> (1st ed.). Mosby-Year Book, Inc..			

Session: 2025-26			
Part A – Introduction			
Name of Programme		M.Sc. Microbiology	
Semester		4	
Name of the Course		Entrepreneurship and employability in microbiology	
Course Code		M24-MIC-409	
Course Type		EEC	
Level of the course		500-599	
Pre-requisite for the course (if any)		NA	
Course Learning Outcomes (CLO)	• CO1. To develop entrepreneurial thinking and identify microbiology-based business opportunities. • CO2. To equip students with career skills relevant to microbiology-based industries and research. • CO3 To understand the regulatory, ethical, and financial considerations in setting up a microbiology enterprise. • CO4. To enhance soft skills, communication, and workplace readiness for better employability.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Entrepreneurship: Entrepreneurship and principles of entrepreneurial development, Qualities of an entrepreneur, Functions and types of entrepreneurs. Need for microbiology-based startups. Challenges of bioentrepreneurship in India and measures to promote bioentrepreneurship in India. Entrepreneurship development programs of public and private agencies (MSME, DBT, BIRAC, Startup, Make In India),		8
II	Collection, transport and culturing of clinical samples, principles of different diagnostic tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation, PCR, DNA probes). An overview of cancer biomarkers: types, tests and importance in management of cancer disease		7
III	Innovations in Microbiology • Emerging trends: microbiome therapy, synthetic biology, CRISPR Biosensors for detecting biomolecules and use in physiological monitoring, advantages and limitations of biosensors.		8
IV	Technology Transfer and Commercialization • Incubation centers, technology licensing • Academia-industry collaborations Case studies: Successful biotech/microbiology entrepreneurs. Bioethics and biosafety issues,		7
Total Contact Hours			30

Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
➤ Theory	15	➤ Theory:	35
• Class Participation:	4	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	4		
• Mid-Term Exam:	7		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. S. N. Jogdand, Entrepreneurship and Business of Biotechnology, Himalaya Publishing Home, 2007.			
2. Desai V, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House (2007).			
3. Gupta, Reena & Malhotra, Bharti & Huddone, et al. (2012). Indian entrepreneurship in biotechnology comes of age.			
4. Sinha, Dwaipayan & Singh, Anjana. (2021). Introduction to Bioentrepreneurship. 10.4018/978-1-7998-7411-9.ch001.			
5. A. K. Bhatt, R. K. Bhatia and T. C. Bhalla (2022) Basic Biotechniques for Bioprocess and Bioentrepreneurship. Elsevier Science Publishing Co Inc Academic Press Inc.			

Session: 2025-26		
Part A – Introduction		
Name of Programme	M.Sc. Microbiology	
Semester	4	
Name of the Course	Dissertation/Project Work	
Course Code	M24-MIC-410	
Course Type	Dissertation/Project Work	
Level of the course	500-599	
Pre-requisite for the course (if any)	NA	
Credits	Dissertation/Project Work	Total
	12	12
End Term Exam Marks	300	300
Max. Marks	300	300

KURUKSHETRA UNIVERSITY KURUKSHETRA

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**Revised Scheme of Examination for MDC (1st,
2nd, 3rd Semester & Minor CC-M2 (2nd
Semester) and inclusion of Minor CC-M3
(3rd Semester) and CC-M6 (6th Semester) for
Under-Graduate
(Subject: Biotechnology)**

**Under Multiple Entry-Exit, Internship and CBCS-
LOCF in accordance to NEP-2020 w.e.f. 2025-26**

DEPARTMENT OF BIOTECHNOLOGY, KURUKSHETRA UNIVERSITY, KURUKSHETRA
Revised Scheme of Examination for Under-Graduate Program
Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-
2020 w.e.f. 2025-26 (in phased manner), Program: Biotechnology

FIRST YEAR: SEMESTER-1									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A&C	CC-1 MCC-1 4credit	B23-BTY-101	Introduction of Biotechnology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme C only	MCC-2 4credit	B23-BTY-102	Basics of Bio-molecules	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme A	CC-M1 2credit	B23-BTY-103	Laboratory Techniques & Practices	1	1	10	20	30	3hrs.
			Practical	1	2	5	15	20	4hrs.
Scheme A&C	MDC-1 3credits	B23-BTY-104	Biotechnology-I	2	2	15	35	50	3hrs.
			Practical	1	2	5	20	25	4hrs.
Scheme C only	CC-M1 4credit	From Available CC-M1 of 4 credits as per NEP							
Scheme A&C	AEC-1 2credit	From Available AEC-1of two credits as per NEP							
	SEC-1 3credit	From Available SEC-1 of three credits as per NEP							
	VAC-1 2credit	From Available VAC-1of two credits as per NEP							
FIRST YEAR: SEMESTER-2									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A&C	CC-2 MCC-3 4credit	B23-BTY-201	General Microbiology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme C only	DSEC-1 4credit	B23-BTY-202	Diagnostic Laboratory techniques	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme A only	CC-M2 2credit	B23-BTY-203	Basics concepts of Biotechnology	1	1	10	20	30	3hrs.
			Practical	1	2	5	15	20	4hrs.
Scheme A&C	MDC-2 3credits	B23-BTY-204	Biotechnology-II	2	2	15	35	50	3hrs.
			Practical	1	2	5	20	25	4hrs.
Scheme C only	CC-M2 4credit	From Available CC-M2 of 4 credits as per NEP							
Scheme A&C	AEC-2 2credit	From Available AEC-2 of two credits as per NEP							
	SEC-2 3credit	From Available SEC-2 of three credits as per NEP							
	VAC-2 2credit	From Available VAC-2 of two credits as per NEP							
Internship of 4 credits of 4-6 weeks duration after 2 nd Semester									

DEPARTMENT OF BIOTECHNOLOGY, KURUKSHETRA UNIVERSITY, KURUKSHETRA

SECOND YEAR: SEMESTER-3									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A,B&C	CC-3 MCC-4 4credit	B23-BTY-301	Cell Biology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B &C	MCC-5 4credit	B23-BTY-302	Genetics	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme A,B&C	MDC-3 3credits	B23-BTY-303	Biotechnology-III	2	2	15	35	50	3hrs.
			Practical	1	2	5	20	25	4hrs.
Scheme A&C	CC-M3 4credits	B23-BTY-304	Animal Tissue Culture	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B only	CC-M3 (V) 4credits	From Available CC-M3(V) of 4 credits as per NEP							
Scheme A,B&C	AEC-3 2credit	From Available AEC-3 of two credits as per NEP							
	SEC-3 3credit	From Available SEC-3 of three credits as per NEP							
Scheme C only	VAC-3 2credits	From Available VAC-3 of two credits as per NEP							
Scheme B only	MCC-3	MCC-2 FROM SCHEME C OF FIRST SEMESTER							
SECOND YEAR: SEMESTER-4									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A,B&C	CC-4 MCC-6 4credit	B23-BTY-401	Recombinant DNA Technology-I	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B &C	MCC-7 4credit	B23-BTY-402	Bioinformatics-I	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B &C	MCC-8 4credit	B23-BTY-403	Metabolism	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B &C	DSE-1 4 credit Select one option	B23-BTY-404	IPR, Biosafety and Bioethics	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
		B23-BTY-405	Foundations of Forensic Biotechnology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme A,B&C	CC-M4(V) 4credits	From Available CC-M4(V) of 4 credits as per NEP							
	AEC-4 2credit	From Available AEC-3 of two credits as per NEP							
Scheme C only	VAC-4 2credits	From Available VAC-4 of two credits as per NEP							
Scheme A&B	VAC-3 2credits	From Available VAC-3 of two credits as per NEP							
Internship of 4 credits of 4-6 weeks duration after 4 th Semester (if not done after second semester)									

DEPARTMENT OF BIOTECHNOLOGY, KURUKSHETRA UNIVERSITY, KURUKSHETRA

THIRD YEAR: SEMESTER-5									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A,B&C	CC-5 MCC-9 4credit	B23-BTY-501	Immunology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B & C	MCC-10 4credit	B23-BTY-502	Microbial Genetics	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B & C	DSE-2 4 credit Select one Option	B23-BTY-503	Fundamentals of Enzymology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
		B23-BTY-504	Fermented foods	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B & C	DSE-3 4 credit Select one Option	B23-BTY-505	Foundations of Environment and Ecology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
		B23-BTY-506	Foundations of Nano-Biotechnology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme A&C	CC-M5(V) 4credits	From Available CC-M5(V) of 4 credits as per NEP							
Scheme A,B&C	Internship 4 credits	Internship #4 credits after 4 th semester							
THIRD YEAR: SEMESTER-6									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A,B&C	CC-6 MCC-11 4credit	B23-BTY-601	Microbial Technology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B & C	MCC-12 4credit	B23-BTY-602	Bio-analytical Techniques	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B & C	DSE-4 4 credit Select one Option	B23-BTY-603	Medical Microbiology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
		B23-BTY-604	Molecular medicine and Gene therapy	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme B & C	DSE-5 4 credit Select one Option	B23-BTY-605	Biostatistics	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
		B23-BTY-606	Bio-entrepreneurship	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme A only	CC-M6 4credits	B23-BTY-607	Fermentation Biotechnology	3	3	20	50	70	3hrs.
			Practical	1	2	10	20	30	4hrs.
Scheme A only	CC-M7(V) 4credits	From Available CC-M7(V) of 4 credits as per NEP							
Scheme B only	CC-M5(V) 4credits	From Available CC-M5(V) of 4 credits as per NEP							
Scheme C only	CC-M6(V) 4credits	From Available CC-M6(V) of 4 credits as per NEP							
Scheme C only	SEC-4 2credit	From Available SEC-4 of two credits as per NEP							

DEPARTMENT OF BIOTECHNOLOGY, KURUKSHETRA UNIVERSITY, KURUKSHETRA
FOURTH YEAR

FOURTH YEAR: SEMESTER-7 (FOR HONOURS/ HONOURS WITH RESEARCH IN BIOTECHNOLOGY)

Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
Honours in biotechnology /Honours with Research in Biotechnology (For Scheme B&C)	CC-H1 4credit	B23-BTY-701	Recombinant DNA Technology-II	4	4	30	70	100	3hrs.
	CC-H2 4credit	B23-BTY-702	Pharmaceutical Biotechnology	4	4	30	70	100	3hrs.
	CC-H3 4credit	B23-BTY-703	Molecular Cell Biology	4	4	30	70	100	3hrs.
	DSE-H1 4 credit Select one Option	B23-BTY-704	Molecular diagnostics	4	4	30	70	100	3hrs.
		B23-BTY-705	Biotechnology in Environment Protection	4	4	30	70	100	3hrs.
	PC-H1 4credit	B23-BTY-706	Practical Based on B23-BTY-701TO704/705	4	8	30	70	100	6hrs.
	CC-HM1 4credit	From Available Minor of 4 credits as per NEP							

SEMESTER-8 (FOR HONOURS IN BIOTECHNOLOGY)

Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
Honours in Biotechnology (For Scheme B&C)	CC-H4 4credit	B23-BTY-801	<i>In vitro</i> culture techniques -Animal	4	4	30	70	100	3hrs.
	CC-H5 4credit	B23-BTY-802	<i>In vitro</i> culture techniques -Plant	4	4	30	70	100	3hrs.
	CC-H6 4credit	B23-BTY-803	Enzyme Technology	4	4	30	70	100	3hrs.
	DSE-H2 4 credit Select one option	B23-BTY-804	Bioinformatics-II	4	4	30	70	100	3hrs.
		B23-BTY-805	Mathematics and calculations in Biotechnology	4	4	30	70	100	3hrs.
	PC-H2 4credit	B23-BTY-806	Practical Based on B23-BTY-801TO804/805	4	8	30	70	100	6hrs.
	CC-HM2 4credit	From Available Minor of 4 credits as per NEP							

OR SEMESTER-8 (FOR HONOURS WITH RESEARCH IN BIOTECHNOLOGY)

Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
Honours with Research in Biotechnology (For Scheme B&C)	CC-H4 4credit	B23-BTY-801	<i>In vitro</i> culture techniques -Animal	4	4	30	70	100	3hrs.
	CC-H5 4credit	B23-BTY-802	<i>In vitro</i> culture techniques -Plant	4	4	30	70	100	3hrs.
	Project/ Dissertation 12credit	B23-BTY-807	Project/Dissertation	8+4	-	-	300	300	-
	CC-HM2 4credit	From Available Minor of 4 credits as per NEP							

KURUKSHETRA UNIVERSITY KURUKSHETRA

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**Revised Syllabus for MDC (1st, 2nd, 3rd
Semester & Minor CC-M2 (2nd Semester) and
inclusion of Minor CC-M3 (3rd Semester) and
CC-M6 (6th Semester) for Under-Graduate
(Subject: Biotechnology)**

**Under Multiple Entry-Exit, Internship and CBCS- LOCF
in accordance to NEP-2020 w.e.f. 2025-26**

MDC-1

Session: 2025-26			
Part A- Introduction			
Subject	Biotechnology		
Semester	I		
Name of the Course	Biotechnology-I		
Course Code	B23-BTY-104		
Course Type: (CC/MCC/MDC/CC-M /DSEC/VOC/DSE/PC/AEC/VAC)	MDC-1		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO): (CLOs 1-4 of theory and 5 th of practical	After completing this course, the learner will be able to: 1. Understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, 2 To study and learn about different evolution theories. 3. To study about function and levels in ecosystem. 4. To study some of the basics of Biotechnology. 5. Learn practical skills on basic Biotechnology practical like microscope, slide preparation, safety measures.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4

Max.Marks:75 Internal Assessment Marks: 20 (15 Theory +5 Practical) End Term Exam Marks: 55 (35 Theory+20 Practical)		Time: Theory-3h; Practical-4h
Part B-Contents of the Course		
<u>Instructions for Paper-Setter</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.		
Unit	Topics	Contact Hours
I	Cell: Structure and Function: Cell theory and cell as the basic unit of life, structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall; cell organelles - structure and function; endomembrane system, endoplasmic reticulum, golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids, microbodies; cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); nucleus, Cell cycle, mitosis, meiosis and their significance.	7
II	Evolution: Origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences); Darwin's contribution, modern synthetic theory of evolution; mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift	8
III	Ecosystem: Concept, components, properties and functions; energy flow-food chain, food web, trophic structure; ecological pyramids and concept of productivity. Biogeochemical cycles: Concept, reservoir pool, gaseous cycles and sedimentary cycles.	7
IV	Introduction to biotechnology: Main areas of application of biotechnology; Biotechnology research in India and biotechnology in context of developing world; Public perception of biotechnological products; Brief account of safety guidelines, risk assessment and ethics in biotechnology.	8

V*	List of Practical: 1. To learn about various safety measures in biotechnology laboratory. 2. To learn about plant tissue culture laboratory setup. 3. To study C, N and O cycle. 4. To study cell division stages under microscope. 5. To study the structure of Prokaryotic cell. 6. To study the structure of Eukaryotic cell.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 • Class Participation:4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam:7 ➤ Practicum-5 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab record etc.:5 • Mid-Term Exam: NA		End Term Examination: 35(Theory); 20 (Practical)- Evaluation of the practical skill will be done by as per University guidelines.
Part C-Learning Resources		
Suggested Readings: 1. Comprehensive Biotechnology, Murray Moo-Young, 2nd edition (2011), Pergamon Press. 2. Introduction to Biotechnology, William J. Thieman & Michael A. Palladino, 3rd edition (2012), Benjamin Cummings. 3. Biotechnology Expanding Horizons, B D Singh, 4th edition (2012), Kalyani Publishers. 4. Biotechnology, Applying the Genetic Revolution, David P. Clark & Nanette J. Pazdernik, 1st edition (2009), Academic Cell. 5. Biotechnology: Demystifying the concepts, David Bourgaize, Thomas R. Jewell & Rodolfo G. Buiser, 1st edition (1999), Benjamin Cummings. 6. Elements of Biotechnology-Gupta, P.K., Rastogi and Co., Merrut, India, 2nd edition (2010). The Ethics of Biotechnology (Biotechnology in the 21st Century), Jonathan Morris, Chelsea House Pub (L), 1st edition (2005).		

CC-M2

Session: 2025-26			
Part A-Introduction			
Subject	Biotechnology		
Semester	II		
Name of the Course	Basics concepts of Biotechnology		
Course Code	B23-BTY-203		
Course Type: (CC/MCC/MDC/CC-M /DSEC/VOC/DSE/PC/AEC/VAC)	CC-M2		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO): CLOs 1-4 of theory and 5 th of practical)	After completing this course, the learner will be able to: 1 Gain fundamental information about various biotechnology fields. 2. Understand enzyme immobilization and their roles. 3. Learn about various immunological components and their functioning in human body. 4. Learn working in biotechnology laboratories. 5. To learn about different biotechnological techniques.		
Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3
Max. Marks: 50 Internal Assessment Marks:15 (10Theory+5Practical) End Term Exam Marks: 35 (20Theory+15Practical)		Time: Theory-3h; Practical-4h	
Part B-Contents of the Course			

Instructions for Paper-Setter

Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to biotechnology – an interdisciplinary pursuit; Main areas of application of biotechnology; Brief account of safety guidelines, risk assessment and ethics in biotechnology; Very brief account of intellectual property rights; future of biotechnology.	3
II	DNA fingerprinting and forensic analysis. Potential laboratory biohazards of genetic engineering. Introduction to molecular markers. Introduction of enzyme technology: nature of enzymes, application of enzymes and immobilized enzymes.	4
III	Scope and applications of animal biotechnology and plant biotechnology. Brief account of immunotechnology: immune system (immune cells, types of immunity and general structure of immunoglobulins), hybridoma technology and monoclonal antibodies. <i>In vitro</i> fertilization and embryo transfer technology in brief.	4
IV	Brief account on bioremediation and waste treatment biotechnology, bioleaching. Application of biotechnology in medicine (pharmaceutical industry, vaccines, antibiotics etc.), food industry, biofuels and chemical industry.	4

V*	List of Practical: 1. To examine case study of patenting of rice and turmeric. 2. To learn and demonstrate the process of DNA fingerprinting. 3. To learn about possible techniques of enzyme immobilization in laboratory. 4. To discuss various applications of Biotechnology in food and agriculture sector. 5. To demonstrate the process of hybridoma technology. 6. To demonstrate the process of IVF.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-10 • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: NA • Mid-Term Exam: 6 ➤ Practicum-5 • Class Participation: • Seminar/Demonstration/Viva-voce/Labrecordsetc.:5 • Mid-Term Exam: NA		End Term Examination: 20 (Theory); 15 (Practical)- Evaluation of the practical skill will be done as per university guidelines
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Lehninger: Principles of Biochemistry, 7th edition, by David L. Nelson and M. M.Cox (2017) Maxmillan/Worth publishers/W.H. Freeman &Company 2. Biochemistry by J.L. Jain, S. Chand & Co. 3. Essentials of Biochemistry, 5th edition by Satyanarayana and Chakrapani (2019) Elsevier, India		

MDC-2

Session:2025-26			
Part A-Introduction			
Subject	Biotechnology		
Semester	II		
Name of the Course	Biotechnology-II		
Course Code	B23-BTY-204		
Course Type: (CC/MCC/MDC/CC-M /DSEC/VOC/DSE/PC/AEC/VAC)	MDC-2		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO): (CLOs 1-4 of theory and 5 th of practical)	After completing this course, the learner will be able to: 1. Understand about study of microorganisms. 2. Understand different processes in microorganisms. 3. Learn about different sterilization techniques. 4. Learn about different types of preservation methods. 5. Students get exposed to different microbiological and biotechnological techniques.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks:75 Internal Assessment Marks: 20 (15Theory+5Practical) End Term Exam Marks:55(35Theory+20Practical)		Time: Theory-3h; Practical-4h	
Part B-Contents of the Course			

Instructions for Paper-Setter

Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Bacterial transformation, conjugation, transfection, DNA as genetic material: experimental evidences, Hershey & Chase experiment, Griffith experiment. Genetically modified organisms (some important examples like cattle, pig, fish, plants like tomato, brinjal).	8
II	Sterilization techniques followed in biotechnology lab.- dry and wet sterilization techniques, Preferred method of sterilization for different materials, Lab rules and safety measures to be taken in Biotechnology Laboratory.	7
III	Nutritional categories of micro-organisms, Microbial growth curve, Generation time, synchronous batch and continuous culture, measurement of growth and factors affecting growth of bacteria. Control of Microorganisms: By physical, chemical and Chemotherapeutic Agents.	8
IV	Cryopreservation: Cryopreservation of plant or animal sample / microorganisms, Difficulties in cryopreservation, Methods for cryopreservation, Selection of material, addition of cryoprotectants, Freezing (rapid freezing, slow freezing, step wise freezing) Storage in liquid nitrogen, Thawing and reculturing of frozen samples.	7
V*	PRACTICALS 1. To learn about various sterilization techniques in biotechnology laboratory. 2. To learn about some important sterilizing Instruments in Biotechnology laboratory.	30

	3. To demonstrate the bacterial growth by using suitable resources. 4. To study structure of DNA in detail. 5. To study effectiveness of different agents for microbial growth.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam:7 ➤ Practicum-5 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.:5 • Mid-Term Exam: NA		End Term Examination: 35 (Theory); 20 (Practical)- Evaluation of the practical skill will be done by as per University guidelines.
Part C-Learning Resources		
1. Elements of Biotechnology-Gupta, P.K., Rastogi Publications, Merrut, India,2 nd edition (2019). 2. Introduction to Plant Biotechnology-Chawla, H.S. CRC Press, 3 rd edition(2020). 3. Text Book of Biotechnology-Das, H.K., Wiley India Pvt.Limited,5 th edition (2017). 4. Plant Biotechnology-Hammound, J., Mc Garvey, P. and Yusibov,V., SpringerVerag (2012). 5. Plant Biotechnology-Gupta, P.K. Rastogi Publishers,Meerut,India,2 nd edition (2016).		

MDC-3**Session: 2025-26****Part A–Introduction**

Subject	Biotechnology		
Semester	III		
Name of the Course	Biotechnology–III		
Course Code	B23-BTY-303		
Course Type: (CC/MCC/MDC/CC-M /DSEC/VOC/DSE/PC/AEC/VAC)	MDC-3		
Level of the course (As per Annexure-I	200–299		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO): CLOs 1-4 of theory and 5 th of practical)	After completing this course, the learner will be able to: 1. Understand protection methods for different biotechnological processes and products. 2. Understand applications of IVF 3. Learn diverse applications of Biotechnology. 4. Learn about fermentation technology. 5. Learn practical skills on different aspects and applications in the field of Biotechnology.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks:75 Internal Assessment Marks:20 (15Theory+5Practical) End Term Exam Marks: 55 (35Theory+20Practical)		Time: Theory-3h; Practical-4h	
Part B-Contents of the Course			
Instructions for Paper-Setter Nine questions will be set in all. Question No. 1 comprising of objective/short answer type			

questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Intellectual Property Rights, Biosafety and Ethical Issues: Intellectual property rights (IPR): Patents, trade secrets, copyright, trademarks; Patenting of biological material; Plant breeders rights (PBRs) and farmers rights; Concerns about GM crops–environmental, biosafety and Ethical issues.	7
II	Fermentation Technology: Fermenters, its types, components and applications. stirred-tank, airlift, bubble column and fluidized bed Fermenters Batch, Fed batch and Continuous culture.	8
III	In vitro fertilization and Embryo Transfer Technology: In vitro fertilization in Humans, Embryo transfer in Humans, Super-ovulation and Embryo transfer in Farm animals.	7
IV	Application of biotechnology in medicine (pharmaceutical industry, vaccines, antibiotics etc.), food industry, chemical industry, Animal and plant sectors.	8
V*	List of Practical: 1. To study about some case studies regarding patent. 2. To demonstrate the composition and functioning of a basic fermenter. 3. To discuss about advantages and disadvantages of genetically modified crops. 4. To represent different types of Fermenters diagrammatically. 5. To demonstrate the process of In Vitro fertilization and discuss its applications.	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory-15 • Class Participation:4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam:7 ➤ Practicum-5 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.:5 • Mid-Term Exam: NA	End Term Examination: 35 (Theory); 20 (Practical) -Evaluation of the practical skill will be done by as per University guidelines.
Part C-Learning Resources	
References 1. Comprehensive Biotechnology, Murray Moo-Young, 2nd edition (2011), Pergamon Press. 2. Introduction to Biotechnology, William J. Thieman & Michael A. Palladino, 3rd edition (2012), Benjamin Cummings. 3. Biotechnology Expanding Horizons, BD Singh, 4th edition (2012), Kalyani Publishers. 4. Biotechnology, Applying the Genetic Revolution, David P. Clark & Nanette J. Pazdernik, 1st edition (2009), Academic Cell. 5. Biotechnology: Demystifying the concepts, David Bourgaize, Thomas R. Jewell & Rodolfo G. Buiser, 1st edition (1999), Benjamin Cummings. 6. Elements of Biotechnology-Gupta, P.K., Rastogi and Co., Merrut, India, 2nd edition (2010).	

CC-M3

Session: 2025-2026			
Part A - Introduction			
Subject	Biotechnology		
Semester	III		
Name of the course	Animal Tissue Culture		
Course Code	B23-BTY-304		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M3		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO): (CLOs 1-4 of theory and 5 th of practical)	After completing this course, the learner will be able to: 1. Understand the basics of animal cell culture, types of cell lines, and culture media. 2. Learn techniques like subculturing, cryopreservation, and contamination control. 3. Know about specialized culture methods and their applications in biotechnology. 4. Understand the ethical issues and safety practices in animal cell culture labs. 5. Perform basic cell culture techniques such as media preparation, aseptic handling, subculturing, and cell viability testing.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 30 (20 Theory + 10 Practical) End Term Exam Marks: 70 (50 Theory + 20 Practical)	Time: Theory-3h; Practical - 4h		
Part B - Contents of the Course			
Instructions for Paper- Setter			
Nine questions will be set in all. Question No. 1 comprising of objective/ short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Question No. 1 and four others selecting one question from each unit. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Introduction to Animal Cell Culture:-Historical development and milestones in cell culture; Basics of cell biology relevant to culture; Types of cell cultures: Primary, Secondary, and Continuous cell lines; Laboratory setup and biosafety in cell culture; Culture media: Composition, types, and preparation	11	

II	Techniques and Maintenance of Cell Cultures:- Aseptic techniques and sterilization; Subculturing, cryopreservation, and thawing of cells; Cell viability, growth kinetics, and characterization; Contamination: Sources, detection, and prevention; Serum and serum-free culture systems.	12
III	Specialized Cell Culture Techniques:- Stem cell culture (ESCs, iPSCs, MSCs); 3D culture and organoid technology (introductory); Co-culture and suspension culture techniques; Scaling up cell culture: Bioreactors and perfusion systems; Cytotoxicity and cell-based assays.	12
IV	Applications and Ethical Aspects; Applications in vaccine production, toxicology, recombinant protein expression; Animal biotechnology: Embryo culture, cloning, and gene editing; Cell culture in cancer research and regenerative medicine; Ethical concerns and regulatory aspects in animal cell culture.	10
V*	List of Practical: Any five 1. Introduction to animal tissue culture laboratory and aseptic practices. 2. Preparation of different types of cell culture media. 3. Preparation of gelatin or poly-L-lysine coated culture plates. 4. Establishment of primary culture from tissue explants. 5. Sub-culturing and maintenance of animal cell lines. 6. Observation and identification of bacterial and fungal contamination. 7. Cryopreservation and thawing of cultured cells. 8. Microscopic observation of cell morphology. 9. Cytotoxicity testing using colorimetric assays (e.g., MTT). 10. Simulated cell culture experiments using teaching kits or video demonstration.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-20 • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5		End Term Examination: 50 (Theory); 20 (Practical)- Evaluation of the

• Mid-Term Exam: 10 ➤ Practicum - 10 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	practical skill will be done by as per University guidelines.
Part C- Learning Resources	
Recommended Books/e-resources/LMS: 1. Textbook of Animal Biotechnology by S.K. Gautam, B. Singh, M.S. Chauhan, S.K. Singla Publisher: TERI Publishers, New Delhi 2. Advances in Animal Biotechnology by B. Singh, S.K. Gautam, M. Mukesh, G. Mal Publisher: Springer Nature 3. Animal Cell Culture: A Practical Approach by John R.W. Masters Publisher: Oxford University Press 4. Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications by R. Ian Freshney Publisher: Wiley-Blackwell	

CC-M6

CC-M6			
Session: 2025-2026			
Part A - Introduction			
Subject	Biotechnology		
Semester	VI		
Name of the course	Fermentation Biotechnology		
Course Code	B23-BTY-607		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO): (CLOs 1-4 of theory and 5 th of practical)	After completing this course, the learner will be able to: 1. Understand development of fermentation. Have knowledge of isolation and preservation of industrially important microbes and various types of fermentations. 2. Attain knowledge about formulation of industrial media, design and types of fermenters. 3. Get introduced to various strategies of product recovery from a fermentation broth. 4. Understand the basic principles of microbial commercial fermentations. 5. Develop practical skill to isolate, improve, analyze and preserve industrially important microbes.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 30 (20 Theory + 10 Practical) End Term Exam Marks: 70 (50 Theory + 20 Practical)	Time: 3h, 4h (practical)		
Part B - Contents of the Course			
Instructions for Paper- Setter			
Nine questions will be set in all. Question No. 1 comprising of objective/ short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Question No. 1 and four others selecting one question from each unit. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Introduction to fermentation technology: History, development and commercial applications. Ideal characteristics for industrially important microorganisms, methods of isolation, screening and preservation. Types of Fermentation systems; batch, fed-batch and continuous system.	11	
II	Media selection and formulation for industrial fermentations. Liquid and solid substrates used in fermentations. Foam formation, drawbacks and control. General design of a Fermenter/bioreactor. Types of fermenters commonly used; stirred tank reactor, airlift reactor, tower fermenter and bubble	12	

	column reactor.	
III	Process development of industrial fermentation: upstream and down-stream processing. Product purification: separation of microbial cells and other solids, cell disruption, filtration, centrifugation, phase extraction, chromatography, drying and crystallization.	12
IV	Commercial importance of fermentation: production of alcoholic beverages in industry; beer, wine and whisky, dairy products; cheese, yoghurt, buttermilk. Single cell protein (SCP): production and significance. Brief idea of extracellular enzymes and their industrial significance.	10
V*	List of Practical: 1. Demonstration of working of fermenter. 2. Isolation of industrially important micro-organisms. 3. Production of Biomass in sub-merged fermentation and surface fermentation. 4. Preservation of isolated microbial cultures. 5. Development of fermentation process for various products like wine, buttermilk or extracellular enzyme.	30

Suggested Evaluation Methods

Internal Assessment: ➤ Theory-20 • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum - 10 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End Term Examination: 50 (Theory); 20 (Practical)- Evaluation of the practical skill will be done by an external examiner.

Part C- Learning Resources

Recommended Books/e-resources/LMS:

1. Stanbury P.F. et al. (1997), Principles of Fermentation Technology, Pergmon Press Oxford.
2. Ward O.P., (1998), Fermentation Biotechnology – Principles, Process and Products. Prentice Hall Publishing, New Jersey.
3. Microbial Biotechnology: Basic Research and Applications (2020). Edit. Singh *et al.* Pub. Springer
4. Modern Industrial Microbiology and Biotechnology (2007) by Nduka Okafor. Science Publishers
5. Arnold I. Demain and Julian E. Davies (1999), Manual of Industrial Microbiology and Biotechnology, 2nd Edition, ASM Press, Washington D.C.
6. Glazer and Nikaido (1998) Microbial Biotechnology by WH Freeman & Company, New York.
7. Cruger and Cruger (2002), Biotechnology – A Textbook of Industrial Microbiology, 2nd Edition, Panima Publishing Corporation, New Delhi.

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)
(“A++” Grade, NAAC Accredited)



Syllabus for Under-Graduate Programme

**Subject: Industrial Microbiology
(Semester 5th and 6th)**

**Under Multiple Entry-Exit, Internship and
CBCS-LOCF in accordance to NEP-2020
With effect from the session 2025-26**

Kurukshetra University, Kurukshetra
Syllabus for UG Programme Subject - Industrial Microbiology
Semester 5th and 6th

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	V		
Name of the Course	IMMUNOLOGY		
Course Code	B23-IMB-501		
Course Type:	<u>CC-5/ MCC-9</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. To acquaint with Basic of immunology. 2. To impart knowledge about various antigens and antibodies 3. To give theoretical knowledge of MHC and complement system. 4. To understand about basics of various types of immune related disorders.		
CLO5 is related to practical component	5. To use the knowledge of immunology in diagnosis based on immunity.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Concept of Innate and Adaptive immunity; Contributions of following scientists to the development of the field of immunology - Edward Jenner, Karl Landsteiner, Robert Koch, Paul Ehrlich, Elie Metchnikoff, MacFarlane Burnet, Neils K Jerne. Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT	13
II	Antigens: Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes); T-dependent and T-independent antigens; Adjuvants Antibodies: Structure, Types, Functions and Properties of antibodies; Antigenic Determinants on antibodies (Isotypic, allotypic, idiotypic); Monoclonal and Chimeric antibodies	12
III	Major Histocompatibility Complex Organization of MHC locus (Mice & Human); Structure and Functions of MHC I & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways) Components of the Complement system; Activation pathways (Classical, Alternative, and Lectin pathways); Biological consequences of complement Activation.	10
IV	Generation of Immune Response Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response (Self MHC restriction, T cell activation, Co- stimulatory signals). Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies; Animal models (Nude and SCID mice), SCID, DiGeorge syndrome, Chediak- Higashi syndrome, Leukocyte adhesion deficiency, CGD; Types of tumors, tumor Antigens, causes cancers.	10
V*	PRACTICAL • Identification of human blood groups. • Determination of total leucocytes count • Determination of differential leucocytes count • Determination of total erythrocytes count • Perform immunodiffusion by Ouchterlony method	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.
2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley-Blackwell Scientific Publication, Oxford.
3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 5th edition W.H. Freeman and Company, New York.
4. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.
5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinburgh.
6. Richard C and Geffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

PLO CLO MAPPING of B23-IMB-501

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1	1	1	1	1.5	1
CLO2	1.5	1	2	1	1	1.5	1	1.5	1
CLO3	1	1	2	1.5	1.5	1.5	1	1.5	1
CLO4	1.5	1	2	1.5	1.5	1	1	1.5	1
CLO5	1	1	2	1.5	1.5	1	1	1.5	1

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	V		
Name of the Course	AGRICULTURE MICROBIOLOGY		
Course Code	B23-IMB-502		
Course Type:	<u>MCC-10</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. CO1: understand different MO present in soil ecosystem and their role and different interactions for sustainable agriculture. 2. CO2: Understand the concept of plant nutrition through biological nitrogen fixation and other biofertilizers. 3. CO3: understand role of microorganisms in different biodegradation strategies of different organic matter, organic polymers, and pesticides. 4. CO4: Understand mechanism of different biocontrol and <u>transgenic approaches for protection of plant from</u> diseases. 5. To impart practical to isolate the microorganism for cellulose degradation and will be able to identify pathogenic fungi from plants		
CLO5 is related to practical component			
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Soil microbial ecology: Soil biota, types of organisms in different soils; Soil microbial biomass; Factors influencing the soil microflora. Different Agriculturally important beneficial microorganisms – free living, symbiotic (rhizobial, mycorrhizal, actinorhizal) Microbial interactions: Different interfaces of interactions - Plant-microbe, microbe-microbe, soil-microbe, soil-plant-microbe interactions leading to symbiotic, associative, endophytic and pathogenic interactions.	13
II	Introduction to biofertilizers- definition, types of biofertilizers; Characteristic features of the following biofertilizer organisms: <i>Azospirillum</i>, <i>Azotobacter</i>, <i>Bacillus</i>, <i>Pseudomonas</i>, <i>Rhizobium</i>, <i>Frankia</i>, <i>Anabaena</i> and <i>Nostoc</i>. Biological nitrogen fixation- Biochemistry of N₂fixation, nif operon, mechanism of nitrogen fixation. Symbiotic nitrogen fixation: Rhizobium-Legume association, Actinorhizal associations, contribution of symbiotic nitrogen fixation. Denitrification.	12
III	Microbial transformations of nitrogen, phosphorus, sulphur, iron and manganese in soil. Biodegradation of pesticides, Organic wastes and their use for production of biogas and manures. Microbial degradation of polymers: lignin, cellulose, hemicelluloses. Factors affecting the degradation of organic matter.	10
IV	Biocontrol – Concept, types, mode of action, uses and practical constraints & applications of biocontrol agents. Biocontrol agent for sustainable agriculture. Different types of biocontrol agents. Biopesticides and bioherbicides, Biopesticides- classification, advantages. Major biopesticides based on bacteria, viruses & fungi (<i>Bacillus thuringiensis</i> (Bt) toxin, Boverin,	10
V*	PRACTICAL 1. To demonstrate the reduction of nitrates to nitrogen gas (denitrification). 2. Isolation of rhizosphere and nonrhizosphere microflora. 3. Isolation of cellulose degrading microorganisms from soil. 4. Isolation of <i>Rhizobium</i> from root nodules. 5. To study the microbial interactions.	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Paul EA. Soil Microbiology, Ecology and Biochemistry. 3rd Ed. Academic Press.
2. Varnam AH & Evans MG. Environmental Microbiology, Manson Publishing Ltd.
3. Christon J.Hurst, Ronald L. Crawford, Jay L. Garland, David A. Lipson, Aaron L. Mills. Manual of Environmental Microbiology, ASM Press
4. Spencer JFT, Alicia L & Ragout de Spencer. Environmental Microbiology: Methods and Protocols. Springer,
6. Burlage R.S., Atlas R., Stahl D., Geesey G. & Sayler G. Techniques in Microbial Ecology. Oxford University press, Inc.
- 7 Gaur A.C. Handbook of organic farming and biofertilizer, Ambika book agency, Jaipur

PLO CLO MAPPING of B23-IMB-502

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1	1	1.5	1	1.5	1
CLO2	1.5	1	2	1	1.5	1.5	1	1.5	1
CLO3	1	1	2	1.5	1	1.5	1	1.5	1.5
CLO4	1.5	1	1	1	1	1.5	1	1.5	1
CLO5	1	1	1	1	1	1.5	1	1.5	1.5

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	V		
Name of the Course	SOIL MICROBIOLOGY		
Course Code	B23- IMB- 503		
Course Type:	<u>DSE-2</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand soil as a complex microbial habitat including its physicochemical properties. 2. Describe microbial diversity in soil and its ecological roles. 3. Explain nutrient cycling and plant-microbe interactions. 4. Apply the knowledge in areas like biofertilizer production, bioremediation, and sustainable agriculture.		
CLO5 is related to practical component	5. Perform core microbiological techniques related to soil analysis..		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions			

from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Soil formation and classification. Composition of soil – physical, chemical, and biological components. Soil profile and soil horizons. Soil as a reservoir of microbial diversity. Factors affecting microbial communities in soil – pH, temperature, organic matter, oxygen, moisture. Types of soils found in India and their microbiological relevance. Rhizosphere and phyllosphere – definitions and microbial populations.	13
II	Types of soil microorganisms – bacteria, fungi, actinomycetes, protozoa, algae. Isolation and enumeration techniques of soil microbes. Beneficial and harmful interactions – symbiosis, commensalism, antagonism. Biological nitrogen fixation – Symbiotic associative and free-living. Mycorrhizae – ecto- and endo-mycorrhizae.	12
III	Nitrogen cycle: ammonification, nitrification, denitrification, nitrogen fixation. Carbon cycle: degradation of cellulose, lignin, and other organic matter. Phosphorus and sulfur transformation. Role of microorganisms in humus formation and organic matter decomposition.	10
IV	Biofertilizers – types (Rhizobium, Azotobacter, Azospirillum, Cyanobacteria, PSM), mode of action, application, and significance. Microbial biopesticides. Soil microbiome and sustainable agriculture. Bioremediation and composting – microbial involvement in solid waste degradation and compost quality improvement.	10
V*	PRACTICAL - pH and moisture content estimation of different soil types - Isolation and enumeration of different types of soil microorganisms. - Isolation of nitrogen fixing microorganisms from root nodules - Composting of organic matter. - Ammonification Test in Soil Using Nessler's Reagent. - Study of Mycorrhizal Association in Plant Roots	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.:5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam: NA		End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Alexander, M. (1999). *Introduction to Soil Microbiology*, 2nd Ed., Wiley.
2. Sylvia D.M. et al. (2005). *Principles and Applications of Soil Microbiology*, Pearson.
3. Subba Rao, N.S. (2001). *Soil Microorganisms and Plant Growth*, Oxford & IBH.
4. Paul, E.A. (2015). *Soil Microbiology, Ecology and Biochemistry*, Elsevier
5. Coyne MS. (2001). *Soil Microbiology: An Exploratory Approach*. Delmar Thomson Learning.
6. Atlas RM and Bartha R. (2000). *Microbial Ecology: Fundamentals & Applications*. 4th edition. Benjamin/Cummings Science Publishing, USA

PLO CLO MAPPING of B23-IMB-503

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1	1.5	1	1	1.5	1
CLO2	1.5	1	2	1	1.5	1.5	1	1.5	1
CLO3	1	1	2	1	1.5	1.5	1	1.5	1.5
CLO4	1.5	1	1	1	1	1	1	1.5	1.5
CLO5	1	1	1	1	1	1	1	1.5	1.5

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	V		
Name of the Course	MOLECULAR BIOLOGY		
Course Code	B23- IMB- 504		
Course Type:	<u>DSE-2</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes(CLO): CLO5 is related to practical component	After completing this course, the learner will be able to: 1. Understand mechanisms regulating gene expression in prokaryotes and eukaryotes. 2. Describe the structure and function of operons and regulatory proteins. 3. Explain mechanisms of RNA processing and splicing. 4. Gain insight into recombinant DNA technology and molecular tools. 5. Perform basic molecular techniques used in genetic engineering and gene expression analysis.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions			

from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Transcription: General principle and steps of transcription: basic apparatus, initiation, elongation and termination. Classes of RNA: rRNA, mRNA and tRNA, structure and function. Types of RNA polymerases: prokaryotic and eukaryotic, Monocistronic and polycistronic RNA, structure of promoter, Brief idea of transcription in eukaryotes.	13
II	Structure and Processing of RNA transcript – Structure of primary RNA transcript. RNA splicing (introns, exons). Capping and polyadenylation. Differences in RNA processing between prokaryotes and eukaryotes.	10
III	Translation: Basic features of genetic code: Triplet code, deciphering of genetic code, degeneracy, characteristics of genetic code, variation in different organisms, universality, significance of genetic code. Central dogma, Basic steps of translation: basic apparatus, initiation, elongation, termination. Initiation, elongation and termination factors, Brief idea of translation in eukaryotes.	12
IV	Regulation in Prokaryotes and Eukaryotes – Introduction to gene regulation. Operon concept: lac operon– structure and regulation. Positive and negative control. Basic idea of regulation of gene expression in eukaryotes.	10
V*	PRACTICAL • Estimation of DNA using Diphenylamine Method. • Estimation of RNA using Orcinol Method • Estimation of Protein Using Lowry Method • Estimation of Protein Using Bradford Assay • Ninhydrin Assay for Amino Acids	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Watson, J. D., Baker, T. A., Bell, S. P., Gann, A., Levine, M., & Losick, R. (2008). *Molecular biology of the gene* (6th ed.). Cold Spring Harbor Laboratory Press, Pearson Education.
- Becker, W. M., Kleinsmith, L. J., Hardin, J., & Bertoni, G. P. (2009). *The world of the cell* (7th ed.). Pearson Benjamin Cummings.
- De Robertis, E. D. P., & De Robertis, E. M. F. (2006). *Cell and molecular biology* (8th ed.). Lippincott Williams & Wilkins.
- Karp, G. (2010). *Cell and molecular biology: Concepts and experiments* (6th ed.). John Wiley & Sons.
- Sambrook, J., & Russell, D. W. (2001). *Molecular cloning: A laboratory manual* (4th ed.). Cold Spring Harbor Laboratory Press.
- Krebs, J., Goldstein, E., & Kilpatrick, S. (2013). *Lewin's essential genes* (3rd ed.). Jones & Bartlett Learning.
- Gardner, E. J., Simmons, M. J., & Snustad, D. P. (2008). *Principles of genetics* (8th ed.). Wiley-India.

PLO CLO MAPPING of B23-IMB-504

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1	1.5	1	1	1.5	1
CLO2	1.5	1	2	1	1.5	1.5	1	1.5	1
CLO3	1	1	2	1	1.5	1.5	1	1.5	1.5
CLO4	1.5	1	1	1	1	1	1	1.5	1.5
CLO5	1	1	1	1	1	1	1	1.5	1.5

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	V		
Name of the Course	MICROBIAL PATHOGENESIS		
Course Code	B23-IMB-505		
Course Type:	<u>DSE-3</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Student will be able to understand the basics of classical molecular microbial pathogenicity. 2. Student will be able to understand the spread of microbes through body, their strategies and mechanism to cause the damage. 3. Students will understand the emergence of new infections as well as various methods of molecular microbial epidemiology. 4. Students will be able to understand the various mechanisms of antimicrobial resistance and new rapid diagnostic principles. 5. To impart practical knowledge of isolation culturing maintenance of food, agriculture and industrial microorganisms.		
CLO5 is related to practical component			
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B-Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Concept of pathogenesis; Differences between pathogens, commensals, and opportunistic microbes. Historical perspectives: Koch's and Molecular Koch's postulates; Microbial structures associated with virulence; Mechanisms of adhesion, colonization, and invasion. Toxins: Exotoxins (A-B toxins, superantigens) and endotoxins; Genetic regulation of virulence: pathogenicity islands	13
II	Entry routes: mucosal surfaces, vectors, wounds. Strategies for immune evasion (antigenic variation, secretion systems) Survival inside host cells (e.g., Mycobacterium, Salmonella) Host cell manipulation via effector proteins. Spread of microbes through the body. Biofilms, quorum sensing, and chronic infections; Impact on antibiotic resistance.	10
III	Host immune responses (TLRs, phagocytosis, antigen presentation); Cytokine signaling and inflammation; Pattern recognition receptors and danger signals. Immune escape via molecular mimicry; Host microbiome and infection outcomes; Genetic susceptibility to infections. Mechanisms of emergence of new pathogens.	10
IV	Diagnostic techniques: microscopy, culture, biochemical tests Molecular diagnostics: PCR, RT-PCR, BACTAC, Vitek Treatment strategies: antibiotics, antivirals, antifungals; Mechanisms of antimicrobial resistance. Vaccine design: live-attenuated vs. mRNA platforms; Herd immunity and vaccination strategies.	12
V*	PRACTICAL - To perform antibiotic susceptibility testing (Kirby-Bauer method) - To perform blood smear analysis and differential count - To study Hemolysis assay on blood agar plates - To perform Enzyme assays (e.g., coagulase, urease tests)	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.:5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam: NA	End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Carroll KC, Hobdon JA, Miller S, Morse SA, Mietzner TA. 27th edition. Jawetz, Melnick, & Adelberg's Medical Microbiology Lange Publication.
2. Edward DJ and Holt KE. Beginner's guide to comparative genome analysis using next generation sequence data. Microbial Informatics and Experimentation, 3:2, <https://doi.org/10.1186/2042-5783-3-2>.
3. Wilson BA, Salyers AA, Whitt DD and Winkler ME. Bacterial Pathogenesis: A molecular approach. 3rd edition. American Society for Microbiology Press, Washington, DC USA.
4. Locht C and Simonet M. Bacterial Pathogenesis: Molecular and Cellular Mechanisms. Caister Academic Press.
5. Persing DH, Tenover FC, Hayden R, Leven M, Miller MB, Nolte FS, Tang YW, Belkum AAV. Molecular Microbiology: Diagnostic Principles and Practice. 3rd edition. Washington, American Society for Microbiology Press.

PLO CLO MAPPING of B23-IMB-505

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1.5	1	1	1	1.5	1	1.5	1.5
CLO2	1.5	1	2	1	1	1.5	1	1.5	1
CLO3	1	1.5	2	1	1	1.5	1	1.5	1.5
CLO4	1.5	1	1	1	1	1.5	1	1.5	1
CLO5	1	1.5	1	1	1	1.5	1	1.5	1.5

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	V		
Name of the Course	INDUSTRIAL MICROBIOLOGY		
Course Code	B23- IMB- 506		
Course Type:	<u>DSE-3</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: CLO1: Understand microbial biotransformation and their industrial applications. CLO2: Describe industrial enzymes and methods of microbial/enzymatic immobilization. CLO3: Explain microbial production of bioplastics, biofuels, biofertilizers, and biopesticides. CLO4: Understand contamination sources and quality control in microbial industries. CLO5: Perform basic industrial microbiology experiments related to the course.		
CLO5 is related to practical component			
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions			

from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Microbial Biotransformations – Concept and scope of biotransformations. Types: oxidation, reduction, hydrolysis, isomerization. Microbial synthesis of steroids and value-added products. Role of whole cells and isolated enzymes in biocatalysis.	13
II	Industrial Enzymes and Immobilization Technology – Overview of industrial enzymes: amylase, protease, cellulase. Methods of immobilization: adsorption, entrapment, covalent binding. Applications of immobilized enzymes and microbes in food and detergent industries.	12
III	Microbial Products and Industrial Applications –elementary idea of production and applications of Biofertilizers, Biofuels, Fermented foods like yogurt, solvents like ethyl alcohol.	10
IV	Contamination Control and Quality Assurance in Industries – Common microbial contaminants in industrial setups. Sources and detection of contamination. Methods for control: sterilization, filtration, aseptic techniques. Concepts of GMP, GLP, and QA/QC in industrial microbiology.	10
V*	PRACTICAL - To check whether bacteria produce amylase to break down starch. - To observe gas (CO₂) formation from sugar by yeast. - To observe starch breakdown using saliva. - To make curd using milk and starter culture.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.:5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam: NA		End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Patel, A. H. (1996). *Industrial microbiology* (1st ed.). Macmillan India Limited.
- Okafor, N. (2007). *Modern industrial microbiology and biotechnology* (1st ed.). BIOS Scientific Publishers.
- Waite, M. J., Morgan, N. L., Rockey, J. S., & Highton, G. (2001). *Industrial microbiology: An introduction* (1st ed.). Wiley-Blackwell.
- Glaze, A. N., & Nikaido, H. (1995). *Microbial biotechnology: Fundamentals of applied microbiology* (1st ed.). W. H. Freeman and Company.
- Casida, L. E. (1991). *Industrial microbiology* (1st ed.). Wiley Eastern Limited.
- Crueger, W., & Crueger, A. (2000). *Biotechnology: A textbook of industrial microbiology* (2nd ed.). Panima Publishing Co.
- Stanbury, P. F., Whitaker, A., & Hall, S. J. (2006). *Principles of fermentation technology* (2nd ed.). Elsevier Science.

PLO CLO MAPPING of B23-IMB-506

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1	1.5	1	1	1.5	1
CLO2	1.5	1	2	1	1.5	1.5	1	1.5	1
CLO3	1	1	2	1	1.5	1.5	1	1.5	1.5
CLO4	1.5	1	1	1	1	1	1	1.5	1.5
CLO5	1	1	1	1	1	1	1	1.5	1.5

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	VI		
Name of the Course	INSTRUMENTATION AND BIOTECHNIQUES		
Course Code	B23-IMB-601		
Course Type:	<u>CC-6/MCC-11</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes(CLO): CLO5 is related to practical component	After completing this course, the learner will be able to: 1. To acquaint with History and Scope of microorganisms 2. To give theoretical knowledge of isolation and growth of microorganisms 3. To impart knowledge of maintenance of cultures and sterilization techniques 4. <u>To give detailed knowledge about structure of bacteria</u> 5. To impart practical knowledge of isolation culturing maintenance, Sterilization and staining of microorganisms		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question			

from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Laboratory Instruments and Their Principles – pH meter, colorimeter, centrifuge (types and applications), autoclave, laminar airflow, incubator, and hot air oven. Concepts of calibration and safety precautions in labs.	10
II	Microscopy and Sterilization Techniques – Working and applications of light microscope, phase contrast, fluorescence microscope. Sterilization methods: dry heat, moist heat, filtration, radiation, and chemical sterilant. Concept of disinfection vs sterilization.	12
III	Chromatography Techniques – Principles and applications of paper chromatography, thin-layer chromatography (TLC), column chromatography, ion-exchange chromatography, and gel filtration. Overview of HPLC and gas chromatography.	10
IV	Electrophoretic and Spectroscopic Techniques – Principle of electrophoresis; types – agarose gel and SDS-PAGE. Introduction to spectrophotometry: Beer-Lambert law. Absorption vs fluorescence. Instrumentation and applications. UV visible spectroscopy.	10
V*	PRACTICAL 1. To learn how to operate and calibrate a digital pH meter. 2. To determine absorbance and concentration of a colored solution. 3. Separation of components of a given mixture using a laboratory scale centrifuge. 4. Separation of mixtures by paper / thin layer chromatography 5. To separate DNA using agarose gel electrophoresis. 6. Separation of protein mixtures by Polyacrylamide Gel Electrophoresis (PAGE)	30
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 > Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Cooper, G. M., & Hausman, R. E. (2009). *The cell: A molecular approach* (5th ed.). ASM Press; Sinauer Associates.
2. De Robertis, E. D. P., & De Robertis, E. M. F. (2006). *Cell and molecular biology* (8th ed.). Lippincott Williams & Wilkins.
3. Karp, G. (2010). *Cell and molecular biology: Concepts and experiments* (6th ed.). John Wiley & Sons.
4. Nelson, D. L., & Cox, M. M. (2008). *Lehninger principles of biochemistry* (5th ed.). W. H. Freeman and Company.
5. Nigam, A., & Ayyagari, A. (2007). *Lab manual in biochemistry, immunology and biotechnology*. Tata McGraw-Hill.
6. Wilson, K., & Walker, J. (2010). *Principles and techniques of biochemistry and molecular biology* (7th ed.). Cambridge University Press.
7. Willey, M. J., Sherwood, L. M., & Woolverton, C. J. (2013). *Prescott, Harley and Klein's microbiology* (9th ed.). McGraw-Hill.

PLO CLO MAPPING of B23-IMB-601

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1.5	1	1	1	1.5	1.5
CLO2	1.5	1	2	1	1.5	1.5	1	1.5	1
CLO3	1	1	2	1.5	1	1.5	1	1.5	1.5
CLO4	1.5	1	1	1	1.5	1	1	1.5	1
CLO5	1	1	1	1.5	1	1	1	1.5	1.5

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	VI		
Name of the Course	MEDICAL MICROBIOLOGY		
Course Code	B23-IMB-602		
Course Type:	<u>MCC-12</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. understood the diverse nature of the normal microflora of the body and its significance as well as mode of infections. 2. gain in depth knowledge about the spectrum of diseases caused by bacterial pathogens, and an understanding of the course of disease development 3. become acquainted with the spectrum of diseases caused by viral pathogens. 4. understand the causation of fungal and protozoal diseases and methods of prevention and control. 5. learnt basic concepts of handling clinical specimens and approaches used to aid in detection/diagnosis of diseases		
CLO5 is related to practical component			
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B-Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Significance of Microbiology in Medicine, Classification of medically important microbes, Normal microbial flora of the human body: normal flora of skin, eye, throat, gastrointestinal tract and urogenital tract. Infections- Sources, types – opportunistic, nosocomial and community acquired infections. Mode of transmission, carriers and their types. sepsis and septic shock	10
II	Human diseases caused by bacterial pathogens: List of diseases of various organ systems and their causative agents. Symptoms, mode of transmission, prophylaxis and control of the following diseases: Respiratory diseases- caused by <i>Streptococcus pyogenes</i> , <i>Haemophilus influenzae</i> , <i>Mycobacterium tuberculosis</i> . Gastrointestinal diseases – caused by <i>Escherichia coli</i> , <i>Salmonella typhi</i> , <i>Vibrio cholerae</i> , <i>Helicobacter pylori</i>	13
III	Human diseases caused by viral pathogens: Symptoms, mode of transmission, prophylaxis and control of the following- Polio, Herpes, Hepatitis, Rabies, Dengue, AIDS, Influenza (swine flu and bird flu), Ebola, Chikungunya, Japanese Encephalitis, Rota virus, Zika.	10
IV	Human diseases caused by protozoan and fungal pathogens: Malaria, Kala-azar – causes, symptoms, diagnosis and treatments. Brief description of the following types of mycoses and one representative disease in detail: Cutaneous mycoses- Tinea pedis (Athlete's foot). Systemic mycoses, Histoplasmosis. Opportunistic mycoses - Candidiasis	12
V*	PRACTICAL - Study of bacterial flora of skin by swab method. - Study of composition and use of important differential media for identification of bacteria: EMB Agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS - Study of various stages of Malarial parasite in RBCs and Leishmania using permanent mounts/photomicrographs. - Identify bacteria, on the basis of cultural, morphological and biochemical characteristics: IMViC, TSI, nitrate reduction, urease and catalase tests.	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.:5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam: NA	End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Ananthanarayan, R. and Paniker, C.K.J. (2017). Textbook of Microbiology. 10th edition. Universities Press, India.
2. Carroll, K.C., Morse, S.A., Mietzner, T.A. and Miller, S. (2016). Jawetz, Melnick and Adelberg's Medical Microbiology. 27th edition. McGraw Hill Education.
3. Madigan, M.T. and Martinko, J.M. (2017). Brock Biology of Microorganisms. 15th edition. Prentice Hall International Inc., USA.
4. Tortora, G.J., Funke, B.R., Case, D., Weber, D. and Bair, W. (2019). Microbiology: An Introduction. 13th edition. Pearson Education, USA.
5. Willey, J. M., Sandman, K. and Wood, D. (2019). Prescott's Microbiology. 11th edition. McGraw Hill Higher Education, USA.

PLO CLO MAPPING of B23-IMB-602

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1.5	1	1	1	1.5	1	1.5	1.5
CLO2	1.5	1	2	1	1	1.5	1	1.5	1
CLO3	1	1.5	2	1	1	1.5	1	1.5	1.5
CLO4	1.5	1	1	1	1	1.5	1	1.5	1
CLO5	1	1.5	1	1	1	1.5	1	1.5	1.5

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	VI		
Name of the Course	BIOFERTILIZERS AND BIOPESTICIDES		
Course Code	B23- IMB- 603		
Course Type:	<u>DSE-4</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: CLO1: Understand microbial biotransformation and their industrial applications. CLO2: Describe industrial enzymes and methods of microbial/enzymatic immobilization. CLO3: Explain microbial production of bioplastics, biofuels, biofertilizers, and biopesticides. CLO4: Understand contamination sources and quality control in microbial industries. CLO5: Perform basic industrial microbiology experiments related to the course.		
CLO5 is related to practical component			
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions			

from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Biofertilizers – Definition, need, and importance. Classification of biofertilizers: nitrogen-fixing, phosphate-solubilizing, and potassium-mobilizing microbes. Types of associations – free-living, symbiotic, associative. Examples: <i>Rhizobium</i> , <i>Azotobacter</i> , <i>Azospirillum</i> , <i>Frankia</i> , cyanobacteria.	13
II	Mechanism of Biofertilizer Action – Nitrogen fixation (symbiotic and asymbiotic), phosphate solubilization, siderophore production, phytohormone production (IAA, gibberellins), role in plant stress tolerance and growth promotion.	12
III	Biopesticides – Introduction and Classification – Types of biopesticides: bacterial (e.g., <i>Bacillus thuringiensis</i>), fungal (e.g., <i>Trichoderma</i>), viral (NPV), and botanical-based products. Mode of action of biopesticides.	10
IV	Production and Application – Mass production of biofertilizers and biopesticides: culture selection, carrier materials, formulation, quality control standards. Storage and application techniques: seed treatment, soil application.	10
V*	PRACTICAL - Isolation of <i>Rhizobium</i> from Root Nodules - Phosphate Solubilization by Soil Microorganisms on Pikovskaya's Agar - Isolation of Free-Living Nitrogen Fixing Bacteria (<i>Azotobacter</i>) from Soil - Detection of Indole Acetic Acid (IAA) Production by PGPR - Siderophore Production Assay using Chrome Azurol S (CAS) Medium - Dual Culture Technique to Test Antagonistic Activity of <i>Trichoderma</i> spp. - Viability Testing of Biofertilizer Formulation (CFU Counting)	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.:5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam: NA		End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Aggarwal, S. K. (2005). *Advanced environmental biotechnology*. APH Publishing.
- Kannaiyan, S. (2003). *Biotechnology of biofertilizers*. CHIPS.
- Rai, M. K. (2005). *Handbook of microbial biofertilizers*. The Haworth Press.
- Reddy, S. M., & Others. (2002). *Bioinoculants for sustainable agriculture and forestry*. Scientific Publishers.
- Saleem, F., & Shakoori, A. R. (2012). *Development of bioinsecticide*. LAP Lambert Academic Publishing GmbH KG.
- Subba Rao, N. S. (1995). *Soil microorganisms and plant growth*. Oxford and IBH Publishing Co. Pvt. Ltd.

PLO CLO MAPPING of B23-IMB-603

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1	1.5	1	1	1.5	1
CLO2	1.5	1	2	1	1.5	1.5	1	1.5	1
CLO3	1	1	2	1	1.5	1.5	1	1.5	1.5
CLO4	1.5	1	1	1	1	1	1	1.5	1.5
CLO5	1	1	1	1	1	1	1	1.5	1.5

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	VI		
Name of the Course	GENETIC ENGINEERING		
Course Code	B23- IMB- 604		
Course Type:	<u>DSE-4</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes(CLO): CLO5 is related to practical component	After completing this course, the learner will be able to: Understand the principles and tools of genetic engineering. Explain various cloning strategies and expression systems. Describe the use of vectors and host organisms in gene manipulation. Gain insight into genome editing techniques like CRISPR-Cas9. Perform basic genetic engineering experiments such as transformation and screening.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions			

from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.

Unit	Topics	Contact Hours
I	Tools of Genetic Engineering – Restriction endonucleases, DNA ligases, alkaline phosphatase, reverse transcriptase. Characteristics of ideal cloning vectors: plasmids (pUC18), cosmids, phagemids, BACs, YACs..	12
II	Cloning Strategies – Gene cloning steps: DNA isolation, cutting, ligation, transformation, and selection. Different strategies for identification of recombinants. DNA libraries: genomic and cDNA libraries,	12
III	Conventional sequencing methods: Sanger sequencing, Maxam-Gilbert sequencing. Expression of Cloned Genes – Prokaryotic and eukaryotic expression vectors. Expression cassette: Promoters, terminators, reporter genes and their regulation.	10
IV	Genome Editing Technologies: Site-directed mutagenesis and protein engineering. RNA interference, Applications in medicine, agriculture, and industry. Bioethics in genetic research and therapy.	10
V*	PRACTICAL 1. Preparation of competent cells for transformation. 2. 1. Isolation of Genomic DNA 3. Quantification of DNA and RNA 4. Extraction of plasmid DNA using alkaline lysis method. 5. Transformation of <i>E. coli</i> with plasmid DNA 6. Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis.	30

Suggested Evaluation Methods

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Brown, T. A. (2007). *Genomes 3*. Garland Science.
- Brown, T. A. (2010). *Gene cloning and DNA analysis* (6th ed.). Blackwell Publishing.
- Clark, D. P., & Pazdernik, N. J. (2009). *Biotechnology: Applying the genetic revolution*. Elsevier Academic Press.
- Primrose, S. B., & Twyman, R. M. (2006). *Principles of gene manipulation and genomics* (7th ed.). Blackwell Publishing.
- Primrose, S. B., & Twyman, R. M. (2008). *Genomics: Applications in human biology*. Blackwell Publishing.
- Sambrook, J., & Russell, D. (2001). *Molecular cloning: A laboratory manual* (3rd ed.). Cold Spring Harbor Laboratory Press.
- Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2008). *Prescott, Harley and Klein's microbiology*. McGraw-Hill Higher Education.

PLO CLO MAPPING of B23-IMB-604

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1	1.5	1	1	1.5	1
CLO2	1.5	1	2	1	1.5	1.5	1	1.5	1
CLO3	1	1	2	1	1.5	1.5	1	1.5	1.5
CLO4	1.5	1	1	1	1	1	1	1.5	1.5
CLO5	1	1	1	1	1	1	1	1.5	1.5

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	VI		
Name of the Course	BIOSAFETY AND IPR		
Course Code	B23-IMB-605		
Course Type:	<u>DSE-5</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Get an insight into Biosafety guidelines and to Analyze and Manage the Risks involved with GMOs 2. Understand the International Agreements and Regulations with respect to Biosafety. 3. Gain Knowledge about Intellectual Property Rights to protect biological inventions. 4. Understand process of filing a patent, about different treaties, rights and duties of Patent owner. 5. Understand the Process involved in Patenting, Patent Search and the protocols for ethical permissions and procedures.		
CLO5 is related to practical component			
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Introduction, biosafety issues; Biological Safety Cabinets & their types; Primary Containment for Biohazards; Biosafety Levels of Specific Microorganisms. Biosafety Guidelines: Biosafety guidelines and regulations (National and International); GMOs/LMOs- Concerns and Challenges; Role of Institutional Biosafety Committees (IBSC), RCGM, GEAC etc. for GMO applications in food and agriculture;	10
II	National regulatory bodies, Biosafety of Genetically engineered products, Genetically engineered products and recombinant DNA technology, Risk assessment of RDT products, Regulating recombinant DNA technology, Web based information of biosafety on GMO, Biosafety database. Good Laboratory biosafety practices and Importance of good laboratory practices.	12
III	Introduction to Intellectual Property and History. Patents, Trademarks, Copyright, Trade secrets, Industrial Design and Rights, Traditional Knowledge, Geographical Indications - importance of IPR – patentable and non patentable – patenting life – legal protection of biotechnological inventions – World Intellectual Property Rights Organization (WIPO), Ethics, Pros and Cons of IP protection.	10
IV	Types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition; An introduction to Patent Filing Procedures; Patent licensing and agreement; Patent infringement- meaning, scope, litigation, case studies, Rights and Duties of patent owner. Agreements and Treaties: GATT, TRIPS Agreements; WIPO Treaties; Budapest Treaty on international recognition of the deposit of microorganisms; UPOV & Brene conventions; Patent Co-operation Treaty (PCT); Indian Patent Act 1970 & recent amendments. Patenting Living Organisms	13
V*	PRACTICAL - Understanding the Structure and working of Biosafety committees. - Case studies of different types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition - Study of Biotechnology and Patent laws: patenting living beings, Patents for Chemicals, Pharmaceuticals. - To operate Biosafety cabinets and understand GLP- Good Laboratory biosafety Practices. - Case studies on the patent infringements and revocations. - Searching of Patent databases a. Indian Patent office b. USPTO c. WIPO	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.:5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam: NA	End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Shomini Parashar, Deepa Goel IPR, Biosafety and Bioethics Pearson India 2013.
2. Diane O. Fleming, Debra L. Hunt Biological Safety: Principles and Practices, 4th Edition. ASM 2006
3. Singh, I. and Kaur, B., Patent law and Entrepreneurship, Kalyani Publishers (2006).
4. Essentials of Intellectual Property: Law, Economics, and Strategy By Alexander I. Poltorak; Paul J. Lerner Wiley, 2011 (2nd edition).

PLO CLO MAPPING of B23-IMB-605

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1	1	1	1	1.5	1
CLO2	1.5	1	2	1	1	1.5	1	1.5	1
CLO3	1	1	2	1.5	1.5	1.5	1	1.5	1
CLO4	1.5	1	2	1.5	1.5	1	1	1.5	1
CLO5	1	1	2	1.5	1.5	1	1	1.5	1

Session: 2025-26			
Part A - Introduction			
Subject	INDUSTRIAL MICROBIOLOGY		
Semester	VI		
Name of the Course	BASICS OF BIOINFORMATICS		
Course Code	B23-IMB-606		
Course Type:	<u>DSE-5</u>		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. understand the basics of bioinformatics like file formats, databases, etc. 2. understand the basic alignments tools like BLAST, PAM, etc 3. understand the different types multiple sequence alignment tools for analysis and will get to know about the basics of genome and transcriptome. 4. Students will be able to understand the various methods of phylogenetic analysis. 5. different protein database and protein modeling tools and to do sequence alignments using BLAST and able to construct phylogenetic tree.		
CLO5 is related to practical component			
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Exam Duration	3 hours	4 hours	
Maximum Marks 100			
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Introduction, overview and needs of bioinformatics technology. Biological databases – nucleic acid, genome, protein sequence and structure, gene expression databases, Database of metabolic pathways, SNP, chemical, metabolic pathways, signalling pathways, general human genetics, cancer gene. Mode of data storage - File formats - FASTA, Genbank and Uniprot, Data submission & retrieval from NCBI, EMBL, DDBJ, Uniprot, PDB.	10
II	Introduction to sequence alignment and its applications. Pair wise sequence alignment: Concept of global and local alignment, Dot Plot, algorithm for pair wise sequence alignment (Needleman Wunsch, Smith-watterman methods). Introduction to BLAST: types of BLAST, algorithm of BLAST and interpretation of its result. Substitution matrices: Introduction to substitution matrices: PAM and BLOSUM matrices, concept of log odd ratio.	12
III	Multiple sequence alignment: Methods of multiple sequence alignment, Tools of MSA– ClustalW, TCOFFEE; Position specific scoring matrices, introduction to consensus sequences, motifs and profiles. Significance of alignments: E value, Scores Diversity of Genomes: Viral, prokaryotic & eukaryotic genomes.	10
IV	Phylogenetic Analysis: Introduction to phylogenetic analysis and its application. Types of phylogenetic trees, Different approaches of phylogenetic tree construction - UPGMA, Neighbour joining, Maximum Parsimony, Maximum likelihood. Genome Annotation: Concept of genome annotation, methods of gene identification. Tools of gene identification: GenScan, Grail, GeneID and Glimmer.	13
V*	PRACTICAL • Introduction to various protein databases. • To perform protein modeling using SWISS-MODEL. • Visualization of 3D structures of proteins. • Sequence retrieval using BLAST. • Sequence alignment & phylogenetic analysis using clustal omega & phylip. • To analyze the given 16sRNA sequences by using BLAST and construct a phylogenetic tree based on the comparison results	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: Theory -50 Written Exam Practical-20 Demonstration/Viva-voce/Lab records

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Baxevanis AD, Ouellette BFF. Bioinformatics: A practical guide to the analysis of genes and proteins (John Wiley and Sons).
2. Rastogi S.C., Mendiratta N. and Rastogi P. Bioinformatics: methods and applications, genomics, proteomics and drug discovery, 2nd ed. Prentice Hall India Publication
3. Lesk M.A. Introduction to Bioinformatics. Oxford Publication, 3rd International Student Edition
4. Primrose and Twyman. Principles of Genome Analysis & Genomics. Blackwell 5. Attwood TK & Parry-Smith DJ. Introduction to Bioinformatics. Pearson Edu.

PLO CLO MAPPING of B23-IMB-606

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	1	1	1	1	1	1	1	1.5	1
CLO2	1.5	1	2	1	1	1.5	1	1.5	1
CLO3	1	1	2	1.5	1.5	1.5	1	1.5	1
CLO4	1.5	1	2	1.5	1.5	1	1	1.5	1
CLO5	1	1	2	1.5	1.5	1	1	1.5	1

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

(“A++” Grade, NAAC Accredited)



Syllabus for Under-Graduate Programme

**Course: Bachelor of Vocation in Medical
Laboratory Technology
(Semester 5th and 6th)**

**Under Multiple Entry-Exit, Internship and
CBCS-LOCF in accordance to NEP-2020
With effect from the session 2025-26**

Session:2025-26			
Part A-Introduction			
Subject	Bachelor of Vocation in Medical Laboratory Technology		
Semester	V		
Name of the Course	Biochemistry–V		
Course Code	B23-MLT-501		
Course Type:	CC-A5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO): CLO5 is based on practical component	After completing this course, the learner will be able to: 1. Demonstrate the knowledge of structure, function and inter-relationship of bio molecules. 2. Understand the integration of various aspects of metabolism andtheir regulatory pathways. 3. Know about the apparatus and reagents used in analytical and diagnostic section of biochemistry. 4. Teach about the concept of quality control. 5*. Gain knowledge of handling of sophisticated instruments for performing various tests.		
Credits	Theory	Practical	Total
	03	01	04
Contact Hours	03	02	05
Max.Marks:100 Internal Assessment Marks:30 (Theory 20+ Practical 10) End Term Exam Marks: 70 (Theory 50 + Practical 20)		Exam duration: Theory:3 Hours Practical:4 hours	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Qualitative analysis of urine for physical and chemical constituents i.e. sugar, proteins, bile salts, bile pigments, ketone bodies, porphobilinogen, faecal occult blood.	10
II	Chemical analysis of body fluids i.e. Cerebrospinal fluid (CSF), pleural fluid, Ascitic fluid. Collection and recording of biological specimens, separation of serum plasma, preservation and disposal of biological samples material. Volumetric analysis - Preparation of standard acid and base solutions.	12
III	Qualitative tests of inorganic urinary ingredients : Chlorides, Phosphates, sulphur compounds, sodium (Na), Potassium (K), Calcium (Ca) and Magnesium (Mg) and their clinical significance.	10
IV	Pathological changes in composition of body fluids and their clinical co-relation. Nosocomial infections and sterility testing of I/V fluids and processing of various samples for hospital infections. Basic statistics (mean, median, mode, standard deviation (SD), coefficient of variation (CV), normal distribution, probability, t-test, chi-square test), normal and reference range.	13
V*	PRACTICAL - Collection and Processing of Laboratory Specimens. - Urine examination: Physical, Chemical, Microscopic and Biochemical (Organic and Inorganic). - Stool examination - Chemical examination of other body fluids : Cerebrospinal fluid (CSF), Pleural fluid, Ascitic fluid. - Volumetric analysis - Preparation of standard acid solutions. - Preparation of standard basic solutions. - Titration of a mixture of a strong and a weak acid. - Titration of a mixture of a strong acid and strong base. - Titration of a mixture of a weak acid and strong base. - Preparation of quality control charts (Standard Deviation (SD), Coefficient of variation (CV) etc.) - Interpretation of quality control charts.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record etc.: 10 • Mid-Term Exam: NA		End Term Examination: Theory: 50 (Written exam) Practical: 20 (Seminar/ Demonstration/ Viva-voce/Lab records etc)

Part C- Learning Resources

Recommended Books/e-resources/LMS:

1. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
2. Essentials of Biochemistry, Second Edition, Dr.(Prof)Satyanarayana
3. Essentials of Biochemistry, 2nd Edition, Dr. PankajaNaik
4. Principles and Techniques of Biochemistry and Molecular Biology, 5Th Edition, Wilson & Walker

PLOCLO Mapping of B23-MLT-501

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	1.5	1.0	1.0	1.5	0.5	0
CLO2	1.5	1.0	1.0	2.0	1.0	0
CLO3	2.0	2.0	2.0	1.5	1.5	0
CLO4	2.0	2.0	2.0	0	1.0	0
CLO5	2.0	2.0	0.5	0	0	0

Session:2025-26			
Part A-Introduction			
Subject	Bachelor of Vocation in Medical Laboratory Technology		
Semester	V		
Name of the Course	Microbiology–V		
Course Code	B23-MLT-502		
Course Type:	CC-B5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. To know the basics of microbiology and knowledge about the contributions of microbiologists. 2. Identify the microorganisms and the disease process as well as aseptic and sterile techniques. 3. Impart general insight into the history, bacterial genetics and serology. 4. Provide knowledge about the equipment used in microbiology and safety precautions. 5*. Handle the instruments and know about the sterilization techniques.		
Credits	Theory	Practical	Total
	03	01	04
Contact Hours	03	02	05
Max.Marks:100 Internal Assessment Marks: 30(Theory 20 + Practical 10) End Term Exam Marks: 70 (Theory 50 + Practical 20)		Exam duration: Theory : 3 Hours Practical : 4 hours	
Part B-Contents of the Course			
Instructions for Paper-Setter: Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. There maining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q. No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Bacteriological examination of water, milk, food and air; Toxin-antitoxin assays and pathogenicity tests; Epidemiological markers of microorganisms - serotyping Bacteriophage and Bacteriocin typing methods	10
II	Food poisoning (food intoxication and food infection) Bacterial food poisoning (Botulism, <i>Staphylococcus</i> and <i>Escherichia coli</i>), fungal food poisoning (<i>Aspergillus</i> , <i>Penicillium</i> and <i>Claviceps</i>)	10
III	Lab diagnosis of common bacterial infection viz : Pyogenic infections, Respiratory tract infections: Meningitis, Diphtheria, Whooping cough, Gas gangrene, Food-poisoning, Enteric fever, Acute diarrhoeal diseases, Cholera Urinary tract infection, Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, Syphilis, Gonorrhoea.	12
IV	Lab diagnosis of fungal infections viz: superficial dermatophyte fungal infections, candidiasis, cryptococcosis pulmonary infections, mycetoma, other deep mycotic infections and subcutaneous fungal infections. Sporotrichosis, Chromoblastomycosis, Eye and Ear fungi infections.	13
V*	PRACTICALS 1. Determination of Biological oxygen demand (BOD) of water. 2. Determination of Chemical oxygen demand (COD) of water. 3. Demonstration of antibiotic sensitivity test. 4. Lab diagnosis of common bacterial infections 5. Lab diagnosis of common fungal infections. 6. Study of bacterial and fungal food poisoning.	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation:5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record etc.:10 • Mid-Term Exam: NA	End Term Examination: Theory: 50 (Written exam) Practical: 20 (Seminar/ Demonstration/Viva-voce/Lab records etc)
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Text Book of Microbiology for Nursing Students, Anant Narayan Panikar 2. Text Book of Ophthalmology, Khurana 3. Text Book of Microbiology, Baveja.	

PLOCLO Mapping of B23-MLT-502						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	0.2	0.2	0	0.5	0.5	0
CLO2	1.5	0	1.0	1.0	1.5	0.5
CLO3	0.4	0.2	0.5	1.5	0.5	0.5
CLO4	1.0	0.2	0.5	0	1.0	1.5
CLO5	1.5	2.0	2.0	0	1.5	1.5

Session:2025-26			
Part A-Introduction			
Subject	Bachelor of Vocation in Medical Laboratory Technology		
Semester	V		
Name of the Course	Pathology–V		
Course Code	B23-MLT-503		
Course Type:	CC-C5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Learn about histopathology, classification of tissues andtheir functions. 2. Impart awareness about the biopsy techniques. 3. Gain knowledge about the atopsy Techniques. 4. Use of various equipments for histology. 5*. Study of laboratory organization related to histology and cytology.		
CLO5 is based on practical component			
Credits	Theory	Practical	Total
	03	01	04
Contact Hours	03	02	05
Max.Marks:100 Internal Assessment Marks:30 (Theory20+Practical10) End Term Exam Marks: 70 (Theory 50 + Practical 20)		Exam duration: Theory:3 Hours Practical:4 hours	
Part B-Contents of the Course			
<u>Instructions for Paper-Setter:</u> Nine questions will be set in all. Question No.1comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Micro-organisms in the tissues-various staining techniques for their demonstration and identification; Examination of body fluids - peritoneal and pericardial fluid, bronchoalveolar lavage fluid, hydatid cyst fluid and Joint fluid.	13
II	Nucleic acids, DNA and RNA special stains and procedures; Tissues requiring special treatment i.e. eye ball, Endometrial biopsy, under calcified bone; Examination of semen - physical characters, count, motility, viability and morphology.	12
III	Autopsy Techniques; Neuropathological Techniques; Immunohistochemistry demonstration; Special microscopy-various types, Electron microscope, ultramicrotomy	10
IV	Museum techniques, microphotography and other display material, teaching material development; Enzyme histochemistry, demonstration of phosphatases, dehydrogenases, oxidases and peroxidases; Transportation of different clinical materials to distant laboratories.	10
V*	PRACTICALS 1. To study the process of laboratory diagnosis of : (a) Peritoneal and pericardial fluid (b) Bronchoalveolar lavage fluid (c) Hydatid cyst fluid (d) Joint fluid (e) Semen analysis 2. Isolation of chromosomal DNA from plant or bacteria or animal tissues. 3. Estimation of DNA by DPA method (Diphenylamine method) 4. Estimation of RNA by orcinol method. 5. Clinical enzymology and determination of transaminases, phosphatases, dehydrogenases and oxidases. 6. Simple assays for cell mediated immunity.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab record etc.: 10 - Mid-Term Exam: NA		End Term Examination: Theory: 50 (Written exam) Practical: 20 (Seminar/ Demonstration/Viva-voce/Lab records etc)

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by Praful Ghodkar
2. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar
3. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
4. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee

PLOCLO Mapping of B23-MLT-503

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	0	1.0	1.0	1.5	1.0	0.5
CLO2	1.0	1.0	3.0	0.3	1.5	0.5
CLO3	0.5	1.5	1.0	1.5	1.5	1.5
CLO4	1.0	2.0	1.0	0	1.5	1.5
CLO5	1.5	2.5	1.5	0	1.5	1.5

Session:2025-26			
Part A–Introduction			
Subject	Bachelor of Vocation in Medical Laboratory Technology		
Semester	VI		
Name of the Course	Biochemistry–VI		
Course Code	B23-MLT-601		
Course Type:	CC-A6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Provide a good theoretical and practical education in understanding activity of enzymes. 2. Understand the organization of a clinical laboratory including lab information system, autoanalyzers in laboratory for qualitative analysis. 3. Introduce various body fluids with their biochemical composition and regulatory mechanism in blood pH. 4. To provide knowledge about various body fluids with their importance in diagnosis of different diseases and toxicology. 5*. Provide skills for accurate results as well as calibrate different laboratory instruments.		
CLO5 is based on practical component			
Credits	Theory	Practical	Total
	03	01	04
Contact Hours	03	02	05
Max.Marks:100 Internal Assessment Marks: 30 (Theory20+Practical10) End Term Exam Marks: 70 (Theory 50 + Practical 20)		Exam duration: Theory:3 Hours Practical:4 hours	
Part B- Contents of the Course			
Instructions for Paper-Setter: Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Principles of enzyme activity determination. Units for expressing enzyme activity. Factors affecting enzyme activity, Mechanisms responsible for abnormal enzyme levels. Isoenzymes - creatine phosphokinase (CPK), creatine kinase (CK), Serum glutamic oxaloacetic transaminase (SGOT), and lactate dehydrogenase (LDH); serum glutamic pyruvic transaminase (SGPT).	10
II	Cholinesterase HBDH, amylase, alpha amylase, lipase, aldolase and myoglobin. Serum leucine, amino peptidase, alkaline and acid phosphatases, lactate dehydrogenase, creatine phosphokinase (CPK), Fructosamine test in semen. Analysis of renal biliary and prostatic stones, Tests of foetal well being by amniotic fluid, Analysis for alpha - foetoprotein and their clinical significance.	13
III	Gastric analysis, free and total acidity, pentagastrin test, histamine and caffeine stimulation tests; Thyroid function test : triiodothyronine T3, prohormone of T3 (T4), <i>thyroid-stimulating hormone</i> (TSH), Free T3, Free T4, protein bound iodine (PBI) and thyroglobulin; Infertility profile : TSH, Follicle stimulating hormone (FSH), <i>Luteinizing hormone LH</i> , Testosterone, estrogen, prolactin and Dehydroepiandrosterone (DHEA) sulphate.	12
IV	Toxicology : Alcohol, heavy metals (Zinc, Mercury etc.) salicylates, drug abuse, screening and drug interference with laboratory findings. Endocrinology : Estimation of growth hormone, Adrenocorticotrophic hormone (ACTH), sex hormone binding globulin, Aldosterone, parathormon, cortisol and 17 - hydroxyprogesteron and their clinical significance.	10
V*	PRACTICALS - The study of progress curve obtained during the hydrolysis of p-nitrophenyl phosphate by serum alkaline phosphatase. - To study the variation of serum alkaline phosphatase activity with enzyme concentration. - The study of effect of temperature on the activity of alpha-amylase. - The study of thyroid function tests and infertility tests. - Estimation of : - Cortisol - Progesterone - Testosterone <i>Creatine kinase</i> NAC (CK-NAC) <i>Creatine kinase</i> MB (CK-MB) - Creatine phosphokinase (CPK) - Serum glutamic oxaloacetic transaminase (SGOT) - Serum glutamic pyruvic transaminase (SGPT)	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record etc.: 10 • Mid-Term Exam: NA	End Term Examination: Theory: 50 (Written exam) Practical: 20 (Seminar/ Demonstration/ Viva- voce/Lab records etc)

Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Essentials of Biochemistry, Second Edition, Dr.(Prof) Satyanarayana 2. Essentials of Biochemistry, 2nd Edition, Dr. Pankaja Naik 3. Principles and Techniques of Biochemistry and Molecular Biology, 5Th Edition, Wilson & Walker 4. An Introduction to Chemistry, 8th Edition by Mark Bishop 5. Clinical Chemistry made easy, 1st Edition by Hughes Tietz Fundamentals of Clinical Chemistry, 7th Edition by Carl Burtis	

PLOCLO Mapping of B23-MLT-601						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	1.5	1.0	0.5	2.0	1.0	1.5
CLO2	1.5	2.0	2.0	0.5	2.0	2.0
CLO3	1.5	1.0	1.0	0.6	2.0	2.0
CLO4	2.0	1.0	2.0	0.3	2.7	2.0
CLO5	2.5	2.0	1.0	0.2	2.0	2.5

Session:2025-26			
Part A-Introduction			
Subject	Bachelor of Vocation in Medical Laboratory Technology		
Semester	VI		
Name of the Course	Microbiology–VI		
Course Code	B23-MLT-602		
Course Type:	CC-B6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Know the occurrence, spread and control of pathogen infections. 2. Provide information about bacterial culture procedures, staining procedures and bio-chemical tests for identification of bacteria. 3. Know the occurrence, spread and control of mycological infections, culture methods required to perform micro-biological tests. 4. To learn general characters, life cycle and laboratory diagnosis of various medically important protozoans. 5*. To train the students with knowledge of medically significant isolates in mycology, parasitology, isolation methods and treatments.		
CLO5 is based on practical component	Credits	Theory	Practical
		03	01
Contact Hours		03	02
Max.Marks:100 Internal Assessment Marks:30(Theory20+Practical10) End Term Exam Marks: 70 (Theory 50 + Practical 20)		Exam duration: Theory:3 Hours Practical:4 hours	
Part B-Contents of the Course			
<u>Instructions for Paper-Setter:</u> Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Serological Test : Widal, Antistreptolysin O (ASO), Liver Function test (LFT), C- Reactive Protein (CRP) , Rosewaller, Brucella, agglutination, Cold agglutinin, Venereal Disease Research Laboratory (VDRL), <i>Treponema pallidum</i> hemagglutination (TPHA), fluorescent treponemal antibody-absorption (FTA-ABS), Serological tests for fungal infection and skin tests, Advanced techniques in microbiology Counter Current Immunelectrophoresis CCIEP, Co-agglutination, Gas liquid chromatography (GLC), High performance liquid chromatography (HPLC) etc, Rapid diagnostic methods and Automation in Microbiology; Culture and Drug sensitivity test : Culture, isolation and identification of pathogens from urine, pus and sputum and recording of recording of their results.	13
II	Principle of serological techniques used in virology – part 1 - Haemagglutination assay (HA) , Haemagglutination Assay Inhibition (HAI), Single Radial Haemolysis (SRH), Reverse Passive Haemagglutination Assay (RPHA), Indirect Haemagglutination Assay (IHA), Complement Fixation Test (CFT); Principles of serological techniques used in virology Part II : <u>Nuchal translucency</u> (Nt), Enzyme Linked Immunosorbent Assay (ELISA), Radio Immunoassay (RIA), <u>Indirect Fluorescent antibody</u> (IFA) , Immuno - peroxidase test.	12
III	Morphology and life cycle of protozoans- Free living Amoebae, <i>Balantidium</i> , <i>Toxoplasma</i> , Diagnosis, morphology and life cycle of trematodes <i>Schistosomes</i> (blood flukes), Intestinal Flukes	10
IV	Serological and Immunological Techniques used in diagnosis - Gel – diffusion, Indirect Haemagglutination Assay (IHA), <u>Indirect Fluorescent antibody</u> (IFA), Enzyme Linked Immunosorbent Assay (ELISA), Indirect Fluorescent antibody, Identification of adult forms- Mosquitoes, Flies, Ticks and fleas Animal care, handling and uses in parasitology. Preparation of parastic antigens and antisera, handling and operating of sophisticated equipments	10
V*	PRACTICALS - Study of parasitology, Morphology and life cycle of - Free living Amoeba, <i>Balantidium</i>, <i>Toxoplasma</i> - Diagnosis of Morphology and life Cycle of trematodes - <i>Schistosomes</i> Intestinal Flukes, Blood Flukes - Identification of adult forms of mosquitoes, flies, ticks and fleas. - Study of serological techniques - Principles of serological techniques used in Virology - Part 1 : Haemagglutination assay (HA) , Haemagglutination Assay Inhibition (HAI), Single Radial Haemolysis (SRH), Reverse Passive Haemagglutination Assay (RPHA), Indirect Haemagglutination Assay (IHA), Complement	30

	Fixation Test (CFT) b. Principles of Serological techniques used in Virology-Part-11 <u>Nuchal translucency</u> (Nt), Enzyme Linked Immunosorbent Assay (ELISA), Radio Immunoassay (RIA), <u>Indirect Fluorescent antibody</u> (IFA) , Immuno - peroxidase test. c. Serological test, Widal, Antistreptolysin O (ASO), Liver Function test (LFT), C- Reactive Protein (CRP), STS, Rose-Waaler Test. d. Serological test; Brucella agglutination, Cold agglutinin test, Venereal Disease Research Laboratory (VDRL), <i>Treponema pallidum</i> hemagglutination (TPHA), fluorescent treponemal antibody-absorption (FTA-ABS)	
5.	Serological and Immunological Techniques used in diagnosis- Gel – diffusion, Indirect haemagglutination assay (IHA), <u>Indirect Fluorescent antibody</u> (IFA), Enzyme Linked Immunosorbent Assay (ELISA), Indirect Fluorescent antibody	

Suggested Evaluation Methods

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab record etc.: 10 • Mid-Term Exam: NA	End Term Examination: Theory: 50 (Written exam) Practical: 20 (Seminar/ Demonstration/Viva-voce/Lab records etc)

Part C-Learning Resources

Recommended Books/ e-resources/LMS:

1. Microbiology for Nursing and Allied Sciences. Dr. Arora 2nd Edition
2. Textbook of Microbiology for Nurses Anantnarayan 1st Edition
3. Practical and Applied Microbiology Anuradha De 4th Edition
4. Text Book of Microbiology Anantnarayan 10th Edition
5. TextBook of Microbiology and Parasitology Praful Godkar 1st Edition
6. Medical Parasitology C. P. Baweja 3rd Edition

PLOCLO Mapping of B23-MLT-602						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	1.5	1.0	1.0	0.5	2.0	1.4
CLO2	1.4	2.4	2.6	0.2	2.1	2.7
CLO3	1.5	2.5	2.2	0.2	2.3	2.6
CLO4	0.5	1.5	2.4	0.8	2.8	2.7
CLO5	1.5	2.5	2.3	0.3	2.7	2.7

Session:2025-26			
Part A-Introduction			
Subject	Bachelor of Vocation in Medical Laboratory Technology		
Semester	VI		
Name of the Course	Pathology–VI		
Course Code	B23-MLT-603		
Course Type:	CC-C6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO): CLO5 is based on practical component	After completing this course, the learner will be able to: 1. Provide knowledge about the immune systems. 2. Gain knowledge about various rheumatological diseases. 3. Enable the students to know about the antigen-antibody reactions. 4. Learn about the cytological techniques. 5*. Study of markers for tumors and cancers.		
Credits	Theory	Practical	Total
	03	01	04
Contact Hours	03	02	05
Max.Marks:100 Internal Assessment Marks:30(Theory20+Practical10) End Term Exam Marks: 70 (Theory 50 + Practical 20)		Exam duration: Theory:3 Hours Practical:4 hours	
Part B-Contents of the Course			
Instructions for Paper-Setter: Nine questions will be set in all. Question No.1comprisingof objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.			

Unit	Topics	Contact Hours
I	Cells and organs of the immune system, Immunoglobulins, antibodies and humeral immune response, Allergy	10
II	Rheumatological diseases and investigations, Rheumatoid arthritis test (RA), Infection and the immune system, Cancer Immunology	10
III	Tumor markers, Tissue typing for kidney transplant and bone-marrow transplant, Laboratory tests for demonstration of antigen, antigen-antibody reaction and cell mediated immunity.	12
IV	Cervical cytology-basis of detection of malignant and premalignant lesions, Hormonal assessment with cytologic techniques and sex chromatin and pregnancy tests, Fine needle Aspiration cytology-principles, indications and utility of the technique with special emphasis on role of cytotechnician in Fine Needle Aspiration Cytology (FNAC) clinics.	13
V*	PRACTICALS - Tumor and cancer markers : (a) Estimation of Alpha feto-proteins (AFP) (b) Estimation of Carcino embryonic antigen (CEA) (c) Estimation of Prostrate specific antigen (PSA) - Study of cervical cytology.	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/classstestetc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Labrecordsetc.:10 • Mid-Term Exam: NA	End Term Examination: Theory:50 (Written exam) Practical: 20 (Seminar/ Demonstration/Viva-voce/Lab records etc)
Part C-Learning Resources	

Recommended Books/e-resources/LMS: - Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by PrafulGhodkar - Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar - Medical Laboratory Technology (Volume 1): Procedure Manual for RoutineDiagnostic, Kanai Mukharjee - Medical Laboratory Technology (Volume 2): Procedure Manual for RoutineDiagnostic, Kanai Mukharjee - Medical Laboratory Technology (Volume 3): Procedure Manual for RoutineDiagnostic, Kanai Mukharjee

PLOCLO Mapping of B23-MLT-603						
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1	1.0	1.7	2.3	0	2.0	2.2
CLO2	1.2	2.0	2.6	0	1.0	2.0
CLO3	1.4	2.4	2.2	0	1.0	2.0
CLO4	1.4	2.5	0.5	0	1.0	1.5
CLO5	1.2	2.4	2.6	0	1.0	3

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

("A++" Grade, NAAC Accredited)



Syllabus for Post Graduate Programme

M.Sc. Home Science (Food, Nutrition and Dietetics)

as per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme

CBCS-LOCF

With effect from the session 2025-26

DEPARTMENT OF HOME SCIENCE

FACULTY OF LIFE SCIENCES

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA

Session: 2025-26			
Part A - Introduction			
Name of Programme	M. Sc. Home Science (Food Nutrition & Dietetics)		
Semester	3		
Name of the Course	Clinical Nutrition & Dietetics-II		
Course Code	M24-FND-301		
Course Type	CC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the role of nutrition in Renal disorders. CLO 2: Know about the chrono nutrition and nutritional management in space. CLO 3: Gain knowledge about the causative factors, metabolic changes, prevention and nutritional management of Non communicable Diseases. CLO 4: Understand the Oncology Nutrition and role of artificial Intelligence in clinical nutrition.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Etiology, manifestations and dietary management of Renal Disorders: - Glomerulonephritis - Nephrotic syndrome - Acute renal failure - Chronic renal failure - Renal stones- Major types of stones		15
II	Chrono- Nutrition: - Introduction, principles and health benefits of Chrono nutrition. - Biological clock and Circadian rhythm Chrono-Nutrition in Disease Prevention and Management- - Type 2 diabetes, obesity, and sleep disorders etc. Nutritional management in space: - Space Nutrition & its goals - Physiological Changes in Space Affecting Nutrition - Space Food Systems - Nutritional Challenges in Space - Future of Space Nutrition		15

III	Etiology, metabolic and clinical aberrations, complications, prevention and nutritional management of: • Weight imbalances (over and under nutrition) • Diabetes mellitus: Type 1, Type 2 • Cardiovascular disorders: Hypertension, Atherosclerosis, Coronary heart disease	15
IV	Oncology Nutrition: • Process and Causes of Cancer Development • Body’s Defense System and types of Cancer • Nutritional Problems and effects of Cancer Therapy on Nutrition • Nutritional Management of cancer Related Symptoms Artificial Intelligence and clinical nutrition: • Introduction and its role in Clinical Nutrition • Limitations and challenges of AI in nutrition • AI Tools Used in Nutrition Research • Nutritio App, iNutrimon • IBM Watson Health: AI platform for dietary recommendations	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
•Class Participation:	5	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.:	10	
•Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1 Sue Rodwell Williams, (1993): Nutrition, Diet Therapy, (7 th Ed.): W.B. Saunders Company London 2. Robinson Ch.,M.B. Lawlea, W.L, Chenoweth, and A.E., Carwick: Normal And Therapeutic Nutrition, Macmillan Publishling Company. 3. Mahan L.K., Sylvia Escott-Stump (2000): Krause’s Food Nutrition and Diet Therapy 10 th Edition, W.B Saunders Company London 4. B. Shrilakshmi, (2007): Dietetics, published by K.K Gupta for New Age International Pvt. Ltd. New Delhi 5. Gopalan C., Ram Sastri B.V. and BalaSubramaniam S.C., (2006) Nutritive Value of Indian Foods, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research 6. Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone 7. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company 8. WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia 9. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts 10. Schlenker D. E. and Roth L.S: William’s Essentials of Nutrition and Diet Therapy 10 th Edition Elesvier MOSBY		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Food, Nutrition and Dietetics)		
Semester	3		
Name of the Course	Public Health Nutrition-II		
Course Code	M24-FND-302		
Course Type	CC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Understanding concepts and factors influencing food and nutritional security at various levels. CLO 2: Gain knowledge of key components, strategies, goals and strategies of national nutritional policy along their relevance with public health and to evaluate the appropriateness of different assessment methods for various community settings. CLO 3: Comprehend and analyze various nutritional programmes aimed at improving nutritional status, including nutrient deficiency control, supplementary, feeding and food security programs. CLO 4: Learn to design and implement effective nutrition education programs, including planning, execution, evaluation and follow up.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	• Concept, definitions and factors affecting Food and Nutrition Security at National, Household and Individual level. • Role of national and international agencies in Public Health Nutrition.		15
II	• National nutrition Policy. • Poshan Abhiyan • Assessment of Nutritional status of the Community ○ Anthropometric measurements ○ Biochemical ○ Clinical ○ Dietary surveys		15

III	• Nutritional Programmes for improvement of Nutritional status: ○ Nutrient Deficiency control programmes. ○ Supplementary Feeding programmes. ○ Food Security Programmes ○ Self-Employment and Wage Employment Schemes	15
IV	• Nutrition Education: ○ Methods ○ Planning and execution ○ Evaluation and follow up	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. B. Shrilakshmi, (2007): Dietetics, published by K.K Gupta for New Age International Pvt. Ltd New Delhi		
2. Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone		
3. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company		
4. WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia		
5. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts		

Session: 2025-26			
Part A– Introduction			
Name of Programme	M.Sc. Home Science (Food, Nutrition and Dietetics)		
Semester	3		
Name of the Course	Sports Specific Nutrition		
Course Code	M24-FND-303		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO: 1. Explain the differences in nutritional needs between normal active persons and athletes/exercising individuals. CLO: 2. Understand the role of carbohydrates, protein, and fat in exercise metabolism and optimize their intake for various sports and training types. CLO: 3 No about hydration strategies and the safe use of common supplements in sports nutrition, considering anti-doping laws and WADA regulations. CLO: 4. Gain knowledge regarding nutrition plans tailored to specific sports and consider the unique needs of various athlete populations.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to sports nutrition: Definition, scope, and principles of sports nutrition. Nutritional considerations for sports and exercising person as compare to normal active person. Types of sports activities and energy substrates for activities of different intensity and duration. Energy systems in athletic performance (ATP-PC, glycolytic, oxidative pathways) Carbohydrates intake and performance: Intensity of training impacting carbohydrates intake and utilization. Types, timing, and quantity of carbohydrates intake in resistance training, endurance training and recreational sports. Carbohydrate loading and its types for various sports. Protein and amino acid requirements: Factors affecting Protein turnover, Protein requirement and metabolism during endurance		15

	exercise, resistance exercise and recovery. Specific role of amino acids for performance. Protein supplements. • Role of fat in exercise metabolism: Factors affecting fat oxidation, effects of fasting and fat ingestion, dietary strategies and implications for endurance and resistance training.	
II	• Dehydration : Causes; Symptoms and its effects on cardiovascular system and muscle metabolism; Tolerable levels of dehydration; Synergistic effect of dehydration and hyperthermia; Effects of dehydration on endurance and performance. • Hydration strategies: Beverage composition and formulation (isotonic, hypotonic and hypertonic); only fluid versus fuelling with other macronutrients and electrolytes for exercise benefits; Beverage volume and Beverage timing (Pre-exercise and Post-exercise rehydration). • Nutrient periodisation and Meal timing: Importance of periodisation and meal timing related to the type of training and exercise intensity. Effects of energy intake and co-ingestion other nutrients like carbohydrate and protein composition before, during and after training. Type of carbohydrates and proteins beneficial for maximum refueling post exercise sessions.	15
III	• Energy balance concept for athletic performance: Macronutrient contributions, caloricity and optimization for training and sports. Principals, factors and methods for determining energy expenditure commonly used among athletes. Managing energy balance in athletes and sports person. • Supplementation and Regulations- Assessing body composition (DXA, skin folds, Safe strategies for weight loss/gain, Evidence-based use of common supplements (creatine, caffeine, beta-alanine),Ergogenic aids and performance impacts, Anti-doping laws and WADA regulations	15
IV	• Sports specific nutrition: nutrition plan for endurance sports (running, cycling), power/strength sports(weightlifting, sprinting), team sports(football, basketball), weight class and aesthetic sports (wrestling, gymnastics), racquet and multi energy spots system • Nutrition considerations for: Female athletes (including RED-S), Adolescent athletes, Master (aging) athletes, Vegetarian/vegan athletes ,Athletes with medical issues (e.g., diabetes, GI disorders)	15
Total Contact Hours		60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Ira Walinaky, (1998) Nutrition in Exercise and sport			
2. Charles B. Corbin, Ruth Lindsey and grey walk (2000) Concepts of fitness and wellness.			
3. Robert A. Robergers and Scott O. Roberts (2000) exercise physiology			

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Home Science (Food, Nutrition and Dietetics)		
Semester	3		
Name of the Course	Food Microbiology		
Course Code	M24-FND-304		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Know about food microbiology, microbial growth and factors affecting it. CLO 2: Get an idea about nutritional parameters, sources of microbial contamination, spoilage and food preservation. CLO 3: Gain insight into fermented foods and food borne diseases. CLO 4: have an account of microorganisms as food and food testing and quality control.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	- Introduction to Food Microbiology. - Microbial growth and methods of measurement of growth. Factors affecting growth of microorganisms in food: Intrinsic (nutrient content, pH and buffering capacity, redox potential, antimicrobial constituents, water activity), extrinsic (relative humidity, temperature, gaseous atmosphere).		15
II	- Nutritional requirements, nutritional types, culture media and its types for microorganism. Sources of contamination and microbial spoilage of: Milk and milk products, eggs and poultry, fish and other sea foods, Cereal and cereal products, meat and meat products, Vegetables and fruits, canned foods. Food Preservation: General principles of food preservation, various classical physical, chemical, and biological methods of preservation.		15

	New developments in food preservation techniques.		
III	• Fermented foods: Production of fermented milk and milk products, plant-based products, pickles, fish products, and meat products, Bread, Vinegar, Yoghurt, Bear, Wine, probiotics and prebiotics. • Food borne diseases: Food borne infections including bacterial, viral and fungal infections. Study of infections due to food borne parasites. Symptoms and methods of prevention and control of food borne diseases caused by following: • Bacterial agents:Salmonella, Staphylococcus, Clostridium, E. coli. • Fungal agents: Aspergillus, Fusarium, penicillium. • Viruses:Polio, Hepatitis. • Protozoa: Giardia, Entamoeba.	15	
IV	• Microorganisms as food: single cell proteins, Mushrooms. • Microbiological criteria for food testing and Quality control: Indicator organisms, Microbiological standards, Principle of GMP and The HACCP system and food safety used in controlling microbiological hazards.	15	
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory: 70	
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. General Microbiology – Powar			
2. Good Microbiology – Frazier and Westhoff			
3. Microbiology – Prescott, Harley, Klein			
4. Food Microbiology – Adams			
5. An Introduction of Microbiology - P. Tauro			
6. General Microbiology – Stanier			
7. Food Microbiology – James M. H Jay			
8. Food Hygiene, microbiology & HACCP – 3rd edition – S.J. Forsythe &P.R. Hayes			

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Part A - Introduction

Name of Programme	M.Sc. Home Science (Food, Nutrition and Dietetics)		
Semester	3		
Name of the Course	Human Physiology		
Course Code	M24-FND-305		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Know about digestive system and cardiovascular system and immune system. CLO2: Have insight into respiratory system, reproductive system and Musculo-skeletal system and related disorder. CLO3: Have an account of excretory system and sensory system related disorder. CLO4: Get an idea about endocrine system and nervous system related disorder.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Digestive System- Different parts of digestive system, Secretory and digestive functions of the salivary glands, stomach, pancreas, liver and intestines, mechanism of absorption of carbohydrates, proteins and fats. Cardiovascular System- Structure and function of the heart, ECG, cardiac cycle, cardiac output, heart sounds, regulation of heart rate, blood pressure: Factors affecting it and hypertension. Blood formation, composition, blood clotting- formation and functions - of plasma proteins, erythropoiesis, blood groups, histocompatibility and blood indices. Immune system- cell mediated and humoral immunity, Innate and adaptive immunity, Activation of WBCs and production of antibodies and role in inflammation and defence.	15
II	Respiratory System- Structure of respiratory organs, uptake and delivery of respiratory gases and regulation of breathing, Laryngitis, pharyngitis bronchitis, asthma in brief Reproductive System- Structure and function of testis and ovaries,	15

	menstrual cycle, puberty, menopause, breast and cervical cancer, menstrual disorders, infertility, ultra sound imaging in brief. • Musculo-skeletal system- Structure and function of bone, cartilage and connective tissue. Disorders of the skeletal system, types of muscles, structure and function.	
III	 • Excretory System- Structure and function of nephron, mechanism of urine formation and the role of the kidneys in water and electrolyte balance, diuretics, renal stone, albuminurea, haematourea, oedema, uremia, incontinence, in brief. • Sensory System- General senses (types, structure and functions). Special senses (structure and functions: olfaction, vision, gestation, equilibrium and hearing).	15
IV	 • Endocrine System- structure, functions and the different syndromes resulting from hypo or hyperactivity of the following glands: Thyroid, parathyroid, adrenal cortex, adrenal medulla, endocrine pancreas, pituitary. • Nervous System- Main divisions, structure and function of various parts of brain: brain stem, cerebral cortex, cerebellum and diencephalon, blood brain barrier, structure and function of spinal cord, cerebrospinal fluid, cranial and spinal nerves, introduction to autonomic nervous system, neuralgia, sciatica, coma, poliomyelitis, EEC, CT, MRI in brief.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Stand, F.L. Modern Physiology the Macmillan Company Latest Ed.		
2. Guyton, A.C. Textbook of Medical Physiology W.S. Saunders		
3. Davidson, B. and Smith E., Textbook of Physiology and Biochemistry, 1972 (8th Ed.).		
4. Human Physiology – A.J. Vander		
5. Principles of Anatomy and Physiology – Anagnastakes.		
6. Textbook of Physiology – Patton		
7. Bloom W. & Favcott. D.W.A. – Textbook of Histology, W.B. Saunders and Company		
8. Martini: Fundamentals of Anatomy and Physiology (6th & 7th Ed)		

Session: 2025-26			
Part A– Introduction			
Name of Programme	M.Sc. Home Science (Food Nutrition and Dietetics)		
Semester	3		
Name of the Course	Nutrition through Life Span		
Course Code	M24-FND-306		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Apply knowledge of the science of nutrition to human health across the lifespan. CLO2: Relate foods and nutrients to the biological requirements of humans at different stages of the life cycle. CLO3: Explain, compare and contrast the nutritional requirements of humans during different stages of the life cycle. CLO4: Learn to address nutritional problems during different life cycles		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Nutrition during infancy – Growth and development during infancy, RDA, Nutritional requirements and factors affecting it, nutritional problems. Advantages of breast feeding, artificial feeding, preterm baby – nutritional requirements, weaning- types of weaning foods and supplementary foods, problems in weaning. Nutrition during preschool age – . Growth and development during preschool, RDA, Nutritional requirements and factors affecting it , nutritional problems.		15
II	Nutrition for school going children – Growth and development, RDA, Nutritional requirements and factors affecting it, nutritional problems, policies for school lunch programmes. Nutrition during adolescence – Growth and development, RDA,		15

	Nutritional requirements and factors affecting it, nutritional problems and nutritional disorders.	
III	• Nutrition in adulthood – RDA, Nutritional requirements and factors affecting it, nutritional problems and nutritional disorders. • Nutrition in old age – physical, physiological changes, Nutritional requirements and factors affecting it , nutritional problems and nutritional disorders.	15
IV	• Nutrition in pregnancy – physiological changes during pregnancy, developmental stages of the embryo, complications in pregnancy, – RDA, Nutritional requirements and factors affecting it, • Nutrition in lactation –physiology of lactation, composition of breast milk and factors affecting it, RDA, Nutritional requirements and factors affecting it.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
1. B. Shrilakshmi, (2007): Dietetics, published by K.K Gupta for New Age International Pvt. Ltd. New Delhi		
2. Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone		
3. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company		
4. WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia		
5. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts		

Session: 2025-26			
Part A– Introduction			
Name of Programme	M.Sc. Home Science (Food Nutrition and Dietetics)		
Semester	3		
Name of the Course	Maternal and Child Nutrition		
Course Code	M24-FND-307		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the role and importance of Maternal nutrition. CLO 2: Knowledge about the Physiology of lactation and nutritional benefits of Breast feeding. CLO 3: Gain knowledge about the growth & development and nutritional requirements during infancy CLO 4: Understand the role of nutrition in preventing and managing childhood diseases.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Maternal Nutrition - Maternal nutrition - Physiological and psychological changes during pregnancy - Nutritional needs during pregnancy - Factors affecting the outcome of pregnancy - Pregnancy in special conditions - Intrauterine Growth Retardation (IUGR) - Congenital malformations - Foetal Alcoholic Syndrome - Gestational Diabetes Mellitus - Pregnancy Induced Hypertension		15
II	Lactation - Development of mammary tissues and role of hormones - Physiology of lactation and milk production - Nutritional needs of lactating mothers - Composition of human milk - Effect of nutritional status of lactating mother on quantity and		15

	quality of breast milk ○ 6. Nutritional Benefits of Breastfeeding ○ For the infant: immunity, growth, cognitive development ○ For the mother: uterine involution, weight loss, reduced cancer risk ○ Breast feeding: factors affecting breast feeding,	
III	● Infancy ○ Growth and development during infancy ○ Immunization Schedule ○ Nutrition requirements during infancy ○ Food requirements and modification of foods for infants Pre-term, LBW infants: implications for feeding and management ○ Weaning and dietary guidelines in infant feeding and complimentary feeding	15
IV	● Childhood ○ Growth and development of children ○ Growth monitoring using growth charts ○ Nutritional requirements of pre-school and school going children ○ Child malnutrition ○ Undernutrition: stunting, wasting, underweight ○ Overnutrition: childhood obesity ○ Nutritional challenges and nutrition for children with special need (cerebral palsy, autism and Down syndrome) ○ Maternal and child nutrition policies and programmes in India	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1.Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone		
2. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company		
3.WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia		
4. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts		
5. Schlenker D. E. and Roth L.S: William’s Essentials of Nutrition and Diet Therapy 10 th Edition Elesvier MOSBY		
6. Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone		
7. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company		
8. WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia		
9. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts		
10. Schlenker D. E. and Roth L.S: William’s Essentials of Nutrition and Diet Therapy 10 th Edition Elesvier MOSBY		

Session: 2025-26			
Part A– Introduction			
Name of Programme	M.Sc. Home Science (Food Nutrition and Dietetics)		
Semester	3		
Name of the Course	Pediatric Nutrition and Geriatric Nutrition		
Course Code	M24-FND-308		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the role and importance of Peadiatric nutrition. CLO 2: Knowledge about the child Malnutrition and nutritional management of Childhood diseases. CLO 3: Gain knowledge about the Geriatric nutrition and age-related changes. CLO 4: Understand the role of nutrition in preventing and managing age related disorder and diseases		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Pediatric Nutrition - Composition of Human Milk, prelacteal feeds, duration of breastfeeding, advantages of breast feeding, types of Infant formulas. - Complementary or weaning feeding, issues and concerns. - Growth, development and body composition from infancy, preschool, childhood, puberty and adolescence. - WHO Growth Standards and classification (Z-scores) - Preterm/ VLBW infants – Complications		15
II	Child Malnutrition: - Undernutrition in childhood – PEM, FTT, SAM, Fe deficiency, Vitamin A deficiency – causes, consequences and nutritional management - Over-nutrition - causes, consequences and nutritional management. - Nutritional Management of Inborn Errors of Metabolism – PKU, Maple syrup urine disease, Homocystinemia, Tyrosinemia, Galactosemia. - Role of diet and nutritional challenges in developmental disabilities- autism spectrum disorders, cerebral palsy, Down syndrome etc. - Pediatric diabetes (type 1) – Impact on growth and development - Food Allergies (milk allergy, lactose intolerance, celiac disease and gluten free diets)		15

	Geriatric Nutrition		
	Definition, importance, Goals, Challenges and key Principles of Geriatric Nutrition		
III	• Changes associated with Ageing process ○ Cellular aspects of ageing ○ Physiological changes: body composition, gastrointestinal, cardiac, respiratory, renal, muscular, skeletal, neural(including brain and spinal cord), endocrine and metabolic, changes and impact on health and nutritional status. • Age-Related Physiological Changes Affecting Nutrition ○ Decreased appetite and taste changes ○ Dentition problems (e.g., missing teeth, ill-fitting dentures) ○ Digestive issues (e.g., decreased gastric acid, constipation) ○ Slower metabolism and reduced physical activity	15	
IV	Age-Related Disorders and Nutrition • Nutritional and health status of elderly: Factors influencing food consumption and nutritional status of elderly, Undernutrition in the Elderly – risk factors. • Common diseases in elderly: Etiopathogenesis, manifestations and interventions – Gastrointestinal disturbances, cardiac, renal, respiratory diseases, mental changes including depression, dementia, Parkinson’s, Alzheimer’s, bone and muscle related abnormalities, Sarcopenia, frailty and Polypharmacy. • Special Diets in Geriatrics ○ Texture-modified diets for dysphagia ○ Low-sodium, low-fat, diabetic diets ○ High-protein diets for muscle maintenance ○ Nutrient-dense snacks and fortified foods	15	
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1.Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone			
2. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company			
3.WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia			
4. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts			
5. Schlenker D. E. and Roth L.S: William’s Essentials of Nutrition and Diet Therapy 10 th Edition Elesvier MOSBY			
6. Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone			
7. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company			
8. WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia			
9. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts			
10. Schlenker D. E. and Roth L.S: William’s Essentials of Nutrition and Diet Therapy 10 th Edition Elesvier MOSBY			

Session: 2025-26			
Part A– Introduction			
Name of Programme	M.Sc. Home Science (Food Nutrition and Dietetics)		
Semester	3		
Name of the Course	Nutrition in Critical Care		
Course Code	M24-FND-309		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the Critical illnesses and its metabolism. CLO 2: Knowledge about the importance and care in Enteral Nutrition. CLO 3: Gain knowledge about the Parenteral nutrition in critical Care. CLO 4: Understand the Assessment of nutritional status in critically ill patients		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Critical Illness and Metabolism - Stress response and metabolic changes (ebb, flow and anabolism phases) - Hypermetabolic, hypercatabolic state and inflammatory response - Role of nutrition in modulating the immune response - Immunonutrition (glutamine, arginine, omega-3 fatty acids) - Role of Immune Enhancers in Clinical Nutrition		15
II	Enteral Nutrition - Various sites for Enteral nutrition - Routes: nasogastric, nasojejunal, PEG, PEJ - Types of formulas: standard, peptide-based, disease-specific - Feeding techniques: continuous, cyclic, bolus - Monitoring tolerance: gastric residual volumes, bowel function - Complications: aspiration, diarrhea, tube dislodgement		15
III	Total Parental Nutrition:		15

	○ The importance of TPN ○ Total vs partial parenteral nutrition ○ Central vs peripheral PN ○ Components: dextrose, amino acids, lipids, electrolytes, vitamins ○ Long term effects of its use and complications including refeeding syndrome and infection.	
IV	● Assessment of Nutritional Status in Critically Ill Patients ○ Nutrition Risk Screening (NRS-2002, NUTRIC score) ○ Subjective Global Assessment (SGA) ○ Anthropometric, biochemical, and clinical assessment ○ Challenges of assessment in ICU (fluid shifts, inflammation) ○ Diet related ethical issues in the critical illnesses	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
●Class Participation:	5	Written Examination
●Seminar/presentation/assignment/quiz/class test etc.:	10	
●Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone		
2. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company		
3. WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia		
4. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts		
5. Schlenker D. E. and Roth L.S: William’s Essentials of Nutrition and Diet Therapy 10 th Edition Elesvier MOSBY		

Session: 2025-26			
Part A–Introduction			
Name of Programme	M.Sc. Home Science (Food Nutrition and Dietetics)		
Semester	3		
Name of the Course	Nutritional Management		
Course Code	M24-FND-310		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the principles of nutritional science in health and disease. CLO 2: Assess nutritional needs in individuals and populations. CLO 3: Plan and implement dietary interventions for prevention and management of various health conditions. CLO 4: Integrate current research and guidelines into nutritional practice.:		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	- Definition, Meaning, scope and interdisciplinary approach of nutritional management. - Brain structure, neurotransmitters, and their nutrient co-factors - Gut-brain axis: micro biota–neurotransmitter link - Role of macronutrients in brain function-Carbohydrates and glucose metabolism in the brain - Protein quality, amino acids (tryptophan, tyrosine, glutamine) in neurotransmitter synthesis - Essential fatty acids (Omega-3, Omega-6) and neuronal membrane integrity. - Micronutrients for brain function - B vitamins (B1, B6, B12, folate) neurotransmitter formation - Minerals (iron, zinc, magnesium, selenium) in cognitive function - Antioxidants (vitamin C, vitamin E, carotenoids, polyphenols) and oxidative stress control.		15
II	Blood–brain barrier and nutrient transport		

	• Dietary approach for - Depression & Anxiety Disorders- Role of serotonin precursors and micronutrients -Anti-inflammatory dietary patterns. • Schizophrenia & Bipolar Disorder -Glycemic control, omega-3 fatty acids, antioxidant therapy • Weight management in behavioral eating disorder antipsychotic patients • Neurodevelopment Disorders (ADHD, Autism- Elimination diets, micronutrient optimization, gut micro biota modulation • Neurodegenerative Disorders (Alzheimer's, Parkinson's- Antioxidants, anti-inflammatory foods, ketogenic interventions • Epilepsy- Ketogenic and modified Atkins diets • Micronutrient supplementation for antiepileptic drug side effect.	15
III	• Nutritional Needs in calamities and emergencies: ○ Assessing nutritional needs based on population demographics and crisis impact. ○ Importance of micronutrients in emergency diets. • Nutrition Interventions: ○ Emergency feeding strategies: general food distributions and targeted supplementary feeding. ○ Therapeutic foods for treating acute malnutrition. • Challenges and Solutions: ○ Cultural considerations in food distribution. ○ Monitoring and evaluating nutrition interventions in emergencies.	15
IV	• Microgravity effects- changes in metabolism, bone density, and muscle mass. • Macronutrient and micronutrient requirements in space • Classification of space food, Food selection, preparation, procession of food for space flight and serving food • Meal planning –strategies for long-duration missions. • Managing food intake- techniques for ensuring adequate nutrition in microgravity. • Mitigating nutrient deficiencies in space-strategies to prevent deficiencies.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone
2. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company
3. WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia
4. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts
5. Schlenker D. E. and Roth L.S: William's Essentials of Nutrition and Diet Therapy 10th Edition Elesvier MOSBY

Session: 2025-26			
Part A – Introduction			
Name of the Programme	M.Sc. Home Science (Food Nutrition & Dietetics)		
Semester	3		
Name of the Course	Clinical Nutrition & Dietetics II		
Course Code	M24-FND-311		
Course Type	PC-5		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Plan, calculate and prepare therapeutic diets for various disorders. CLO 2: Know about commercial nutritional supplements available in market. CLO 3:..Develop skills in preparing teaching aids for the diagnosis of different diseases. CLO 4: Develop skill of doing market survey of commercial nutritional supplements.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours (or as decided by PGBOS)	
Part B- Contents of the Course			
Practicals			Contact Hours
	Syllabus/ List of Practical 1. Clinical Nutrition & Dietetics 1.1 Planning, Calculation, Preparation, serving and evaluation of therapeutic diets for diseases covered in theory. 1.2 Preparation of diet counselling aids for common disorders. 1.3 Market survey of the following products: • Food Supplements • Commercial nutritional Supplements • Disease specific foods 1.4 Formulation of therapeutic diets emphasizing fat and energy modification, sodium & potassium restriction and hypocaloric diets for Obesity.		120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Gopalan C., Ram Sastri B.V. and BalaSubramaniam S.C., (2006) Nutritive Value of Indian Foods, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research			
2. Longvah T., Ananthan R., Bhaskarachary K. and Venkaiah K. (2017): Indian Food Composition Tables, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, Telangana (India)			
3. Nutrient Requirements for Indians, Recommended Dietary Allowances And Estimated Average Requirements-2020, ICMR-NIN			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	M.Sc. Home Science (Food Nutrition & Dietetics)		
Semester	3		
Name of the Course	Public Health Nutrition- II		
Course Code	M24-FND-312		
Course Type	PC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the concept & purpose of Nutritional status assessment in community sitting. CLO 2: Be familiar with standard methods & Techniques for assessing nutritional status CLO 3: Gain knowledge on the basis of education communication strategies for improvement of Nutritional status. CLO 4: Student will be able to communicate Nutritional information effectively audiences.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours (or as decided by PGBOS)	
Part B- Contents of the Course			
Practicals			Contact Hours
	Syllabus/ List of Practical ➤ Assessment of nutritional status of community by using anthropometric, dietary measurement. (Report to be submitted in the practical exam) ➤ Preparation of visual aids for addressing public health nutrition in the community: - charts/ posters - Pamphlets/ brochures - Nutritional games/ nutritional stories Nutrition ➤ Preparation and effective use of aids for improving Nutritional status.		120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			

Session: 2025-26			
Part A - Introduction			
Name of Programme	M. Sc. Home Science (Food Nutrition & Dietetics)		
Semester	3		
Name of the Course	Nutrition for Holistic Health		
Course Code	M24- OEC-322		
Course Type	OEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Importance of macro nutrients in maintaining good health CLO 2: Familiarize with the micro nutrients of food group system CLO 3: Impart knowledge on food groups and meal Planning. CLO4. Gain knowledge about balanced diet and therapeutic diet.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Food: Functions of food and classification. Essential food constituents: - Carbohydrates - Proteins - Fats Fiber: Role of fiber in human nutrition.		8
II	Dietary sources, functions, daily allowances, deficiency and excess of following: Vitamin: A, D, E, K, B1, B2, B3, B12, C Minerals: Calcium, iron, iodine, sodium, potassium. Functions of water in the body.		8
III	- Food groups - Food Pyramid - Meal Planning: Meaning and introduction - Principles of meal planning, factors affecting it.		7
IV	- My food plate - Balanced diet, its concept and points to be considered while planning a balanced diet.		7

	• Therapeutic diet and its diets and principals		
Total Contact Hours			30
Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
➤ Theory	15	➤ Theory:	35
• Class Participation:	4	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	4		
• Mid-Term Exam:	7		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
4. B. Shrilakshmi, (2007): Dietetics, published by K.K Gupta for New Age International Pvt. Ltd. New Delhi			
6. Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone			
7. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company			
8. WohlShils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia			
9. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts			

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act-XII of 1956)
("A++" Grade, NAAC Accredited)



Syllabus
for
Post Graduate Programme
M.Sc. Home Science (Human Development)

as per NEP 2020
Curriculum and Credit Framework for Postgraduate Programme

CBCS-LOCF
With effect from the session 2025-26

DEPARTMENT OF HOME SCIENCE
FACULTY OF LIFE SCIENCES

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA

Session: 2025-26			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Child and Family: Guidance, Counselling and Psychotherapeutic Interventions		
Course Code	M24-HDE-301		
Course Type	CC- 9		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the concept, principles, scope and practice of guidance and counselling. CLO 2: Comprehend the task of identifying and assessing at risk children and providing services to them. CLO 3: Understand the problems and provide appropriate support and therapy in different stages of Life CLO 4: Develop skills for providing counseling and therapeutic services.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1. Nature and Scope of Guidance -Concept, Definition and Scope Nature, Principles and Need of Guidance Areas of Guidance: -Educational – Concept, Definition, Characteristics, Principles etc. -Vocational – Concept, Definition, Characteristics, Principles etc., -Personal – Concept, Definition, Characteristics, Principles etc., -Group Guidance-Different Techniques used 2. Nature and Scope of counseling -Meaning, Areas, Scope of Counseling -Needs, Aims and Principles of Counseling -Variou s Approaches to Counseling: Humanistic approaches- Roger’s Client centered approach, Gestalt		15

	approach Psychoanalytic -Psycho dynamic approaches by Sigmund Freud, Carl Jung, Alfred Adler Behaviourist approach- Skinner and Bandura Eclectic approach	
II	3. Stages of Human Development and Areas of Guidance, counseling and therapy. -Problems of Childhood: remedial measures, techniques, therapies used -Problems of Adolescence: remedial measures, techniques, therapies used -Problems of Adulthood: remedial measures, techniques, therapies used -Problems of Aged: remedial measures, techniques, therapies used 4. Types of Therapy -Psychotherapy: Concept, Definition, Types, Application etc., -Play therapy: Concept, Definition, Types, Application etc., -Behaviour modification therapy: Concept, Definition, Types, Application etc., -Any other therapy: Music, Dance, Drama, Art etc.,	15
III	5. Counseling Special Groups Meaning, Concept, Characteristics, Needs, Support network and counselling processes for: -Children suffering from Child Abuse -Children in Divorce Families -Children in Step Families -Children in Single Parent Families -Children of Street -Children in Alcoholic Families 6. Counseling Exceptional Children: Meaning, Concept, Characteristics, Needs, Support network and counselling processes for: -Gifted Children -Children with Emotional and Behavior Disorders -Learning Disabled Child -Attention Deficit Hyperactivity Disorder -Intellectually Challenged Children -Physically challenged Children	15
IV	7. Fundamental counseling-Skills -The Client Counselor Relationship: Meaning, Types, Impact, Importance -Qualities and skills of a counselor: Required for success -Counsellors objectivity/subjectivity: Meaning, Importance eg. -Emotional involvement and limits: Permissible limits and importance 8. The counseling Process -First contact, Assessment, Intervention, Closure, Follow up -Ethics in counseling involved -Need for Ethical standards -Ethical, Codes and Guidelines- Rights of Clients, Dimensions of Confidentially -Dual relationships in counseling Practices: Meaning, Impact, Importance	15

Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Bumard, P. (1999). Counseling skills training. New Delhi: Viva Books.			
2. Manthel, R. (1997), Counseling: The skills of finding solutions to problems. London: Routledge.			
3. Nicolson, D & Ayers, H. (1995). Individual Counseling: Therapy and practice: London: David Fulton.			
4. Anthony DJ. 2006. <i>Mental Disorders Encountered in Counselling</i> . Anuragha Publications, Chennai.			
5. Barker M, Vossler A and Langdridge D. 2010. <i>Understanding Counselling and Psychotherapy</i> . Sage Publications, New Delhi.			
6. Cooper S. 2005. <i>Counselling, Inception, Implementation & Evaluation</i> . Infinity Books, New Delhi.			
7. Gunner J. 1984. <i>Counselling and Therapy for Children</i> . The Free Press, New York.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Mental Health and Well-being in Developmental Perspectives		
Course Code	M24-HDE-302		
Course Type	CC- 10		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the concept of holistic health, wellbeing, happiness. CLO 2: Gain knowledge about the mental health needs in different stages of life. CLO 3: Aware students about the school mental health program and intervention CLO 4: Gain knowledge about management of stress and various problems during lifespan.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1. Mental Health -Definition, concept and importance of holistic health -Definition, concept and importance of well being -Definition, concept and importance of happiness -National Mental Health Program of India (1982) -Community mental health: Needs, Programs, etc., 2. Infancy -Implication of attachment and bonding for mental health -Maternal deprivation Syndrome -Malnutrition and its effect on growth and behaviour of infant -Intervention with families and professionals from allied fields		15
II	3. Early Childhood Years -Mental Health Needs of: Safety, Security, Relationships, Autonomy and Self-concept		

	-Behavior Problems manifested at this stage:Feeding problem Aggression, Withdrawal and Problems related to early Schooling -Intervention work with Children, Family, Teachers 4. Middle Childhood -Mental Health Needs of: Recognition, Appreciation, Friendships and Industry -School Related Problems: Truancy, School phobia, Conduct disorder, Childhood depression -Maladjustment at Home and School -Providing guidance to children, parents, teachers, peers and school administration	15	
III	5. Adolescence -Mental Health Needs of: Sense of Identity, Autonomy and Individualism -Problems related to Sexuality, Physical appearance and Relationships -Academic Problems, Aggression, Substance Abuse, Depression and Suicide -Authority adolescent conflicts (parents, school, grandparents) -Counselling and guidance of adolescents, parents, school authorities 6. School Mental Health Programs -Need for mental health programs for identification and intervention -Improving school climate -Importance of sensitizing and involving teachers and administrators in mental health aspects of children -Orienting teachers to attend to developmental behaviour problems in the classroom	15	
IV	7. Adulthood -Mental health problems in the community: Life events that cause stress e.g. separation due to death, migration, illness, disease etc. -Substance abuse and addiction -Violence -Sexual abuse -Management of stress through: counseling, Training in relaxation, Yoga and meditation etc.,	15	
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

1. Barry, P.D. (1990), Mental Health and Mental Illness (4th ed) Philadelphia: J.B. Lippincott Co.
2. Bono, E.de(1991) handbook for the Positive Revolution, London: Penguin Publications
3. Carler, F. & Cheesman, P(1988). Anxiety in childhood & adolescence encouraging self- help through relaxation training London: Croom Helm.
4. Goleman, D (1996) Emotional Intelligence. N.Y. : Bantam Books
5. Gopalkrishanan. N. (1994) Mental health and ou, Mumbai: Popular Prakashan.
6. Govt. of India. Ministry of Health & Family Welfare (1982). National Mental health program for India.

Session: 2025-26			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Women and Gender Studies		
Course Code	M24-HDE-303		
Course Type	DEC- 1		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the concept of contemporary emergence and positioning of gender studies. CLO 2: Comprehend the concept of gender studies. CLO 3: Gain knowledge about the roles and status of women in India from social and development perspectives. CLO 4: Develop skills for critical appraisal of gender Issues and design programs for women empowerment.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1. Rationale for Women Studies -Meaning, Significance, Importance of Women studies -Scope of Women studies -Growth of Women's studies movement in India -Growth of Women studies movement in other Countries -Women's movements: In the Pre independent era in India -Women's movements: In the Post independent era in India -Women's movements: In the Current times in India -Empowerment of Women: Need, significance and its effects On them 2. Theoretical Perspectives in Women's Studies -Gender differences: Its effects and consequences -Sexual division of labor and Its implications, -Discrimination at work place -Invisibility and devaluation		15

II	3. Status of Women in India -Demographic Profile of Women with reference to: -Health and its related issues and concerns -Education and its related issues and concerns -Employment and its related issues and concerns -Social issues and concerns -Political aspects, issues and concerns -Gender biasness in Indian context: Issues and concerns -The Indian Girl Child and its status -Changing role of Women in the current scenario 4. Concepts related to Gender differences from Social and development perspectives -Caste and its effect on gender discrimination -Class and its effect on gender discrimination -Culture and its effect on gender discrimination -Gender interface and its effects -Gender and Education -Gender and Economic Empowerment -Development processes and programs from Women's perspective	15
III	5. Special Issues and Problems -Foeticide: Meaning, Occurrence, Causes, Effects, Remedial measures -Infanticide: Meaning, Occurrence, Causes, Effects, Remedial measures -Dowry: Meaning, Causes, Types, Effects, Remedial measures and laws -Child marriage: Meaning, Causes, Effects, Prevention and laws 6. Violence -Sexual Harassment and abuse: Of women and children -Eve teasing, Bullying and Honour killing -Socialization of the girl child -Discrimination: In nutrition and health care of women and children	15
IV	7. Women Welfare Programs -Women Welfare Programs: In Urban & Rural areas for women -Various Policies & Programs: Floated for women's advancement -Women Welfare Organizations in India and their work 8. Women Empowerment -Development of Women Entrepreneurship -Legal Status of Women in India -Empowering lives of women by managing patriarchy system	15
Total Contact hours		60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Astana. P. (1974) Women's movement in India. Vikas, Delhi. 2. Antony, M.L. (1985). Women's Rights: Dialogue, New Delhi. 3. Baker. H.A. Bertheide. G.W. and Others (Eds)(1980). Women Today: A multi-disciplinary approach to Women's Studies. Brooks/ Cole Publication. 4. Baral. J.K. and Patnaik. K. (1990). Gender Politics. New Delhi: Discovery. 5. Dak. T.M. (1988) Women and Work in Indian Society: Discovery, New Delhi. 6. Desai. N. (1988). A decade of Women's Movement in India: Himalaya, Bombay. 7. Desai. N & Patel. V. Indian Women: Change and Challenges in the International Decade: Popular Prakashan Bombay. 8. Gunew. A.R.(1990) Feminist Knowledge Critic and Constituent: Routledge, London. 9. Gupta, N.K. & Sudan I.K.(1990) Women at work in developing economy: Amol, New Delhi. 10. Joseph. A & Sharma K.(Eds)(1994). Whose News? The media and Women's Issues: Sage. New Delhi. 11. Kalia. N.N. (1979). Sexism in Indian Education Vikas. New Delhi. 12. Jain, D & Banerjee. N.(1985). The Tyranny of House Hold: Investigative essays on women and work: Vikas, New Delhi. 13. Okin, S.M. (1989), Justice, gender and family: Basic Books.N.Y. 14. Pant, N (1995) Status of girl child and women in India. Delhi: APH 15. Parashar, A. (1992). Women and Family law reforms in India: Uniform civil Code and gender equity: Sage. New Delhi.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Communication Processes and Techniques		
Course Code	M24-HDE-304		
Course Type	DEC - 1		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the process of communication and its dissemination. CLO 2: Gain insight into various approaches used for communication. CLO 3: Gain knowledge about the various extension techniques used for good communication. CLO 4: Know about the latest communication technologies used for research purpose and all.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1. Communication -Concept, Process, Scope and Usages of communication 2. Dissemination of information -Meaning, nature, types -Factors affecting -Appropriate training, motivating extension workers, approach to extension agents etc., 3. Approaches to communication -Individual approach: Meaning, Methods, Usage, Impact etc., -Group approach: Meaning, Methods, Usage, Impact etc., -Mass approach: Meaning, Methods, Usage, Impact etc., -Motivating approach: Meaning, Methods, Usage, Impact etc.,		15
II	4. Major Models of Communication in brief: -Aristotle's Model -Lasswell's Model		15

	-Shannon and Weaver's Model -Schramm's Model -Berlo's SMCR Model -Westley and MacLean's Model -Dance's Helical Model -Barnlund's Transactional Model -Rogers' Diffusion of Innovation Model -Osgood-Schramm Model 5. Communication and extension methods -Different media: Their characteristics, Types, Usage etc., -Selection of teaching tools: Characteristics, Types, etc. 6. Traditional and Mass Media in Education & Communication -Print Media: Newspapers, Magazines, Pamphlets – Layout, Readability & Visuals -Audio Media: Radio, Podcasts, Community Radio – Structure and Scripting -Visual Media: Television, Films, Documentaries – Features and Uses -Folk and Traditional Media: Puppetry, Songs, Street Theatre, Dance Forms -Media Literacy and Media Ethics -Role of Mass Media in Social Change, Education, and Policy Awareness	
III	7. New and Emerging Communication Technologies -ICT in Education and Research (ICT: Meaning, Scope, Relevance) -Use of Internet, Email, Mobile, Whatsapp, Webinars, and Virtual Meetings (Zoom, Google Meet) -E-learning, MOOCs, SWAYAM, YouTube Channels, Educational Portals -Social Media Platforms (Facebook, Twitter/X, Instagram, Blogs) in Communication -Multimedia Presentations – PowerPoint, Canva, Info graphics, Podcasts -Cyber Security, Plagiarism, and Digital Citizenship -Artificial Intelligence and Virtual Reality in Communication	15
IV	8. Communication for Development and Extension -Concept and Need of Development Communication -Communication Approaches: Participatory, Diffusion of Innovation, Behavior Change -Role of Communication in Health, Nutrition, Family Welfare, Child Development & Education -Communication Strategies in Community Work and Outreach -Audio-Visual Aids: Classification, Characteristics, and Selection for Rural/Urban Settings -Media Mix and Message Design for Extension Work -Evaluation and Feedback Mechanisms in Communication	15
Total Contact hours		60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Curran, J.et al (1977): Mass Communication and Society, London.			
2. Banerjee (eds) (1985): Culture and Communication, Paroit Publishers, Delhi.			
3. Ruloof, M.E. and Miller, G.R. (eds) (1987): Interpersonal Process: New Directions in Communication Research, Sage, USA.			
4. Chatterjee, P.C. (1988): Broadcasting in India, New Delhi, Sage Publications.			
5. Berger, C.R. and Chaffee, S. (eds) (1987): Handbook of Communication Science, Sage Publications, New Delhi.			
6. Brown J., Lewis, R and Harclerod, F. (1985): All instruction: Technology Media and Methods, McGraw Hill, New Delhi.			
7. Ellington, H. (1985): A Handbook of Educational Technology, Kogan Page, London.			
8. Joseph A. Devito. The Essentials of Human Communication.			
9. Ministry of Education Resources: SWAYAM, e-PGPathshala, NPTEL.			
10. IGNOU Modules on Extension and Communication.			
11. UGC NET Paper 1 and Home Science Previous Year Papers.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Cognitive Development: Mind, Brain and Education		
Course Code	M24-HDE-305		
Course Type	DEC - 1		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Identify the several critical developmental milestones. CLO 2: Gain knowledge about language and reading development. CLO 3: Critically reflect on the Neuro-cognitive and cultural basis of cognitive development. CLO 4: Draw implications for early educational development.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	1. Concept development -Category formation -Naïve and essential theories -Conceptual change -Development of causal reasoning -Misconceptions and biases in causal reasoning -Scientific reasoning and hypothesis testing in children -Development of mathematical concepts	15	
II	2. Language and reading development -Theories: Chomsky and Vygotsky and milestones of development - Meta-linguistic awareness and reading -Early literacy acquisition -Developmental delay and interventions	15	
III	3. Development of theory of mind -Neuro-cognitive perspectives: Neuro-cognition, Brain-behaviour relationship, Cognitive processes and their application	15	

	-Cultural perspectives		
IV	4. Emotions and cognitive development -Neurocognitive evidences -Classroom environment,sociocultural settings of learning -School readiness and achievement		15
Total Contact hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory		30	➤ Theory: 70
• Class Participation:		5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:		10	
• Mid-Term Exam:		15	
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Flavell, Miller & Miller. (2002). Cognitive Development. 4th Edition, Prentice Hall.			
2. Gauvain, M. (2001). The social context of cognitive development. Guilford Press.			
3. Goswami, U. (2008). Cognitive development: the learning brain. Psychology press			
4. Goswami, U. (Ed.) (2002). Handbook of childhood cognitive development. Blackwell Publishing Company.			
5. Hobson, P. (2004). The Cradle of thought. New York, Oxford University Press			
6. Lee, K. (Ed.). (2000). Childhood cognitive development: The essential readings. Wiley-Blackwell.			
7. Siegler&Alibali. (2005). Children’s thinking. 4th Edition, Prentice Hall			

Session: 2024-25			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	HIV/AIDS Counselling		
Course Code	M24-HDE-306		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Explain about the diagnosis and transmission of HIV/AIDS. CLO 2: Gain insight about reproductive health and gender perspectives. CLO 3: Identify reasons for dilemmas and issues related to HIV. CLO 4: Identify reasons for dilemmas and issues related to HIV.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	1. Basic concepts and facts about HIV/AIDS -Transmission of HIV infection -Signs and symptoms of AIDS -Diagnosis of HIV infection -Management and care of HIV infected persons -Prevention of HIV infection -Ethical issues and dilemmas	15	
II	2. Understanding sexuality, reproductive health and the gender perspective -The human reproductive organs and sexual characteristics -Meeting the needs of childhood sexuality -Forms of sexual practise -Harmful side of sex: Sexual abuse 3. Psycho-social aspects of HIV/AIDS -What it means to be HIV positive -Challenges, stigma and discrimination -Emotional toll	15	

III	4. HIV/AIDS counselling -The principles of counselling, goals of HIV/AIDS counselling -The prerequisites of counselling, stages of counselling, specific counselling skills -Assessment of risk behaviour -Characteristics & attitudes of a counsellor, the do's and don't in counselling -Content of communication about HIV/AIDS	15
IV	5. Some specific counselling situations -The activities of pre-test counselling the concept of informed consent -Types of post- test counselling -Activities of various types of post- test counselling -Psycho- social issues linked with positive diagnosis 6. Coping strategies of HIV/AIDS persons 7. Legal issues: -Rights -Ethics	15
Total Contact hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
•Class Participation:	5	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.:	10	
•Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Panthaki, Dhun (1997). Education in Human sexuality, Delhi: Family Planning Association of India		
2. Bharat, S (1996). Facing the challenge-household and community response to HIV/AIDS in Mumbai, Bombay: TISS.		
3. Ahmed, P.I (1992). Living and dying with AIDS. New York: Plenum.		
4. Sonawat R and Mathur S (1999). HIV/AIDS persons coping strategies, Mumbai: Multi Tech Publishing Co.		
5. Banerji, D. (1996). Aids threat of India. Health for Millions.		
6. Hackney, H & Cormier, L.S. (1998). Counselling strategies and interventions. N.J.: Prentice Hall, Inglewood Cliffs		

Session: 2025-26			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Behaviour Science		
Course Code	M24-HDE-307		
Course Type	DEC- 2		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Learning to manage emotions and building interpersonal competence. CLO 2: Gain knowledge about attitudes and positive attitude building. CLO 3: To become aware about the relevance of behaviour communication for relationship management. CLO 4: Identify the components of excellence for developing professional power.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1. Managing Emotions and Building Interpersonal Competence -Need and importance of Emotions -Healthy and Unhealthy expression of emotions -Anger: Conceptualization and Cycle -Developing emotional and interpersonal competence -Self-assessment, analysis and action plan 2. Leading Through Positive Attitude -Understanding Attitudes -Formation of Attitudes -Types of Attitudes -Effects of Attitude on: Behavior, Perception, Motivation, Stress, Adjustment -Time Management -Effective Performance -Building Positive Attitude		15
II	3. Behavioral Communication -Scope of Behavioral Communication		

	-Process – Personal, Impersonal and Interpersonal Communication -Guidelines for developing Human Communication skills -Relevance of Behavioral Communication in relationship management 4. Behavioral Communication -Scope of Behavioral Communication -Process – Personal, Impersonal and Interpersonal Communication -Guidelines for developing Human Communication skills -Relevance of Behavioral Communication in relationship management	15
III	5. Foundation of Interpersonal Relationships -Elements of satisfying relationships -Conforming and Dis-confirming Communication -Culturally Relevant Communication -Guideline for Creating and Sustaining Healthy Climate 6. Individual, Society and Nation -Individual Differences and Dimensions of Personality -Socialization Process -Relating to the Nation: Values, Culture, Religions	15
IV	7. Components of Excellence -Personal Excellence: -Identifying long-term choices and goals -Uncovering the talent, strength & style -Analyzing choke points in your personal processes by analysis in area of placements, events, seminars, conference, extracurricular activities, projects etc. -Developing professional power: Goal-setting, time management, handling criticism	15
Total Contact hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Tersm Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Chatterjee Debashish, Leading Consciously: 1998 1 st Edition, Viva Books Pvt Ltd.		
2. Dr. Dinkmeyer Don, Dr. Losoncy Lewis, The Skills of Encouragement: St. Lucie Press.		
3. Singh, Dalip, 2002, Emotional Intelligence at work; First Edition, Sage Publications.		
4. Goleman, Daniel: Emotional Intelligence, 1995 Edition, Bantam Books		
5. Goleman, Daniel: Working with E.I., 1998 Edition, Bantam Books.		
6. J William Pfeiffer (ed.) Theories and Models in Applied Behavioral Science, Vol 2, Group (1996); Pfeiffer & Company		
7. Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers		
8. Raman, A.T. (2003) Knowledge Management: A Resource Book. Excel Books, Delhi.		
9. Kamalavijayan, D. (2005). Information and Knowledge Management. Macmillan India Ltd. Delhi		

Session: 2025-26			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Health and Well Being		
Course Code	M24-HDE-308		
Course Type	DEC- 2		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Gain knowledge about health and wellness. CLO 2: To know more about the role of diet and nutrition for health and wellness. CLO 3: Know about the prevention of life threatening diseases. CLO 4: Gain knowledge about psychological Wellbeing and resilience.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1. Health and Wellness -Define and differentiate health and wellness -Importance of health and wellness education 2. Yoga and Health -Historical background of yoga and its relevance in contemporary world. -Need and importance of yoga. -Asanas and meditation for healthy well-being. -Prenatal yoga for women well-being. -Yoga and stress management.		15
II	3. Diet and nutrition for health & wellness -Essential components of balanced diet for healthy living -Role of carbohydrates, proteins, fats, vitamins & minerals -Processed foods and unhealthy eating habits and disorders 4. Identification of suicidal tendencies -Substance abuse (Drugs, Cigarette, Alcohol)		15

	-De-addiction -Counselling and rehabilitation.	
III	5. Management of Health and Wellness -Healthy foods for prevention of life threatening diseases with special reference to -Cancer, Hypertension, Diabetes and Cardiovascular diseases -Physical Fitness and components of Physical Fitness 6. Advantages of Good Physique. -Active and sedentary lifestyles and its implications -Postural deformities and its corrective measures	15
IV	7. Psychological wellbeing -Meaning and importance, in personal and professional space -Role of sleep in maintenance of physical and mental health -Resilience for satisfying life -Wellness and responsible citizenship	15
Total Contact hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1.Physical Activity and Health by Claude Bouchard, Steven N. Blair, William L. Haskell. 2. Mental Health Workbook by Emily Attached & Marzia Fernandez, 2021. 3. Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve Well-Being by Nashay Lorick, 2022. 4. Lifestyle Diseases: Lifestyle Disease Management, by C.Nyambichu& Jeff Lumiri, 2018. 5.Physical Activity and Mental Health by Angela Clow & Sarah Edmund, 2013.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Family Ecology and Human Development		
Course Code	M24-HDE-309		
Course Type	DEC- 2		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to: and	CLO 1: Gain knowledge about family and parent child relationships. CLO 2: To impart knowledge about family transitions and communication. CLO 3: To aware students about family stressors and protective factors. CLO 4: To know about impact of emigration and multiculturalism on families.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1.Family relationships -Family as a social system -Socialization within the family -Models of parenting 2.Parent child relationships -Functional and dysfunctional dyads -Family cohesion -Conflict and family disorganization –impact on parenting -Children as family agents		15
II	3.Children and marital life -Child abuse -Bidirectionality in parent child relations -Family interactions and delinquency -Improving family communication and interpersonal relations 4.Family under transition -Family transitions -Change and continuity over life cycle -Needs and problems of families at different developmental		15

	stages -Impact of social change on family -Changing family patterns in India -Religion and family -Family social class and ethnic variations in child rearing	
III	5.Family stressors and resilience -Family as an institution under stress -Family crisis -Poverty and children -Stressors and family relations - with special reference to family disruption, sickness, divorce, substance abuse and disability -Stress Process Model -Family’s adaptation to stress 6.Family resilience and protective factors -Promotion of family resilience -Family environment and social support as a source of risk and resilience for vulnerable children/youth -Inter-generational family dynamics in management of family conflicts and negative patterns	15
IV	7.Impact of consumerism, emigration and multiculturalism on families -Impact of consumerism on rural families -Impact of consumerism on urban families -Impact of emigration on families -Impact of multiculturalism on families -Two culture children and their psycho-social dilemmas -Contemporary issues related to families	15
Total Contact hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1.Carson DK, Carson CK, Chowdhury A. 2007. <i>Indian Families at the Crossroads</i> . Gyan Publishing House, New Delhi 2.Daly KJ. 2007. <i>Qualitative Methods for Family Studies & Human Development</i> . Sage Publications, New Delhi. 3.Falcov CJ. 1991. <i>Family Transitions</i> . Guilford Press, California. 4.Garbarino J, Eckenrode J and Barry F D. 1997. <i>Understanding Abusive Families: An Ecological Approach to Theory and Practice</i> . Jossey-Bass, New York. 5.Grigorenko EL and Stenberg RJ. 2001. <i>Family Environment and Intellectual Functioning: A Life-Span Perspective</i> . Lawrence Erlbaum Associates Publishers, London. 6.Karim AB. 2014. <i>Family Interactions: Concepts, Mechanism & Methods to Improve the Family Communication & Interpersonal Relationships</i> . Successful Family Upbringing Series, Refman. 7.Kuczynski L. 2003. <i>Handbook of Dynamics in Parent-Child Relations</i> . Sage Publications, New Delhi. 8.McCubbin H and Figley CR. 1991. <i>Stress And The Family: Coping with Normative Transitions</i> Routledge. Taylor and Francis Group, New York.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Family Support Therapy		
Course Code	M24-HDE-310		
Course Type	DEC- 2		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Gain insight into theoretical development in family therapy. CLO 2: Know about the areas and social learning approaches of marriage therapy. CLO 3: Gain knowledge about the different areas of family therapy. CLO 4: Know about the future directions of marriage and family therapy.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1. Theoretical development in family therapy 2. Types of family therapy -Structured: Meaning, Types, Usage etc., -Strategic: Meaning, Types, Usage etc., -Experimental: Meaning, Types, Usage etc., -Integrated: Meaning, Types, Usage etc.,		15
II	3. Social Learning Approach -Contemporize Marital Therapies -Psychoanalytic: Meaning, Types, Usage etc., -Behavioral: Meaning, Types, Usage etc., -System Therapy: Meaning, Types, Usage etc., 4. Areas and scope of marriage and family therapy		15
III	5. Different areas of family therapy - Psychosomatic symptoms and remedial therapies - Psychiatric disorders and remedial therapies		

	- Marital distress and remedial therapies - Alcoholism and remedial therapies - Drug dependence and remedial therapies - Juvenile offences and remedial therapies - Conduct Problems and remedial therapies - Work and school Phobias and remedial therapies	15
IV	6. Qualities of marriage and family therapists 7. Advanced techniques of marriage and family therapy 8. Future direction for marriage and family therapy -Bridging research, theory and practices. -Advances in clinical assessment -Preventive and Enrichment Programs	15
Total Contact hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Mark R. 2003. Family Therapy on focus. Sage Publications.		
2. Roger L. 2004. Family therapy- A Constructive Framework. Sage Publications.		

Session: 2025-26			
Part A - Introduction			
Name of the Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Psychotherapeutic Interventions for Family		
Course Code	M24-HDE-311		
Course Type	PC- 5		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Gain insight into the counselling process used in various centres. CLO 2: Learn to assess the behaviour problems of children. CLO 3: Plan and prepare nukkad natak on parents needs. CLO 4: Learn to conduct case studies.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours (or as decided by PGBOS)	
Part B- Contents of the Course			
1. Compiling research reviews on various aspects of guidance and counseling. 2. Preparing a checklist to observe and analyze guidance and counseling centers: 3. Their organizational structure, objectives, types of services provided, available facilities, staff competencies and problems experienced by them, etc. 4. Interaction with practicing counselors and therapists -Through visit to Hospitals -Schools -Women Centers -Clinics and write a report about the organization and its functions 4. Aassessment of behavior problems among children 5. Organizing parent education programs based on parents needs: -Behavior problems -Emotional problems among children 6. Preparation of Skit/Nukkad Natak and various aids on parent needs 7. Case study of an adolescent 8. Resource file 9. Prepare an iinterview schedule for Parents of Children with behavior/conduct disorders/ academic difficulties 10. Interview adults with marital problems/divorced persons and report them 11. Use of various inventories for this purpose 12. Organizing Guidance sessions and Development of intervention for Youth and Adult stage			

13. Development of leaflet on counseling ethics			
Practicals			Contact Hours
	<Instruction regarding Practicals> <Syllabus/ List of Practicals> 1. Lectures 2. Case studies of guidance & counselling institutions/ clinics– analysis & discussion 3. Viewing related video clips-report writing and discussion 4. Field visits to different guidance and counselling centers/ institutions 5. Interviews with clients of such centers and counselors. 6. Observations and analysis of profile & issues of clients.		120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2024-25			
Part A - Introduction			
Name of the Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Interventions for Youth and Adults for their Health and Mental Well-being		
Course Code	M24-HDE-312		
Course Type	PC - 6		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Learn to prepare interview schedules for adults. CLO 2: Learn more about psychosocial behavior of youth. CLO 3: Learn about mental health issues amongst youth. CLO 4: Interact with professional from allied fields.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours (or as decided by PGBOS)	
Part B- Contents of the Course			
1. Formulation of questionnaire to assess problems and conflicts of Youth and Adults 2. Preparation of Interview schedule for adults, taking into account their developmental tasks 3. Plan and organize group discussions for healthy and responsible psycho social behaviour of Youth 4.Organizing interactive sessions and focused group discussions if possible with professionals from allied fields, on significant issues of adulthood: Stress/Anger/Depression/Work-Leisure balance 5. Preparation of chart/poster on any one issue of mental health for youth 6. Conversations and Interview of an adult for an in-depth Case study, to highlight their concerns, anxieties, adjustment and other problems 7.Conduct debate on current mental health issues amongst Youth and write reports, for and against the motion 8. Reports and resource files to be maintained by students			

Practicals		Contact Hours
	<Instruction regarding Practical> <Syllabus/ List of Practical> 1. community based intervention -role of governmental and non-governmental organizations, self-help groups, role of psychiatry and counseling, psychosocial rehabilitation	120
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2025-26			
Part A - Introduction			
Name of the Programme	MSc. Home Science (Human Development)		
Semester	III		
Name of the Course	Marriage and Family Dynamics		
Course Code	M24-OEC-323		
Course Type	OEC		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	B.Sc. Home Science/Any branch of life Sciences or Food/Nutrition/Dietetics/Psychology/Human Development as one of the main subject at under graduate level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand key concepts concerning marriage and family dynamics. CLO 2: Gain knowledge about kinship and family evolution. CLO 3: To know about the various trends in family pattern and adjustment. CLO 4: Gain knowledge about various laws and technical advancement related to marriage.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	1. Significance of the term 'Family Dynamics' -Marriage and family as an institution and its importance 2. Marriage: -Marriage- Purpose, Motives, Functions & types -Marriage in different Indian Societies -Traditional marriage and modern marriage -Readiness for marriage 3. Compatibility in Marriage: -Premarital Counselling -Marital harmony & personal compatibility in marriage	8	
II	4. Kinship: -Terminology, Principles, Patterns & Types of Kin groups -Degrees, Decent, Usage & its influence. -Kinship trees for Families of Origin. 5. Family: -Origin, Evolution, Meaning, Structure and Forms of families. -Family and its changing functions.	7	

	-Approaches of family- Biological, Historical, Sociological, Developmental -Family life cycle & development tasks (seven stages of family Life cycle)	
III	Changing trends in family system 6. Family Patterns: -Alternate Family Patterns-causes, Characteristics and Implications -Family dyadic relationships-filial, Fraternal, Conjugal, in-laws, Grandparent-children -Multiple roles of women -Role change & conflicts. 7. Family Adjustments and Disorganization: -Areas of adjustment -Patterns of adjustment -Causes and consequences of disorganization 8. Crises and Counselling: -Crises in family life: Meaning, Types -Current family problems -Marriage and family counselling	8
IV	9. Laws: -Laws related to marriage and families in various religions and cultural settings of India 10. Technological Advancement and family: -Various impacts of technology on the family life. 11. Demographic profiles: -Of women and children (with special reference to India). 12. Survey of families: -With different backgrounds for understanding the changing scenario of families in the present context -Post marital counselling	7
Total Contact Hours		30
Suggested Evaluation Methods		
Internal Assessment: 15		End Term Examination: 35
➤ Theory	15	➤ Theory 35
• Class Participation:	4	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	4	
• Mid-Term Exam:	7	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Olson, D, DeFrain, and J, Skogrand, L (2011). Marriages and Families: Intimacy, Diversity and Strength. McGraw Hill Publication.
2. Benokraitis, N (2015). Marriages & Families : Changes, Choices and Constraints. Pearson Education, Inc.
3. Carr, A. (2000). Family Therapy: Concepts, Process and Practice. John Wiley & Sons, Ltd. New York.
4. Metcalf. L. (2011). Family and Marital Therapy. Springer Publishing Co. New Y
5. Niclos. M. & Schwartz R.C (2004) Ed. Family therapy-concepts and methods. CA Allyn and Bacon
6. Napier. A.Y & Whitaker, C. (1988) Ed. The family crucible- The intense experience of family therapy, New York,
7. Becvar, D.S. & Beevar, R.J. (2005) Ed. Family therapy- A systemic integration. Massachusetts. Allyn & Bacon

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act-XII of 1956)
("A++" Grade, NAAC Accredited)



Syllabus
for
Post Graduate Programme
M.Sc. Home Science (Clothing and Textiles)

as per NEP 2020
Curriculum and Credit Framework for Postgraduate Programme

CBCS-LOCF
With effect from the session 2025-26

DEPARTMENT OF HOME SCIENCE
FACULTY OF LIFE SCIENCES

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA

Semester-3

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Entrepreneurship Management		
Course Code	M24-CLT-301		
Course Type	CC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Understand business environment for the entrepreneur government of Indian policy. CLO2: to learn management techniques- planning, organizing, executing, controlling. CLO3: understand the role of agencies like SSI MIDC and MSIC. CLO4: Understand about the communication- importance of business communication, principle, promotions etc. and learn how to establish an enterprise.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	I. Entrepreneurship – Definition, characteristics, employment promotion, efforts to promote entrepreneurship. II. Business environment for the entrepreneur. Government of India's policy towards promotion of entrepreneurship, reservations and sanctions for small scale sector.	15	
II	III. Agencies for development of entrepreneurship – Role of SSI, procedure and formalities for setting up SSI, Role of MIDC in Industrial development, Role of NSIC – supply of machinery and equipment on like purchase, voluntary organization, Bank loan. IV. Personal effectiveness; Factors affecting entrepreneurs role, effective communication skills, achievement motivation, goal orientation,	15	

	psychological barriers to self-employment	
III	V. Technical communication – Importance of Business communication, Principles, Procedures, Formulation of project proposal, Budget estimate and Feasibility of report. VI. Establishing an enterprise – Problems, information, source / schemes of assistance etc.	15
IV	VII. Management Techniques: - Planning, Organizing, Appointing Staffs, Executing, Controlling and Review. Financial Management, Working Capital, Bank Funding, Calculating Risks, Personal Management, Product Management, Purchase Techniques, Costing, Marketing Management, Sales Promotion, Labour Law Application.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory		➤ Theory:
•Class Participation:		70
•Seminar/presentation/assignment/quiz/class test etc.:		Written Examination
•Mid-Term Exam:		
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Kanitkar, A. (1995) Grassroots, Entrepreneurship; Entrepreneurs and Micro – Enterprises in Rural India, New Age International, New Delhi.		
2. S.K.G. – Sundaram: Entrepreneurship: A Hand Book for Beginners, S.N.D.T. Women’s University, Mumbai.		
3. G. R. Jain and Debnuni Gupta, New Initiatives in Entrepreneurship Education and Training, ed.		
4. W. Harrell (1995) For Entrepreneurs Only, New Jersey, Career.		
5. Sarabhai Vikram (1974): Management for Development, Vikas Publishing House Pvt. Ltd.,		
6. Michael Armotrong (1986): A Handbook of Management Techniques, Kogar Page Limited.		
7. K. Sadgrove (1997), the complete Guide to Business Risk Management, Jaice Publishing House, Mumbai.		
8. Colin Melver : Case Studies in Marketing, Advertising and Public Relations, Heinemann, London.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Garment Production Technology		
Course Code	M24-CLT-302		
Course Type	CC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Gain knowledge of garment industry, structure and functioning. CLO2: Understand the related to processes before, during and after production. CLO3: Familiarity with various machines, tools and equipment used in garment industry. CLO4: Understand various materials and components of garment production.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to the Background and Structure of the Garment / creating Industry. The organization of garment factory 1. Principles of Management. 2. Various Departments like: (i) Design Departments (ii) Marketing Departments (iii) Finance Departments (iv) Purchasing Departments (v) Production Departments (vi) Operations Departments		15
II	Manufacturing Technology A) Cutting & Cutting Room (i) Market planning (ii) Efficiency, Method & use of worker plan. Methods of spreading of fabric and requirements of the spreading process. Cutting the fabric – objectives and methods of cutting fabric. Fusing		15

	Technology.	
III	Sewing Technology Sewing – Properties, Stitch types – Types of Sewing Machines – Feed machines and Types of Needles. Sewing threads – Types of fiber used, construction and finishing, thread size, thread packaging, thread costs, thread properties and seam performance. Sewing problems; Stitch formation, damage along the seam line puckering. Testing for sewability and Tailor ability.	15
IV	Use of components and Trims, Alternative Methods of forming materials Fusing Welding and adhesives, Moulding, Pressing Technology Production Technology Ware Housing Engineering & Quality Control Production Engineering Principles of Quality Control.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Gerry Cooklin – Introduction to Clothing Manufacture, Black Well Sciences. 2. Harold Carr & Barbara Lathare – The Technology of Clothing Manufacture – Blackwell Science. 3. A.J. Chuter – Introduction to Clothing Production Management Blackwell Science. 4. D. J. Tyles – Materials Management in Clothing production – Blackwell Science. 5. Harold Carr & Barbara Lathan (1992): Fashion Design and Product Development – Blackwell Science. 6. Mike Easey – Fashion Marketing. Blackwell Science. 7. Stylios, G. (1991): Textiles objective Measurement and Automation in Garment Manufacture, Ellis Horword Ltd., New York, London, Singapore.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Functional Clothing		
Course Code	M24-CLT-303		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understanding Importance of user centric functional clothing CLO 2: Learning about required features in the garment for enhanced mobility CLO 3: Exploring features to be incorporated in protective clothing CLO 4: Gathering information regarding clothing to enhance body functions		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours	3 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	User Centered Design • Conducting research • Defining problem • Design strategies		15
II	Providing Mobility in Clothing • Expansion of clothing during movement • Increased mobility in clothing • Fit and movement		15
III	Protective Clothing • Clothing system for thermal protection • Impact –protective clothing • Protective clothing design for radiation hazard		15
IV	Clothing to Enhance and Augment Body Functions • Clothing for sensory perception • Clothing for high visibility • Clothing for physical strength enhancement • Clothing for protection from water • Clothing for special need		15

• Smart textiles			
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
•Class Participation:	5	Written Examination	
•Seminar/presentation/assignment/quiz/class test etc.:	10		
•Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1) Hayes, S.G., and Venkatraman, P. (2017) Material and Technology for Sportswear and Performance Apparel, CRC Press.			
2) Song, G. (ed.) (2011) Improving Comfort in Clothing, Woodhead Publishing.			
3) Watkins, S.M., and Dune, L.E. (2015) Functional Clothing Design, from Sportswear to Spacesuit, Fairchild Books, New York.			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Textiles For Home & Hospitality		
Course Code	M24-CLT-304		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Recall the salient features of various period styles of furnishings. CLO 2: Classify the textiles used for home & hospitality and describe their selection criteria. CLO 3: Explain the role of emerging trends in fashion and technology used in textiles for home and hospitality. CLO 4: Discuss the growing market for home & hospitality and the major production centers in India.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours	3 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Textiles Used in Home and Hospitality - Textiles used in home and various sectors of hospitality like hospitals, modes of travelling (airlines, railways, automobiles etc.), restaurants and hotels - Different styles in home furnishings. - Classification of textiles for home and hospitality (hard and soft): upholstery fabrics, window textiles, bed linen and other bed textiles, bathroom textiles, kitchen and table linen, floor coverings-rugs and carpets		15
II	Selection, Use, Care, Storage and Maintenance Various parameters for selecting textiles for home and hospitality (types, standard sizes, construction, performance, durability, aesthetics,		15

	price range etc.) • Informative labelling and Packaging • Government regulations and standards • Maintenance of various product categories at domestic and commercial levels		
III	Influence of Fashion and Technology • Contemporary fashion trends in textiles for home and hospitality and forecast for the future • Factors affecting selection of design (end use, size and type of room, type of arrangement, type of furniture, geographical location etc.) • Designers, Brands and Outlets dealing with furnishings • Innovations in technology, high performance materials and use of finishes to enhance functionality • Sustainable and eco-friendly practices in textiles used for home and hospitality	15	
IV	Manufacturing and Production Capacity of Textiles for Home and Hospitality • Textiles for home and hospitality: Global Vs Indian market • Growing domestic market and major production centers • Present status of the industry and areas for improvement	15	
Total Contact Hours		60	
Internal Assessment: 30		End Term Examination: 70	
➤ Theory		30	➤ Theory: 70
• Class Participation:		5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:		10	
• Mid-Term Exam:		15	
Part C-Learning Resources			
Recommended Books/e-resources/LMS: • Das, Subrata (2010) Performance of Home Textiles, New Delhi, Woodland Publishing India Pvt Ltd • Howes, Karen (1997) Making the Most of Bedrooms, London, Conran Octopus • Lebeau, Caroline (2004) Fabrics- the Decorative Art of Textiles, London, Thames and Hudson • Neiswand, Nonie (1998) Bedrooms and Bathrooms, London, Conran Octopus • Ranall, Charles T. (2002) Encyclopedia of Window Fashions, California, Randall International • Wingate, Isabel B. (1949) Textile Fabrics and Their Selection, New York, Prentice Hall			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Knitting Technology		
Course Code	M24-CLT-305		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: learn about knitting technology and terms used in knitting CLO2: Gain knowledge about Indian knitting industry- past, present and future CLO3: Know about development of hand knitting to machine knitting CLO4: Study about basic wrap knit stitches, waste reduction techniques and future developments		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours	3 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Knitting Technology; - Evolution and significance of knitting in Textile Industry. Comparison of knitted, woven, non-woven fabrics Classification of processes involved in knitting.		15
II	Knitted fabric defects. Comparison of warp and weft knitting. Basic weft knit stitches – single jersey, rib, purl, interlock, float & tuck stitches. Basic warp knit stitches – Under lap, closed lap, open lap.		15
III	Development of knitting from hand knitting to machine knitting and further developments. Weft knitting - Basic structure, stitches, designing of weft- knit structures, needle and yarn selection of weft knitting. Quality control of weft knit fabrics.		

		15
IV	Warp knitting- development of warp knitting machines, basic warp knit structures and their representation. Tricot and Raschel knits - principle, machines and production methods Waste reduction techniques in knitting by recycling and reusing knitting waste. Robotics in knitting Technology. Future directions in knitting technology.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
•Class Participation:	5	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.:	10	
•Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Prof. Ajgaonkar D.B., "Knitting Technology", University Publishing Co. Mumbai. • Brackenbury Terry, "Knitting clothing Technology", Blackwell Science, U.K. • Spencer David J., "Knitting Technology", Pregeman Press, U.K.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Apparel &Textile Designing		
Course Code	M24-CLT-306		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Learn about apparel designing and influence of social media. CLO2: Learn about various fabric types and their handling. CLO3: Learn textile designing and its applications CLO4: Present day scenario of textile designing and sustainable textile practices		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours	3 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Apparel designing: • Definition, Meaning and Importance, Origin and History. Apparel Designing and Influence of Celebrities, social media and upcoming generations on it.		15
II	Factors influencing selection of fabric Special consideration in designing and layout of the garment for prints, stripes, checks, pile fabric. Handling of special fabric while cutting and stitching. (Deep pile, lace, velvet, chiffon, knits, leather) Supporting Fabrics: Interlining, Interfacing, Underlining: their functions and application		15
III	Textile designing: Meaning & Importance of Textile Designing. Differentiate between		15

	Apparel and Textile Designing Different techniques/methods of textile designing Elements of Textile Design, Motifs, Styles, Repeats, Layouts, Exploration and Stylization of designs, Construction of designs from incomplete repeats.		
IV	Scope of Textile Designing in Fashion Industry. Present Day Scenario of Textile Designing in Textile Industry of India. Circular Economy in Textiles, Sustainable Textile Practices and their scope &benefits to the society. Contemporary interpretations of Traditional Crafts	15	
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory		30	➤ Theory: 70
•Class Participation:		5	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.:		10	
•Mid-Term Exam:		15	
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
• Gioello and Berke: Figure Type and Size Ramnge, Fairchild Publications, New York.			
• Allen Anne Seaman Julian Fashion Drawing the Basic Principles B.T. Batsford Ltd. London.			
• Grociki, Z.J.: Textiles Design and Colour, London, Longmans Green and Co. Ltd.			
• William Watson: Advanced Textiles Design, London, Longmans Green and Co. Bombay.			
• Nisbet, H : Grammar of Textile Design, Tarapoprewale Sons and Co. Bombay.			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Laundry Science and Finishing of Fabrics		
Course Code	M24-CLT-307		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Learn about various laundering processes CLO 2: Know different equipments used in laundry and how to use them in daily life. CLO 3: Learn about soaps and detergents and their ingredients and manufacturing process. CLO 4: Know about removal of different stains from fabrics in day to day life		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours	3 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Laundry process; Laundry equipments and their use Working of different electronic gadgets used in daily life and their Care and Maintenance		15
II	Soaps and supplies: Soaps and detergents; Stiffening Agents; Blueing Agents; Bleaching & other laundry reagents; Grease absorbents & solvents.		15
III	Use and care of fabrics. Dry cleaning of different clothes Storage and Care of Clothing Stains - classification of stains, methods of removing different types of stains.		15
IV	Fabric Finishing – Overview and Need, Significance in various clothing types. • Specialty and Heritage Finishing Methods their advantages and		15

	- process-like jacquard, ciboria, brocades etc. - Sustainable and Eco-friendly finishing used in textile industry.		
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Corbman BP (19810) Textiles Fibre to fabric MC Graw Hill, New York.			
2. Hollen N & Saddler J Textiles (Latest Edition) Mac Mittan & Co. New York.			
3. Joseph M.L. (1976) Essentials of Textiles holt Ripeniart of Winston, New York.			
4. Joseph M.L. (1972) Introductory Textiles Science Holt Ripenhart of Winston, New York.			
5. Tortorc P.G. (1978) Understanding Textiles New York Mac Milan Publishing Inc.			
6. Gupta Sushma (20010) Text Book of Clothing Textiles and Laundry. Kalyani Publishers New Delhi.			
7. Deulkar Durga (1988) Household Textiles and Laundry Work, Atma Ram and Sons. Kashmiri Gate Delhi – 6			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Fabric Manufacture		
Course Code	M24-CLT-308		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Learn about basic terminology and overview of textile industry. CLO2: Develop expertise in selecting appropriate fabrics, international fabrics and textile materials, and their scope. CLO3: Gain knowledge of carbon footprints, and their after effects. CLO4: To create innovations in fabric manufacture.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours	3 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1) Introduction to the term Fabric and related terminology. Fabric count, Fabric Identification. 2)An Overview of the Textile Industry; - *Mill sector/organized sector *Power loom sector/unorganized sector *Handloom sector/cooperatives/unorganized sector Discussion of all above with special reference to minimum lengths possible, scope for design intervention, lead times and cost.		15
II	International Fabrics and Textile Materials in the Indian market their demand supply and significance for the customer. Sourcing of different Fabrics; - International and National Scope for international and national fabrics in comparison with each other.		15
III	Processing of different fabrics with reference to; -Texture, colour and		15

	performance plus ability of the same. Carbon Footprints in textile industry and their effects on environment. Awareness towards bad effects of carbon footprints. Present day status of Indian textile materials in the fashion industry and their demand in western culture.	
IV	1) Innovations in Fabrics (intrinsic and visual) integrating into design practice a) International b) National c)Role of NGO’s in development and promotion of fabrics. 2)Understanding linings and interlinings-a designer perspective “Green Design in terms of fibre content, finish and garment packaging. 3) Interrelating Garment and Fabric Designs.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
•Class Participation:	5	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.:	10	
•Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. S. H., Hengky. "Image Analysis: Textile Industry in Indonesia." World Journal of Business and Management 1, no. 1 (June 25, 2015): http://dx.doi.org/10.5296/wjbm.v1i1.7883 .		
2. Lyons, Agnes M. M. "The Textile Fabrics of India and Huddersfield Cloth Industry." Textile History 27, no. 2 (January 1996): http://dx.doi.org/10.1179/004049696793711202 .		
3. Exploring Textile Arts: The Ultimate Guide to Manipulating, Coloring, and Embellishing Fabrics, by the Editors of Creative Publishing International, Inc. 2002, Creative Publishing International, Inc. ISBN# 1589230485		
4. The Maker’s Hand, by Peter Collingsworth, 1987, Lark Books and Interweave Press.		
5. Handbook of Textile Design: Principles, Processes and Practice (PB) By Wilson		
6. 1st Edition Emerging Technologies for Textile Coloration Edited By Mohd Yusuf, Mohammad Shahid Copyright 2022		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Indian Traditional Arts		
Course Code	M24-CLT-309		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand and explore various Indian arts. CLO 2: to give an insight and input about various aspects of history of Indian art right from its origin. CLO 3: students will learn about the historic importance and relevance of various aspects of Indian miniatures. CLO 4: students will get inspired and be influenced for their own creations		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours	3 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Historical context of the following; - - Study Art and Architecture of Indus valley Civilization - Art and Architecture during Mohenjo-Daro and Harappa Civilization - Gupta Architecture - Mauryan art		15
II	To explore and review the traditional art of following; - Ajanta& Ellora - Temples of Orissa - Khajuraho		15
III	Descriptive and Detailed study of the following - Mughal Miniatures - Rajasthani Miniatures - Pahari miniatures - Buddhist Jatakas		15

IV	Study of various art and architecture of following; • Tomb of Humayun • Mewar Art, • Miniature Paintings of India • Taj Mahal of Agra • Buland Darwaza	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
• Indian Architecture (Hindu & Buddhist) By Percy Brown		
*Indian Architecture (Islamic) By Percy Brown		
*The Art of India by C. Sivaramamurti		
*History of Fine Arts by Edith Tomory.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Textile Waste Management		
Course Code	M24-CLT-310		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the usage of textile waste. CLO 2: To understand how to manage and reuse the textile waste. CLO 3: To get theoretical and practical knowledge about different types of methods used in waste management of textiles. CLO 4: To acquaint the students with skills of making appropriate materials by using textile wastes.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours	3 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Definition of textile wastes. Different methods of managing textile waste. 3R s of waste management. Recycling vs upcycling.		15
II	Overview of textile industry. Waste fabrics- tool for women empowerment. Textile waste products and their usage.		15
III	Textile waste management and environmental concerns. Deadly waste in garment manufacturing. Textile industry-threat to nature. Different types of pollution.		15
IV	Solid waste management in textile industry. Awareness among new generation for value addition of post-consumer textile waste. Challenges faced by labourers in textile industry. Government initiatives and policies to manage textile waste.		15

Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Rajkishore Nayak and Asis Patnayik (2021): Waste Management in the Fashion and Textile Industry.			
2. Pintu Pandit, Shakeel Ahmed, Kunal Singha, Sanjay Shrivastava (2020): Recycling from Waste in Fashion and Textiles: A Sustainable and Circular Economic Approach			
3. Ayşegül Körlü; Waste in Textile and Leather Sectors.			
4. Waste Management in the Fashion and Textile Industries. The Textile Institute Book Series.			
5. See Felett: C. (1980): A curriculum for preschools, Columbus: Charles E. Merrill Publishing company			
6. Hurlock, Elizabeth B. (2017). Child Development Sixth Edition. MC-Graw Hill Book Co. New Delhi.			
7. Berk, Laura E (2022). Child Development. 9th edition, Prentice Hall of India, Private Ltd. New Delhi.			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Printing In Textiles		
Course Code	M24-CLT-311		
Course Type	PC-5		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: understand the different styles and methods involved in printing Textiles. CLO2: learn to make various Indian printing techniques CLO3: recognize the difference between different kinds of prints and their processing. CLO4: apply various printing methods on different types of fabrics and create designs.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours (or as decided by PGBOS)	
Part B- Contents of the Course			
Practicals			Contact Hours
	1. Develop at least two designs each for various printing techniques mentioned below, and Also create a Mixed sample (paper +fabric design) folder for the same along with sheet work. • Madhubani art • Kalamkari printing • Nib painting • Lippan art inspired Fabric painting • Gond Art • Mandala Art • Bagh/Rajput painting on Textiles 2. Develop at least three functional or decorative products using any printing technique done earlier above. You can combine and create a fusion surface design also. 3. Make one article using ecofriendly material or make use of textile upcycling techniques and use old discarded fabrics refreshing them using any printing or painting techniques .Offered end products can include wall hanging, diary covers, wall organizers, kits, fashion accessories etc.		
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	

➤ Practicum	30	➤ Practicum	70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. A. Shenai (1987), Chemistry of Dyes and Principles of Dyeing Sevak Prakashan, Mumbai.			
2. H. A. Lubs, Robert E. The Chemistry of Synthetic Dyes and pigments, Krieger Publishing Company, New York.			
3. V. A. Shenai (1999), Azo Dyes – Facts and Figures – Sevak Prakashan, Mumbai.			
4. R. S. Prayag, Technology Textile Printing – Noyes Data Corporation.			
5. V.A. Shenai (1977), Technology of Printing – Technology of Textile Processing, Vol. IV, Sevak Publication.			
6. M.L. Gulrajani and Deepti Gupta (1990), Natural dyes and their Application to Textiles”, ed. I.T.I. Delhi Publications.			
7. John and Margarot Cannow (1994), Dye Plants and Dyeing, The Herbert Press (UK).			
8. ASTM and ISI Standards.			
9. K. Venkatrama (1970), Chemistry of Synthetic Dyes, Part I and II.			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Advance Fashion Illustration		
Course Code	M24-CLT-312		
Course Type	PC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Understand the sketching of basic action croquis CLO2: Illustrate garment details and developing a line of garment on theme. CLO3: Develop basic rendering techniques CLO4: Create and display theme based croquis		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours (or as decided by PGBOS)	
Part B- Contents of the Course			
Practicals			Contact Hours
	• Sketching of different action croqui (based on basic figure learnt earlier) • Garments and garment details: - • Necklines and collars • Sleeves details • Skirts & pants • Blouses, coats & jackets • Drawstring & fastenings • Pleats, gathers, darts and tucks • Frills, flounces, ruffles, fringes • Cowls & cascades& headgears • Footwear • Bags & Purses • Jewelry • Basic Rendering Techniques: • - Colour Macrames and patch work. • -Shirring, smoking, quilting • Yokes and ties • . • 3. Sketching of Accessories: • Hats matching using different mediums. • Stripes Checks, gingham and plaids. • Patterns & textures • Shading techniques		120

	Theme Rendering: Developing a line of garments based on a theme (any one the following) • Beachwear - Cocktail wear • Swimwear - Eveningwear • Casual wear - Ramp wear • Action/Sportswear – • Executive wear • Nightwear - Traditional Indian Costume	
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
•Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Abling Bina, Fashion Sketchbook, Fairchild Publishers, New York.		
2. Mckelvey Kathyarn, Illustrating Fashion Blackwell Science Munslow Janine.		
3. Seaman Julian, Professional Fashion Illustration, B.T. Batsord Ltd. London.		
4. Ireland, Patrick John, Fashion Illustration, B.T. Batsford Ltd. London.		
5. Allen Anne Seaman Julian Fashion Drawing The Basic Principles B.T. Batsford Ltd. London.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Home Science (Clothing and Textiles)		
Semester	3		
Name of the Course	Nutrition for Holistic Health		
Course Code	M24-OEC-322		
Course Type	OEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Importance of macro nutrients in maintaining good health CLO2: Familiarize with the micro nutrients of food group system CLO 3: Impart knowledge on food groups and meal Planning. CLO4. Gain knowledge about balanced diet and therapeutic diet.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Food: Functions of food and classification. • Essential food constituents: ○ Carbohydrates ○ Proteins ○ Fats Fiber: Role of fiber in human nutrition.	8	
II	Dietary sources, functions, daily allowances, deficiency and excess of following: ○ Vitamin: A, D, E, K, B1, B2, B3, B12, C ○ Minerals: Calcium, iron, iodine, sodium, potassium.	8	

	• Functions of water in the body.		
III	• Food groups • Food Pyramid • Meal Planning: Meaning and introduction • Principles of meal planning, factors affecting it.	7	
IV	• My food plate • Balanced diet, its concept and points to be considered while planning a balanced diet. • Therapeutic diet and its diets and principals	7	
Total Contact Hours		30	
Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
➤ Theory	15	➤ Theory:	35
• Class Participation:	4	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	4		
• Mid-Term Exam:	7		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
4. B. Shrilakshmi, (2007): Dietetics, published by K.K Gupta for New Age International Pvt. Ltd. New Delhi			
6. Passmore P, and M.A. East Wood: Human Nutrition and Dietetics, Churchill Living Stone			
7. Antia F.P.and Philip Abraham (2001) Clinical Nutrition and Dietetics, Oxford Publishing Company			
8. Wohlshils and Goodheart: Modern Nutrition in Health and Disease, McLaren and Ubrman, Philadelphia			
9. Stanfield S. P. and Hui Y.H: Nutrition and Diet Therapy14th Edition Jones and Barlett Publishers Sudbury, Massachusetts			

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

("A++" Grade, NAAC Accredited)



Revised Scheme of Examination for

Post Graduate Programme

M.Sc. Chemistry

as per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme

With Multiple Entry-Exit, Internship and CBCS-LOCF

With effect from the session 2025-26 (in phased manner)

**DEPARTMENT OF CHEMISTRY
FACULTY OF SCIENCES**

**KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA**

Programme Learning Outcomes(PLOs) for PG Programmes as per NEP-2020

PLOs for a M.Sc. Chemistry

PLOs	<u>M.Sc. Chemistry</u>
	After the completion of <u>M.Sc. Chemistry</u> the student will be able to:
PLO-1: Knowledge and Understanding	Demonstrate the fundamental and advanced knowledge of the subject and understanding of recent developments and issues, including methods and techniques, related to the Chemistry.
PLO-2: General Skills	Acquire the general skills required for performing and accomplishing the tasks as expected to be done by a skilled professional in the fields of Chemistry.
PLO-3: Technical/ Professional Skills	Demonstrate the learning of advanced cognitive technical/professional skills required for completing the specialized tasks related to the profession and for conducting and analyzing the relevant research tasks in different domains of the Chemistry.
PLO-4: Communication Skills	Effectively communicate the attained skills of the Chemistry in well-structured and productive manner to the society at large.
PLO-5: Application of Knowledge and Skills	Apply the acquired knowledge and skills to the problems in the subject area, and to identify and analyze the issues where the attained knowledge and skills can be applied by carrying out research investigations to formulate evidence-based solutions to complex and unpredictable problems associated with the field of Chemistry or otherwise.
PLO-6: Critical thinking and Research Aptitude	Attain the capability of critical thinking in intra/inter-disciplinary areas of the Chemistry enabling to formulate, synthesize, and articulate issues for designing of research proposals, testing hypotheses, and drawing inferences based on the analysis.
PLO-7: Constitutional, Humanistic, Moral Values and Ethics	Know constitutional, humanistic, moral and ethical values, and intellectual property rights to become a scholar/professional with ingrained values in expanding knowledge for the society, and to avoid unethical practices such as fabrication, falsification or misrepresentation of data or committing plagiarism.
PLO-8: Capabilities/qualities and mindset	To exercise personal responsibility for the outputs of own work as well as of group/team and for managing complex and challenging work(s) that requires new/strategic approaches.
PLO-9: Employability and job-ready skills	Attain the knowledge and skills required for increasing employment potential, adapting to the future work and responding to the rapidly changing demands of the employers/industry/society with time.

Kurukshetra University, Kurukshetra

Revised Scheme of Examination for Postgraduate Programme M.Sc. Chemistry
as per NEP 2020 Curriculum and Credit Framework for Postgraduate Programmes
(CBCS LOCF) with effect from the session 2025-26 (in phased manner)

Framework-2 Scheme-P

S e m e s t e r	Course Type	Course Code	Nomenclature of course	Theory (Th)/ Practical (P)	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
						Total	L	T	P	Total				
1	CC-1	M24-CHE-101	Inorganic Chemistry-I	Th	4	26	4	0	0	4	30	70	100	3
	CC-2	M24-CHE-102	Physical Chemistry-I	Th	4		4	0	0	4	30	70	100	3
	CC-3	M24-CHE-103	Organic Chemistry-I	Th	4		4	0	0	4	30	70	100	3
	CC-4	M24-CHE-104	Environmental and Bioinorganic Chemistry	Th	3		3	0	0	3	25	50	75	3
	PC-1	M24-CHE-105	Inorganic Chemistry Practical-I	P	3		0	0	6	6	25	50	75	6
	PC-2	M24-CHE-106	Physical Chemistry Practical-I	P	3		0	0	6	6	25	50	75	6
	PC-3	M24-CHE-107	Organic Chemistry Practical-I	P	3		0	0	6	6	25	50	75	6
	SEM	M24-CHE-108	Seminar	S	2		0	0	0	2	0	50	50	1

2	CC-5	M24-CHE-201	Inorganic Chemistry-II	Th	4	26	4	0	0	4	30	70	100	3
	CC-6	M24-CHE-202	Physical Chemistry-II	Th	4		4	0	0	4	30	70	100	3
	CC-7	M24-CHE-203	Organic Chemistry-II	Th	4		4	0	0	4	30	70	100	3
	CC-8	M24-CHE-204	Spectroscopy and XRD	Th	3		3	0	0	3	25	50	75	3
	PC-4	M24-CHE-205	Inorganic Chemistry Practical-II	P	3		0	0	6	6	25	50	75	6
	PC-5	M24-CHE-206	Physical Chemistry Practical-II	P	3		0	0	6	6	25	50	75	6
	PC-6	M24-CHE-207	Organic Chemistry Practical-II	P	3		0	0	6	6	25	50	75	6
	CHM	M24-CHM-201	Constitutional, Human and Moral Values and IPR	Th	2		2	0	0	2	15	35	50	3
	Internship	M24-INT-200	An internship course of 4 Credits of 4-6 weeks duration during summer vacation after IInd semester is to be completed by every student. Internship can be either for enhancing the employability or for developing the research aptitude.									50	50	100
3	CC-9	M24-CHE-301	Advanced Organic Spectroscopy	Th	4	26	4	0	0	4	30	70	100	3
	CC-10	M24-CHE-302	Physical Chemistry-III	Th	4		4	0	0	4	30	70	100	3
	DEC-1	M24-CHE-303	Inorganic Chemistry Special-I	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-304	Physical Chemistry Special-I	Th	4		4	0	0	4	30	70	100	3

		M24-CHE-305	Organic Chemistry Special-I	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-306	Pharmaceutical Chemistry Special-I	Th	4		4	0	0	4	30	70	100	3
	DEC-2	M24-CHE-307	Inorganic Chemistry Special-II	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-308	Physical Chemistry Special-II	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-309	Organic Chemistry Special-II	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-310	Pharmaceutical Chemistry Special-II	Th	4		4	0	0	4	30	70	100	3
	PC-7 *	M24-CHE-311A	Inorganic Chemistry Special Practical-I	P	4		0	0	8	8	30	70	100	6
		M24-CHE-311B	Physical Chemistry Special Practical-I	P	4		0	0	8	8	30	70	100	6
		M24-CHE-311C	Organic Chemistry Special Practical-I	P	4		0	0	8	8	30	70	100	6
		M24-CHE-311D	Pharmaceutical Chemistry Special Practical-I	P	4		0	0	8	8	30	70	100	6
	PC-8 *	M24-CHE-312A	Inorganic Chemistry Special Practical-II	P	4		0	0	8	8	30	70	100	6
		M24-CHE-312B	Physical Chemistry Special Practical-II	P	4		0	0	8	8	30	70	100	6
		M24-CHE-312C	Organic Chemistry Special Practical-II	P	4		0	0	8	8	30	70	100	6
		M24-CHE-312D	Pharmaceutical Chemistry Special Practical-II	P	4		0	0	8	8	30	70	100	6

	OEC	M24-OEC-305	Applied Chemistry	Th	2		2	0	0	2	15	35	50	3
4	CC-11	M24-CHE-401	Inorganic Chemistry-III	Th	4	26	4	0	0	4	30	70	100	3
	CC-12	M24-CHE-402	Organic Chemistry-III	Th	4		4	0	0	4	30	70	100	3
	DEC-3	M24-CHE-403	Inorganic Chemistry Special-III	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-404	Physical Chemistry Special-III	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-405	Organic Chemistry Special-III	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-406	Pharmaceutical Chemistry Special-III	Th	4		4	0	0	4	30	70	100	3
	DEC-4	M24-CHE-407	Inorganic Chemistry Special-IV	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-408	Physical Chemistry Special-IV	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-409	Organic Chemistry Special-IV	Th	4		4	0	0	4	30	70	100	3
		M24-CHE-410	Pharmaceutical Chemistry Special-IV	Th	4		4	0	0	4	30	70	100	3
	PC-9 *	M24-CHE-411A	Inorganic Chemistry Special Practical-III	P	4		0	0	8	8	30	70	100	6
		M24-CHE-411B	Physical Chemistry Special Practical-III	P	4		0	0	8	8	30	70	100	6

		M24-CHE-411C	Organic Chemistry Special Practical-III	P	4		0	0	8	8	30	70	100	6
		M24-CHE-411D	Pharmaceutical Chemistry Special Practical-III	P	4		0	0	8	8	30	70	100	6
	PC-10 *	M24-CHE-412A	Inorganic Chemistry Special Practical-IV	P	4		0	0	8	8	30	70	100	6
		M24-CHE-412B	Physical Chemistry Special Practical-IV	P	4		0	0	8	8	30	70	100	6
		M24-CHE-412C	Organic Chemistry Special Practical-IV	P	4		0	0	8	8	30	70	100	6
		M24-CHE-412D	Pharmaceutical Chemistry Special Practical-IV	P	4		0	0	8	8	30	70	100	6
	EEC	M24-CHE-413	Skills in Chemistry	Th	1		1	0	0	1	10	20	30	3
				PC	1		0	0	3	3	5	15	20	3

- CC-Course Course, CHM-Constitutional, Human & Moral Values and IPR, DEC-Discipline Elective Course, EEC-Employability and Entrepreneurship Skills Course, OEC-Open Elective Course, PC-Practicum Course

* For PC-7, PC-8, PC-9, PC-10, the total number of Practical Groups should not exceed the total intake divided by the Group Size / $120 + 20 = 140 = \text{number of Practical Groups} \leq 7$

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

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Revised Syllabus for

Post Graduate Programme

M.Sc. Chemistry 1st and 2nd Semester

as per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme

With Multiple Entry-Exit, Internship and CBCS-LOCF

With effect from the session 2025-26 (in phased manner)

**DEPARTMENT OF CHEMISTRY
FACULTY OF SCIENCES**

**KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA**

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	I		
Name of the Course	Inorganic Chemistry-I		
Course Code	M24-CHE-101		
Course Type	CC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know about the basic aspects of symmetry and group theory and also their applications CLO 2: To know about the concept of bonding using VSEPR theory and applications of Huckel theory to various molecules and also some substitution reactions of boron, silicon and Nitrogen. CLO 3: To know about the metal equilibria in solutions with reference to stability and factors affecting the stability of complexes. CLO 4: To know about the limitations of crystal field theory and its effects in coordination complexes and to apply the concept of molecular orbital theory to tetrahedral square planar and octahedral complexes.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper-Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Symmetry and Group Theory in Chemistry Definitions of group, subgroup, relation between orders of a finite group and its subgroup. Conjugacy relation and classes. Symmetry elements and symmetry operation, Point symmetry group. Schönflies symbols, representations of groups by matrices (representation for the C_n , C_{nv} , C_{nh} , D_{nh} etc. groups to be worked out explicitly). Character of a representation, reducible and irreducible representations, The great orthogonality theorem (without proof) and its importance, Derivation of character tables of C_{2v} , C_{3v} and their use. Molecular asymmetry, dissymmetry and optical activity.		15

II	Stereochemistry and Bonding in Main Group Compounds VSEPR Theory, Walsh diagrams (tri- atomic molecules), d-p π bonds, Bent rule and energetics of hybridization, Huckel theory with reference to ethylene and butadiene, Some simple substitution reactions of covalently bonded molecules of boron, silicon and nitrogen.	15
III	Metal-Ligand Equilibria in Solution Stepwise and overall formation constants and their interaction, trends in stepwise constants, inert and labile complexes, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect and its thermodynamic origin, determination of binary formation constants by pH-metry and spectrophotometry. Substitution reactions in octahedral complexes, theories of trans effect with respect to Pt(II) complexes.	15
IV	Metal-Ligand Bonding Crystal field theory and its limitations of crystal field theory, Crystal field effects on ionic radii, Lattice energies, Heat of hydration & Geometry of coordination complexes, John-Teller distortion, Consequences of John-Teller distortion, Nephelauxetic effect and Nephelauxetic series, spin-orbital coupling, Molecular orbital theory of octahedral, tetrahedral and square planar complexes (with and without n-bonding).	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.		
2. Inorganic Chemistry, J.E. Huhey, Harper & Row.		
3. Chemical Applications of Group Theory; F.A. Cotton, Wiley, New York.		
4. Chemistry of the Elements, N.N. Greenwood and A. Earnshaw, Pergamon.		
5. The Chemical bond; J.N.Murrell, SFA Kettle and J.M. Tedder; Wiley, New York.		
6. Modern Aspects of Inorganic Chemistry; H. J. Emeleus and Sharpe.		
7. Concepts and Models of Inorganic Chemistry; B. Douglas, D.H. McDaniel and J. J. Alexander; John Wiley and Sons.		
8. Inorganic Chemistry, A Modern Introduction; T Moeller, John Wiley and Sons.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	I		
Name of the Course	Physical Chemistry-I		
Course Code	M24-CHE-102		
Course Type	CC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understanding thermodynamics and partial molar properties. CLO 2: To demonstrate thermodynamic formulations of activated complex theory. CLO 3: To understand the electrochemistry of ion-ion interaction and concept of electrical double layer CLO 4: Understand different adsorption models and their application in heterogeneous catalysis.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Partial Molar Properties Recapitulation of thermodynamic laws, Partial molar quantities, chemical potential and Gibbs-Duhem equation, variation of chemical potential with temperature and pressure, chemical potential for an ideal gas, chemical potential of ideal gas mixture(s), determination of partial molar volume, thermodynamic functions of mixing (free energy, entropy, volume and enthalpy), concept of fugacity and activity, dependence of activity on temperature and pressure, determination of activity by (i) measurement of vapour pressure and (ii) emf measurement.		15
II	Chemical Kinetics Collision theory of reaction rates, the steric requirement, Arrhenius equation and Conventional Transition State Theory (CTST), Equilibrium hypothesis, Statistical mechanics and Chemical Equilibrium, Comparison of Collision theory and CTST, Potential energy surfaces (Only basic Idea), Thermodynamic formulation of activated complex theory, Chain reactions (hydrogen-halogen reaction), Unimolecular reactions: Lindemann-Christiansen Hypothesis, Hinshelwood treatment.		15

III	Electrochemistry Debye-Hückel theory of ion-ion interaction and activity coefficient, applicability and limitations of Debye-Hückel limiting law, its modification for finite-sized ions, effect of ion-solvent interaction on activity coefficient. Physical significance of activity coefficients, mean activity coefficient of an electrolyte. Debye-Huckel-Onsager (D-H-O) theory of electrolytic conductance, Debye-Falkenhagen effect, Wein effect. D-H-O equation - its applicability and limitations, Pair-wise association of ions (Bjerrum treatment), Modification of D-H-O theory to account for ion-pair formation. Metal/Electrolyte interface, Concept of electrical double layer and its structure: Helmholtz-Perrin, Gouy-Chapman, and Stern models, electrokinetic phenomena, determination of zeta potential.	15
IV	Surface Chemistry and Catalysis Langmuir adsorption isotherm (L.A.I.) and its derivation for non-dissociative and dissociative adsorption, BET adsorption isotherm, its derivation and applications, Surface Tension and Gibbs Adsorption Isotherm. Heterogeneous catalysis: Fundamentals and examples, Surface heterogeneity, Miller indices and Bravais-Miller indices of planes and directions in solids, Based on L.A.I. - rate calculation of surface catalyzed unimolecular and bimolecular reactions, Activation energy for surface reactions, Comparison of uncatalyzed and catalyzed reaction rates.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. An Introduction to Chemical Thermodynamics, R.P. Rastogi and R.R. Misra, Vikas Pub.		
2. Physical Chemistry, P.W. Atkins, Oxford University Press.		
3. Thermodynamics for Chemists, S. Glasstone, Affiliated East-West Press.		
4. Thermodynamics, I.M. Klotz and R.M. Rosenbers, Benzamin.		
5. Chemical Kinetics, K.J. Laidler, McGraw Hill.		
6. Kinetics and Mechanism, A. A. Frost and R.G. Pearson, John Wiley and Sons.		
7. Electrochemistry, S. Glasstone, Affiliated East-West Press.		
8. Physical Chemistry, G.W. Castellan, Narosa.		
9. Heterogeneous Catalysis: Fundamentals and Applications, Julian R.H. Ross, Wiley-VCH; 2nd, Revised and Enlarged Edition edition (October 1, 2007).		
10. Concepts of Modern Catalysis and Kinetics, I. Chorkendorff and J. W. Niemantsverdriet.		
11. Physical Chemistry, by Robert J. Silbey, Robert A. Alberty, Mounji G. Bawendi, Wiley India; Fourth edition (1 January 2015)		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	I		
Name of the Course	Organic Chemistry-I		
Course Code	M24-CHE-103		
Course Type	CC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the general aspects (theoretical and experimental) of organic reaction mechanism and reaction intermediates. CLO 2: To understand mechanistic details of aliphatic nucleophilic substitution reactions and elimination reactions. CLO 3: To understand the stereo-chemical terms and conformational aspects in cyclic and acyclic systems. CLO 4: To understand the important stereochemical terms and aspects related to asymmetric synthesis. Idea about conformations of sugars and decalines.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Reaction Mechanism: Structure and Reactivity Types of mechanisms, types of reactions, thermodynamic and kinetic requirements, effect of structure on reactivity - resonance and field effects, steric effect, quantitative treatment -The Hammett equation and linear free energy relationship, substituent and reaction constants and Taft equation. Kinetic and thermodynamic control, Hammond's postulate, Curtin-Hammett principle. Potential energy diagrams, transition states and intermediates, methods of determining reaction mechanisms. Generation, structure, stability and reactivity of carbocations, carbanions, carbenes and nitrenes.		15
II	Mechanism of Nucleophilic Aliphatic Substitution The limiting cases SN^1 and SN^2 , detailed mechanistic description and borderline mechanisms, nucleophilicity and solvent effects, ambident nucleophiles, hard and soft nucleophiles and electrophiles, leaving		15

	group effects, steric and other substituent effects on substitution and ionization rates, stereochemistry of nucleophilic substitution. SNⁱ, SN¹, SN² and SNⁱ mechanisms. Mechanism of Elimination Reactions The E1, E1cB and E2 mechanisms, Orientation Effects in Elimination Reactions, Saytzeff and Hoffman rules, Stereochemistry of E2 Elimination Reaction and Eclipsing Effects in E2 Eliminations, Dehydration of Alcohols, Pyrolytic eliminations.	
III	Stereochemistry-I Symmetry elements, D-L, R-S, E-Z and threo-erythro nomenclature, interconversion of Fischer, Newman, Sawhorse and flying wedge formulae. Conformational analysis, enantiomerism and diastereomerism of simple, cyclic (chair and boat conformations) and acyclic systems. Axial and planar chirality, optical isomerism in allenes, biphenyls (atropisomerism), spiranes, hemi-spiranes. Elementary ideas about stereochemistry of tertiary amines, quaternary salts, sulphur and phosphorous compounds.	15
IV	Stereochemistry –II Topicity of ligands and faces, their nomenclature and prostereoisomerism, stereogenecity, chirogenicity, pseudoasymmetry and prochiral centre. Stereospecific and stereoselective reactions. Elementary idea of principal categories of asymmetric synthesis, Cram’s rule and its modification, Prelog rule and horeaus rule. Stereochemistry of sugars- C1 and 1C conformations of hexoses, c₂’-endo and c₃’-endo conformation of pentoses, homo-morphous sugars, abnormal mutarotation and Δ-2 instability factor. Stereochemistry of decalins, Chemical correlation of configuration-determination of relative configuration of 2-butanol, isoserine, alanine, malic acid, lactic acid and mandelic acid.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Reaction Mechanism in Organic Chemistry by Mukherji and Singh revised by S.P. Singh and Om Prakash published by Laxmi Publication, New Delhi.		
2. Advanced Organic Chemistry Reactions, Mechanism and Structure, Jerry March, John Wiley.		
3. Advanced Organic Chemistry, F. A. Carey and R. J. Sundberg, Plenum.		
4. A Guide-Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.		
5. Structure and Mechanism in Organic Chemistry, C. K. Ingold, Cornell University Press.		
6. Organic Chemistry, R. T. Morrison and R. N. Boyd, Prentice-Hall.		
7. Modern Organic Reactions, H. O. House, Benjamin.		

8. Principles of Organic Synthesis, R. O. C. Norman and J. M. Coxon, Blackie Academic & Professional.
11. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International.
12. Stereochemistry of Organic Compounds, P.S, Kalsi, New Age International.
13. Stereochemistry of Organic compounds, E.L. Eliel, Mc Graw Hills, 1962.
14. Organic Chemistry, Volume 1 and 2, I.L. Finar, Pearson Publication

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	I		
Name of the Course	Environmental and Bioinorganic Chemistry		
Course Code	M24-CHE 104		
Course Type	CC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know about the chemical aspects of hydrosphere and atmosphere CLO 2: To know about the concept and role of various dioxygen carriers with reference to hemoglobin, myoglobin, hemocyanin and also some model compounds as synthetic oxygen carriers. CLO 3: To discuss about the metal storage, their transportations in living organisms and biomineralization and also to learn about the role of vitamin B6 and vitamin B12 and calcium in living organisms.		
Credits	Theory	Tutorial	Total
	3	0	3
Teaching Hours per week	3	0	3
Internal Assessment Marks	25	0	25
End Term Exam Marks	50	0	50
Max. Marks	75	0	75
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 7 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 3 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting at least one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Hydrosphere Hydrological cycle, water pollutants, eutrophication, trace elements in water, Chemical speciation (heavy metals like Pb, Hg and As). Water quality parameters and standards, monitoring techniques and methodology: effect of pH, Dissolved Oxygen, fluoride, ammonia, nitrate, nitrite, phosphate and sulfide, total hardness of water, chemical oxygen demand, metal and metalloids. Atmosphere Air pollutants and their types, air quality standards, analysis of CO, NO_x, SO_x, hydrocarbons, photochemical smog, acid rain, effect of atmospheric pollution, tropospheric chemistry.	15	

II	Transport and Storage of Dioxygen Heme proteins and oxygen uptake, structure and function of hemoglobin, myoglobin, hemocyanin and hemerythrin, model synthetic complexes of iron and cobalt. Electron Transfer in Biological Systems Structure and function of metalloproteins in electron transport processes-cytochromes and iron-sulfur proteins, synthetic models.	15
III	Biom mineralization, Metal storage and its transportation Na /K pump, Ferritin, transferrin, and siderophores Calcium in Biology Role of Calcium in living cells, its transport and regulation, calcium pump, role of calcium in muscle contraction	15
Total Contact Hours		45
Suggested Evaluation Methods		
Internal Assessment: 25		End Term Examination: 50
➤ Theory	25	➤ Theory : 50
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	10	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Environmental Chemistry; A. K. De, Wiley Eastern. 2. Environmental Pollution Analysis; S. M. Khopkar, Wiley Eastern. 3. Environmental Chemistry; S. K. Banerji: Prentice– Hall. 4. Principles of Bioinorganic Chemistry: S. J. Lippard and J. M. Berg, University Science Books. 5. The Inorganic Chemistry of Biological Process; M. N. Huges; John Wiley & Sons.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	I		
Name of the Course	Inorganic Chemistry Practical-I		
Course Code	M24-CHE-105		
Course Type	PC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Able to analyse the given mixture for the presence of two acidic radicals, insoluble salt. CLO 2: Able to detect the presence of two rare earth metal ions present in the given mixture. CLO 3: Able to perform the Cerimetric/Iodometric titrations to find out the strength of the given analyte.		
Credits	Theory	Practical	Total
	0	3	3
Teaching Hours per week	0	6	6
Internal Assessment Marks	0	25	25
End Term Exam Marks	0	50	50
Max. Marks	0	75	75
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
I	Qualitative analysis: Total five radicals to be given containing two less common metal ions, one insoluble and two acid radicals: CH_3COO^- , BO_3^{3-} , PO_4^{3-} , CO_3^{2-} , HCO_3^- , NO_2^- , NO_3^- , Cl^- , Br^- , I^- , S^{2-} , SO_3^{2-} , SO_4^{2-} , $S_2O_3^{2-}$, F^- , $C_2O_4^{2-}$ Less common metal ions – W, Tl, Mo, Se, Ti, Zr, Th, V, U, Ce, Be (two metal ions in cationic and anionic forms). Insoluble: Halides (AgCl, AgBr, AgI); Sulphates (PbSO ₄ , BaSO ₄) and Oxides (Al ₂ O ₃ , Cr ₂ O ₃ , SnO ₂ , TiO ₂ , SiO ₂) Cerimetric / Iodometric/ Oxidimetry titrations.		30 6 Hours Per Week
Total Contact Hours			90
Suggested Evaluation Methods			
Internal Assessment: 25		End Term Examination: 50	
➤ Practical	25	➤ Practical	50
• Class Participation:	5	Marks Distribution:	

• Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10	Experiment Marks: 35 Lab record Marks: 5 Viva-voce Marks: 10
• Mid-Term Exam:	10	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. A Text Book of Macro and Semi-micro Quantitative Analysis, A. I. Vogel, Orient Longman.		
2. A Vogel’s Text Book of Quantitative Inorganic Analysis, J. Bassett, R. C. Denney, G. B. Jaffery and J. Menaham, Longman, London.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	I		
Name of the Course	Physical Chemistry Practical-I		
Course Code	M24-CHE-106		
Course Type	PC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the concept of Surface Tension and pH metric titration to find out the strength of acids. CLO 2: To understand the fundamentals of potentiometric experiments and study of extent of adsorption with verification of Freundlich and Langmuir adsorption isotherm. CLO 3: To study and conduct experiments related to chemical kinetics for the determination of order and rate constant of the reaction and further learn about data handling/analysis.		
Credits	Theory	Practical	Total
	0	3	3
Teaching Hours per week	0	6	6
Internal Assessment Marks	0	25	25
End Term Exam Marks	0	50	50
Max. Marks	0	75	75
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter:			
Unit	Topics		Contact Hours
I	Surface Tension 1 Determine the surface tension of given organic solvents. 2 Study the effect of soap concentration on the lowering of surface tension of water. 3 Compare the cleansing powers of two cloth detergents provided to you. pH-metry 4 Determine the strength of strong acid by pH-metric titration with strong base. 5 Determine the strength of weak acid by pH-metric titration with strong base. 6 Determine the dissociation constant of acetic acid using pH-meter. Potentiometry 7 Determine the standard electrode potential of Cu and Zn. 8 Determine the strength of a given solution of ferrous ammonium sulphate by potentiometric titration with K₂Cr₂O₇ solution.		6 Hours per week

	9 Study the precipitation titration between KCl and AgNO₃ potentiometrically. 10 Determine the standard free energy change and equilibrium constant for the reaction $\text{Cu} + 2\text{Ag}^+ \rightleftharpoons \text{Cu}^{2+} + 2\text{Ag}$ Adsorption 11 Verify the Freundlich and Langmuir adsorption isotherms for adsorption of acetic acid/oxalic acid on activated charcoal. Chemical Kinetics 12 Study the hydrolysis of methyl acetate in presence of hydrochloric acid. 13 Study saponification of ethyl acetate by sodium hydroxide solution using the same initial concentration of both the reactants. 14 Study saponification of ethyl acetate by sodium hydroxide solution taking the initial concentration of ester and base to be different. Data Handling 15 Wherever possible, error analysis in the experimental observations and results should be reported.	
Total Contact Hours		90
Suggested Evaluation Methods		
Internal Assessment: 25		End Term Examination: 50
➤ Practical	25	➤ Practical 50
● Class Participation:	5	Marks Distribution: Experiment Marks: 35 Lab record Marks: 5 Viva-voce Marks: 10
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10	
● Mid-Term Exam:	10	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman. 2. Findley’s Practical Physical Chemistry, B.P. Lavitt, Longman. 3. Practical Physical Chemistry, S.R. Palit and S.K. De, Science. 4. Experimental Physical Chemistry, R.C. Das and B. Behera, Tata McGraw Hill. 5. Advanced Practical Physical Chemistry, J. B. Yadav Krishna Prakashan 6. Systematic experimental Physical Chemistry, T.K. Chandershekhar & S.K. Rajbhoj Anjali Publication. 7. A Comprehensive Guide to Physical Chemistry Experiments and Viva Questions, Neelam Seedher.		

Session: 2025-26			
Part A - Introduction			
Name of Programme		M.Sc. Chemistry	
Semester		I	
Name of the Course		Organic Chemistry Practical-I	
Course Code		M24-CHE-107	
Course Type		PC-3	
Level of the course		400-499	
Pre-requisite for the course (if any)		Chemistry as a subject at UG level	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO : To understand the basic principle & techniques of separation and analysis of the organic compounds in the given binary mixture by qualitative analysis and confirm by preparing one derivative of each.	
Credits	Theory	Practical	Total
	0	3	3
Teaching Hours per week	0	6	6
Internal Assessment Marks	0	25	25
End Term Exam Marks	0	50	50
Max. Marks	0	75	75
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
I	Organic Mixture Analysis Demonstrations of separation of binary mixtures: using H ₂ O, HCl, NaOH, NaHCO ₃ , Ether or other reagent as may be necessary along with required conditions for their use. Systematic identification of mixtures of pure organic compounds: separation and identification of simple binary mixtures having acidic, basic and neutral components. Preparation of their derivatives, determination of b.p./m.p. for components and their derivatives. Any other experiment be added as per requirement		6 Hrs Per Week
Total Contact Hours			90
Suggested Evaluation Methods			
Internal Assessment: 25		End Term Examination: 50	
➤ Practical	25	➤ Practical:	50
● Class Participation:	5	Marks Distribution: Experiment Marks: 35 Lab record Marks: 5 Viva-voce Marks: 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	10		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. A Handbook of Organic Analysis Qualitative and Quantitative by H.T. Clarke and revised by			

- B.Maynes, Edward Arnold (Pub.) Ltd. London, 1975).
2. Systematic Qualitative Organic Analysis by H.Middleton, Edward Arnold (Publishers) Ltd., London 1959.
 3. A Text Book of Practical Organic Chemistry including Qualitative Organic Analysis by Arthur I. Vogel, Longmans Green and Co., Ltd., London 1966.
 4. Elementary Practical Organic Chemistry by Arthur I. Vogel, CBS Publishers & Distributors.
 5. Vogel's Text Book of Practical Organic Chemistry by B.S. Furners et. al., Longman Group Ltd.

Session: 2025-26	
Name of the Programme	M.Sc. Chemistry
Semester	I
Name of the Course	Seminar
Course Code	M24-CHE-108
Course Type: (CC/DEC/PC/Seminar/CHM/OEC/EEC)	Seminar
Level of the course	400-499
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the deep concept and get knowledge of topic in details. CLO 2: To understand the teaching methodology and expression of concepts in classroom.
Credits	Seminar
	2
Teaching Hours per week	2
Max. Marks	50
Internal Assessment Marks	0
End Term Exam Marks	50
Examination Time	1 hour
Instructions for Examiner: Evaluation of the seminar will be done by the internal examiner(s) on the parameters as decided by staff council of the department. There will be no external examination/viva-voce examination.	

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	II		
Name of the Course	Inorganic Chemistry-II		
Course Code	M24-CHE-201		
Course Type	CC-5		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know about electronic transitions occurring in the metals and their complexes and also to apply the concept for assignment of absolute configuration in optically active metal chelates and their stereochemical information CLO 2: To explain the synthesis, structural characteristics, chemical properties and reactivity of metal-n complexes. CLO 3: To know the various classifications of metal cluster compounds and to categories the metal boranes carboranes, metallo-boranes and metallo-carboranes and their various aspects. CLO 4: To learn about basic concepts of photochemistry viz photochemical laws, quantum yield, electronically excited states and to learn about the Energy dissipation by radiative and non radiative processes along with Franck condon principle.		
Credits	Theory	Tutorial	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Electronic Spectra and Magnetic Properties of Transition Metal Complexes Electronic arrangements of microstates, calculation of the number of microstates in various electronic arrangements, spectroscopic term symbols, vector diagrams to indicates coupling of orbital angular momenta in p^2 , p^3 , d^2 configurations and spin orbit coupling for p^2 arrangement, spectroscopic terms, spectral terms of d^2 to d^8 metal ions,		15

	determining the ground state terms-Hund's rules, derivation of the term symbols for a closed subshell. Interpretation of electronic spectra, Orgel diagrams, Tanabe-Sugano diagrams for transition metal complexes (d ¹ -d ⁹ states), calculations of Dq, B and b parameters, charge transfer spectra, spectroscopic method of assignment of absolute configuration in optically active metal chelates and their stereochemical information, anomalous magnetic moments, magnetic exchange coupling and spin crossover.	
II	Metal π-Complexes Metal carbonyls, structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, important chemical reactions of metal carbonyls, preparation, bonding, structure and important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes; tertiary phosphine as ligand.	15
III	Metal Clusters Boranes: Introduction, Nomenclature, synthesis and properties of some important members (B ₂ H ₆ , B ₄ H ₁₀ , B ₅ H ₉ , B ₅ H ₁₁ and B ₁₀ H ₁₄), bonding in Boranes, STYX code, Borane anions, Carboranes: Introduction, general methods of preparations and important properties, Polyhedral skeletal electron pair theory, Metalloboranes and metallocarboranes :Introduction, general methods of preparation and properties, Isolobal analogy, Metal carbonyl and halide clusters, introduction, Structure and bonding of compounds having M-M bonds, calculation of M-M bond.	15
IV	Photochemistry Absorption, absorption spectra, excitation, photochemical laws, quantum yield, electronically excited states- Jablonski Diagrams: Vibrational Relaxation, Internal Conversion, Intersystem Crossing, Fluorescence, and Phosphorescence; Fluorescence Spectra, Rules of fluorescence, Fluorescence Quantum Yield, Franck-Condon principle, Radiative Lifetime. Bimolecular quenching: Stern-Volmer relation, photochemical kinetics, photochemical stages-primary and secondary.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.		
2. Inorganic Chemistry, J.E. Huhey, Harper & Row.		
3. Inorganic Electronic Spectroscopy, A.B.P. Lever, Elsevier.		
4. Chemistry of the Elements, N.N. Greenwood and A. Earnshaw, Pergamon.		
5. Introduction to Ligand fields; B.N. Figgis, Wiley, New York.		
6. Modern Aspects of Inorganic Chemistry; H.J. Emeleus and Sharpe.		
7. Introduction to Ligand Field Theory; C.J.Ballahyen, McGraw Hill, New York.		
8. Organometallic Chemistry; R.C. Mehrotra and A.Singh, New Age International.		

9. Concepts and Models of Inorganic Chemistry; B. Douglas, D.H.McDaniel and J.J. Alexander; John Wiley.
10. The Organometallic Chemistry of the Transition Metals; R.H. Crabtree, John Wiley.
11. Basic concepts of Inorganic Photochemistry, A.W. Adamson and P.D. Fleischauer, Wiley.
12. Photochemistry of coordination compounds, K.Balzani and V.Carassti, Academic press.
13. Elements of Inorganic Photochemistry; G.J. Ferraudi, Wiley.

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	II		
Name of the Course	Physical Chemistry-II		
Course Code	M24-CHE-202		
Course Type	CC-6		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To learn to setup Schrödinger equation for simple systems and find their solutions CLO 2: To learn about the systems showing rotational motion and determine solutions of their Schrödinger equations besides knowing about angular momentum operators CLO 3: To understand the basic concepts of polymers ,polymerization and their molecular weights. CLO 4: To know the basic concepts of nuclear and radiochemistry.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Quantum Mechanics-I The postulates of quantum mechanics, Linear and Hermitian operators, Commutation of operators and Uncertainty Principle. Eigen functions, Eigen values. Schrödinger equation, free particle, Schrödinger equation for a particle in a box, the degeneracy, particle in a box with a finite barrier, Tunneling Problem: Tunneling through a rectangular barrier, Schrödinger equation for linear harmonic oscillator and its solution, zero point energy	15	
II	Quantum Mechanics-II Energy levels and wave-functions of Rigid rotator. Hydrogen atom: Complete solution (separation of variables in spherical polar coordinates and its solution). Radial distributions. Angular momentum and its directional quantization, Angular momentum operators, commutation relations, Ladder operators, shapes of atomic orbitals upto d-level and their discussion.	15	
III	Polymers Basic concepts, Kinetics of Polymerization: Mechanism and Kinetics of chain growth polymerization: free-radical, cationic, anionic and coordination polymerization. Mechanism and Kinetics of step-growth	15	

	polymerization. Comparison between step-growth and chain polymerization. Molecular mass of polymers: Significance of average molecular mass. Poly-dispersity. Determination of molecular mass by viscosity method. Electrically conducting polymers, Flame retardant polymers, Liquid crystal polymers.		
IV	Nuclear and Radiochemistry Nuclear stability and binding energy. Mass and binding energy, Nuclear fission and nuclear fusion, fission cross section, chain fission, fission product and fission yield. Interaction of nuclear radiation with matter, Detectors (Proportional, Geiger-Muller and Scintillation counters) and their principles. Units for measuring radiation absorbed, radiation dosimetry.	15	
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
● Class Participation:	5	Written Examination	
● Seminar/presentation/assignment/quiz/class test etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Introduction to Quantum Chemistry, A.K. Chandra, Tata McGraw Hill.			
2. Quantum Chemistry, I.M. Levine, Prentice Hall.			
3. Essentials of Nuclear Chemistry, 4th Edition (1995), H.J. Arnika, Wiley Eastern, New Delhi.			
4. Nuclear & Radiochemistry, 3rd Edition (1981), G. Fridlander, J.W. Kennedy, E. S. Macias, and J. M. Miller, John Wiley, New York.			
5. Introduction to Nuclear Chemistry, B. C. Harvey Prentice-Hall (1969).			
6. Polymer Chemistry, Billmayer.			
7. Polymer Chemistry, Gowarikar.			
8. Principles of Polymerization, Gerge Odian.			
9. Quantum Chemistry, B. K. Sen, Kalyani Publishers.			
10. Quantum Chemistry, R.K. Prasad, New Age International.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	II		
Name of the Course	Organic Chemistry-II		
Course Code	M24-CHE-203		
Course Type	CC-7		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know the concept of Aromatic substitution/displacement reactions. CLO 2: To understand the concept of neighbouring group participation and carbocation rearrangements. CLO 3: To describe the generation, structure, stability and reactivity of free radicals and to know the mechanisms of addition to alkenes and alkynes. CLO 4: To understand the concept of addition to carbon hetero atom multiple bonds with emphasis on $>C=O$ group.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Aromatic Electrophilic Substitution Theoretical treatment of aromatic substitution reactions, structure-reactivity relationship in mono substituted benzene ring, orientation in other ring systems, partial rate factor, energy profile diagram, Vilsmeier-Haack reaction, Reimer-Tiemann reaction, Bischler-Napieralski reaction, Pechmann reaction, Houben-Hoesch reaction, Fries rearrangement. Nucleophilic Aromatic Substitution Mechanism of Nucleophilic substitution in aromatic systems via diazonium ions, by addition-elimination and elimination-addition mechanism (involving arynes); von-Richter rearrangement, Sommelet-Hauser, Stevens and Smiles rearrangements. General aspects of generation, structure, stability and reactivity of arynes.		15

II	Neighbouring Group Participation and Carbocation Rearrangements Anchimeric assistance, neighbouring group participation by non-bonding electrons, sigma and -bonds, classical and non-classical carbocations. Carbocations rearrangements: migratory aptitudes, Wagner Meerwein rearrangement, pinacol pinacolone rearrangement, Demjanove rearrangement, Tiffeneau-Demjanov ring expansion, aldehyde-ketone rearrangement, dienone-phenol rearrangement and trans-annular rearrangements and the Stieglitz rearrangement.	15
III	Free Radicals General aspects of generation, structure, stability and reactivity of free radicals, types of free radical reactions, halogenation including allylic halogenation (NBS), auto-oxidation, decomposition of azo compounds and peroxides, coupling of alkynes, homolytic aromatic substitution, Sandmeyer reaction and Hunsdiecker reaction. Addition to C-C Multiple Bond General mechanistic considerations, Mechanism of addition of hydrogen halide, H ₂ O, halogens, HOX and mercuric salt to alkenes and alkynes. Hydroboration, formation of C-C bonds via organoboranes, hydroboration of acetylenes, nucleophilic addition to alkenes.	15
IV	Addition to Carbon-Hetero Atoms Multiple Bonds General mechanistic considerations and reactivity, Hydration and Addition of Alcohols to Aldehydes, Ketones and Acids. Addition -Elimination Reactions of Ketones and Aldehydes, Reactivity of carbonyl compounds towards Addition. Lithium aluminium hydride reduction- carbonyl compounds, acids, esters, nitriles. Additions of Grignard reagents. Reformatsky reaction, Wittig reaction, Claisen condensation, Dieckman reaction, Aldol condensation, Knoevenagel condensation, Perkin reaction, Cannizzaro reaction, Benzoin condensation, Mannich Reaction, Robinson-Mannich reaction, Ester hydrolysis, aminolysis of esters, amide hydrolysis.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Reaction Mechanism in Organic Chemistry by Mukherji and Singh revised by S.P. Singh and Om Prakash published by Laxmi Publication, New Delhi.		
2. Advanced Organic Chemistry Reactions, Mechanism and Structure, Jerry March, John Wiley.		
3. Advanced Organic Chemistry, F. A. Carey and R. J. Sundberg, Plenum.		
4. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.		
5. Structure and Mechanism in Organic Chemistry, C. K. Ingold, Cornell University Press.		
6. Organic Chemistry, R. T. Morrison and R. N. Boyd, Prentice-Hall.		
7. Modern Organic Reactions, H. O. House, Benjamin.		
8. Principles of Organic Synthesis, R. O. C. Norman and J. M. Coxon, Blackie Academic & Professional.		

9. Advanced Organic Chemistry and Reaction Mechanisms, Reinhard Bruckner, Academic Press.
10. Organic Chemistry, Jonathan Clayden, Nick Greeves, and Stuart Warren, Oxford University Press.

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	II		
Name of the Course	Spectroscopy and XRD		
Course Code	M24-CHE-204		
Course Type	CC-8		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand rotational and vibrational spectroscopy and their applications in Chemistry. CLO 2: Understand basics and significance of NMR, NQR and ESR techniques in Chemistry. CLO 3: Understand basics of X-ray Crystallography and interpret powder XRD patterns of cubic crystals.		
Credits	Theory	Practical	Total
	3	0	3
Teaching Hours per week	3	0	3
Internal Assessment Marks	25	0	25
End Term Exam Marks	50	0	50
Max. Marks	75	0	75
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 7 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 3 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting at least one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Microwave Spectroscopy Basics of spectroscopy. The rotation of molecules, rotational spectra of rigid diatomic molecules, intensities of rotational spectral lines, isotopic effect, non-rigid rotator, spectra of polyatomic linear molecules and symmetric top molecules. Infrared Spectroscopy The vibrating diatomic molecule, force constant, zero point energy, simple harmonic vibrator, anharmonicity, Morse potential, overtones, hot bands, diatomic vibrating rotators, P,Q,R branches, vibration of polyatomic molecules, normal mode of vibrations. Raman Spectroscopy Classical and quantum theories, pure rotational Raman spectra of linear molecules, vibrational Raman spectra, mutual exclusion principle, polarization of the light and Raman effect, depolarization of Raman lines.		15
II	Nuclear Magnetic Resonance Spectroscopy		15

	Basic principles of NMR, theory of nuclear magnetic resonance, spin lattice relaxation, spin-spin relaxation, experimental techniques, chemical shift, chemical shift unit (δ) the origin of shielding constant, pattern of coupling, origin of spin-spin coupling. Electron Spin Resonance Spectroscopy Basic principles of ESR, experimental technique, hyperfine splitting and hyperfine structure (Hydrogen, methyl radical etc.), ESR applications to the study of free radicals and Mc-Connell relationship. Nuclear Quadrupole Resonance Spectroscopy Introduction, energies of quadrupole transitions, relationship between electric field gradient and molecular structure.	
III	X-ray Crystallography Symmetry elements in crystals, stereographic projections, point groups (illustration of R, R-bar, Rm, R/m, (R-bar)m point groups only), criteria for determining unit cell of lattice, space lattices, space groups P1, Pbar1, P2, P2₁, Pm, Pc, C2, Cm, Cc. Bragg's Law, Reciprocal lattice concept and its importance, Definition of Reciprocal lattice vector (derivation excluded). Interplanar spacing using reciprocal lattice concept for cubic, tetragonal, orthorhombic and hexagonal crystal systems, Structure factor calculations for primitive, base-centered, body-centered and face centered unit cells. Relation of structure factor to electron density and intensities (derivation excluded), Interpretation of powder photographs for cubic crystals, Data reduction (Brief overview), Phase problem (definition only), Correctness of a structure (Discrepancy Index).	15
Total Contact Hours		45
Suggested Evaluation Methods		
Internal Assessment: 25		End Term Examination: 50
➤ Theory	25	➤ Theory: 50
● Class Participation:	05	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	10	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Fundamentals of Molecular Spectroscopy, C.N. Banwell, Tata McGraw Hill.		
2. Modern Spectroscopy, J.M. Hollas, John Wiley.		
3. Basic Principles of Spectroscopy, R.Chang, McGraw Hill.		
4. Introduction to Magnetic Resonance Spectroscopy, ESR, NMR & NQR, D. N. Sathyanarayan		
5. Physical Method in Chemistry, R.S. Drago, Saunders College.		
6. Introduction to Molecular Spectroscopy, G.M. Barrow, McGraw Hill.		
7. Elementary Crystallography, L. Azaroff.		
8. Structure Determination by X-ray Crystallography, M. Ladd and R. Palmer.		
9. X-Ray Structure Determination: A Practical Guide, 2nd Edition by George H. Stout and Lyle H. Jensen.		
10. X-Ray Diffraction: A Practical Approach by C. Suryanarayana and M. Grant Norton		
11. An Introduction to Crystallography by F. C. Phillips		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	II		
Name of the Course	Inorganic Chemistry Practical-II		
Course Code	M24-CHE-205		
Course Type	PC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know the concept of quantitative analysis and its application. CLO 2: Able to separate and quantify the presence of two metal ions in a solution. CLO 3: Able to prepare various coordination complexes and their spectroscopic study.		
Credits	Theory	Practical	Total
	0	3	3
Teaching Hours per week	0	6	6
Internal Assessment Marks	0	25	25
End Term Exam Marks	0	50	50
Max. Marks	0	75	75
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics	Contact Hours	
I	Quantitative analysis: Separation of the metal ions and determination of any one of them using volumetric/gravimetric methods. Cu-Ni, Cu-Zn, Cu-Al, Ca-Ba, Fe-Mg, Fe-Ni etc. Preparations: Preparation of the following inorganic compounds and their spectroscopic studies. I. Hg[Co(SCN) ₄] II. [Cu(NH ₃) ₄]SO ₄ .H ₂ O III. Prussian Blue IV. Na[Cr(NH ₃) ₂ (SCN) ₄] V. Mn(acac) ₃ VI. [Ni(NH ₃) ₆]Cl ₂ VII. VO(acac)	30 6 Hours Per Week	
Total Contact Hours			90
Suggested Evaluation Methods			
Internal Assessment: 25		End Term Examination: 50	

➤ Practical	25	➤ Practical:	50
● Class Participation:	5	Marks Distribution: Experiment Marks: 35 Lab record Marks: 5 Viva-voce Marks: 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	10		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. A Text Book of Macro and Semi-micro Quantitative Analysis, A. I. Vogel, Orient Longman.			
2. A Vogel’s Text Book of Quantitative Inorganic Analysis, J. Bassett, R. C. Denney, G. B. Jaffery and J. Menaham, Longman, London.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	II		
Name of the Course	Physical Chemistry Practical-II		
Course Code	M24-CHE-206		
Course Type	PC-5		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know the concept of viscosity and solution chemistry of different mixtures. CLO 2: To understand and master the fundamentals of conductometric titrations in aqueous media. CLO 3: To study the specific/molar rotation of sugars and kinetics of inversions of sucrose by polarimetry.		
Credits	Theory	Practical	Total
	0	3	3
Teaching Hours per week	0	6	6
Internal Assessment Marks	0	25	25
End Term Exam Marks	0	50	50
Max. Marks	0	75	75
Examination Time		6 hours	
Part B- Contents of the Course			
Unit	Topics	Contact Hours	
I	Viscosity 1 Determine the viscosity of given organic solvents. 2 Study the variation of viscosity with concentration for a glycerol solution using Ostwald viscometer and determine the unknown concentration of given solution of glycerol. 3 Determination of molar mass of a polymer using viscometric method Conductometry 4 Determine the strength of strong acid by conductometric titration with strong base. 5 Determine the strength of weak acid by conductometric titration with strong base. 6 Determine the strength of strong acid and weak acid in a mixture by conductometric titration with strong base. 7 Study precipitation titration between KCl and AgNO ₃ conductometrically. Determine the strength of the given solution of AgNO ₃ . 8 Determine solubility and solubility product of sparingly soluble salts like CaSO ₄ , BaSO ₄ .	6 Hours Per Week	

	9 Determine the relative strength of chloroacetic acid and acetic acid by conductivity measurements. Polarimetry 10 Study the variation of angle of optical rotation with the concentration of any optically active substance (sucrose or glucose) and determine the unknown concentration of the same substance in given solution. 11 Determine the specific and molecular rotation of sucrose or glucose at a number of concentrations. 12 Study the kinetics of inversion of cane-sugar (sucrose) in presence of an acid. 13 Distinguish between dextro/laevo rotatory substances using polarimeter and determine their specific rotation. Solution Chemistry 14 Determine the solubility product of calcium hydroxide by saturation titration method. 15 Determine the molal volume of ethanol and its partial molal volume in dilute aqueous solution. Note: Any experiment can be introduced / omitted in the practical class on the basis of availability of instruments/chemicals.	
Total Contact Hours		90
Suggested Evaluation Methods		
Internal Assessment: 25		End Term Examination: 50
➤ Practical	25	➤ Practical: 50
● Class Participation:	5	Marks Distribution: Experiment Marks: 35 Lab record Marks: 5 Viva-voce Marks: 10
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	10	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman.		
2. Findley's Practical Physical Chemistry, B.P. Lavitt, Longman.		
3. Senior Practical Physical Chemistry by B.D. Khosla, V.C. Garg, Adarsh Gulati - Publisher: R Chand & Co.		
4. Advanced Practical Physical Chemistry, J. B. Yadav Krishna Prakashan		
5. Experimental Physical Chemistry, V .D. Athawale and P. Mathur - New Age International Publishers		
6. Vogel's Textbook of Quantitative Chemical Analysis by Vogel, Bassett, Jeffrey, Mendam, Denney - Longman Higher Education; 5th edition		
7. CRC Handbook of Laboratory Safety, 5th Edition by A. Keith Furr		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	II		
Name of the Course	Organic Chemistry Practical-II		
Course Code	M24-CHE- 207		
Course Type	PC-6		
Level of the course	400-499		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO : To understand the basic laboratory and purification techniques in organic chemistry and to know the concept of stepwise synthesis of the organic compounds.		
Credits	Theory	Practical	Total
	0	3	3
Teaching Hours per week	0	6	6
Internal Assessment Marks	0	25	25
End Term Exam Marks	0	50	50
Max. Marks	0	75	75
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	Demonstrations of Laboratory & Purification techniques Refluxing, Solvent extraction, Purification of solvents and reagents using various techniques like crystallization, distillation, steam distillation, and vacuum distillation. Drying and storage of solvents, sublimation etc. Two-step Preparation of some important organic compounds involving the reactions out of the following representative reactions) 1. Esterification and saponification 2. Oxidation 3. Reduction or Hydrogenation 4. Partial Reduction 5. Nucleophilic substitution 6. Aromatic electrophilic substitution reaction 7. Condensation reactions 8. Hoffman's Bromamide reaction 9. Heterocyclic synthesis 10. Any other reaction as per requirement For example 1. Synthesis of m-nitroaniline from nitrobenzene. 2. Synthesis of aniline from benzoic acid. 3. Synthesis of m-nitrobenzoic acid from methylbenzoate. 4. Synthesis of anthranilic acid from phthalic anhydride. 5. Synthesis of p-bromoaniline from acetanilide. 6. Synthesis of p-nitroaniline from acetanilide.		6 Hours Per Week

	7. Synthesis of phenytoin from Benzoin 8. Synthesis of 4-aminobenzoic acid from 4-nitrotoluene. 9. Synthesis of S-benzylisothiuronium salt of any acid The purity of the above synthesized compounds should be checked with thin layer chromatography (TLC) Copies of IR & NMR of the above synthesized compounds should be provided for study All the students must submit the recrystallised product along with m.p. for all the stages of preparation.		
Total Contact Hours		90	
Suggested Evaluation Methods			
Internal Assessment: 25		End Term Examination: 50	
➤ Practical	25	➤ Practical:	50
● Class Participation:	5	Marks Distribution: Experiment Marks: 35 Lab record Marks: 5 Viva-voce Marks: 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	10		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. A Handbook of Organic Analysis Qualitative and Quantitative by H.T. Clarke and revised by B. Maynes, Edward Arnold (Pub.) Ltd. London, 1975).			
2. Systematic Qualitative Organic Analysis by H. Middleton, Edward Arnold (Publishers) Ltd., London 1959.			
3. A Text Book of Practical Organic Chemistry including Qualitative Organic Analysis by Arthur I. Vogel, Longmans Green and Co., Ltd., London 1966.			
4. Elementary Practical Organic Chemistry by Arthur I. Vogel, CBS Publishers & Distributors.			
5. Vogel's Text Book of Practical Organic Chemistry by B.S. Furners et. al., Longman Group Ltd.			

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

("A++" Grade, NAAC Accredited)



Syllabus of Examination for Post Graduate Programme

M.Sc. Chemistry 3rd and 4th Semester

as per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme

With Multiple Entry-Exit, Internship and CBCS-LOCF

With effect from the session 2025-26 (in phased manner)

**DEPARTMENT OF CHEMISTRY
FACULTY OF SCIENCES**

**KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA**

Session: 2025-26			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Advanced Organic Spectroscopy		
Course Code	M24-CHE-301		
Course Type	CC-09		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Understand UV-Vis spectroscopy (electronic transitions, influencing factors), Fieser-Woodward rules for conjugated systems, and IR spectroscopy principles for functional group identification. CLO 2: Understand NMR phenomenon and fundamentals, including chemical shift, coupling constant, 1st/2nd-order NMR spectra, and 2D-NMR. Develop skill to predict NMR spectra, interpret them, and use NMR data to determine structure of Organic molecules. CLO 3: Analyse mass spectrometry principles: fragmentation patterns, influencing factors, ion analysis techniques, and structural determination using spectral data. CLO 4: Enable student compare ^1H-NMR and ^{13}C-NMR techniques and use C-13 NMR along with other spectra techniques in solving composite structural problems in organic chemistry.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Ultraviolet and Visible Spectroscopy Introduction and understanding of UV phenomenon, Various electronic transitions (185-800 nm), Beer-Lambert law, Chromophores, Auxochromes, Bathochromic and Hypsochromic shift, Hyperchromic and Hypochromic effect, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl		15

	compounds, dienes, conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds. Infrared Spectroscopy Principle and Theory, Modes of stretching and bending vibrations, Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance. Problems related to IR spectroscopy.	
II	Nuclear Magnetic Resonance Spectroscopy General introduction: Theory and basic principles of NMR, Chemical shift: Definition, mechanism of measurement, shielding mechanism, factors affecting chemical shifts, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides & mercapto). Spin-Spin coupling: Theory, splitting patterns, coupling constants and their significance, magnetic and chemical equivalence, factors affecting coupling constant, complex spin-spin interaction between two, three, four and five nuclei (first order spectra). Hindered rotation and NMR: Temperature effects and splitting patterns. Spin system: Pople notation. Second order spectra, Virtual coupling, Stereochemistry: concept of topicity, effect of enantiomeric and diastereomeric protons. ¹⁹F and ³¹P-NMR: An overview and heteronuclear couplings. Tools for simplification of complex NMR spectrum (chemical and instrumental):-Deuteration, changing solvent, trifluoroacetylation, basification and acidification, lanthanide shift reagents, increased magnetic field strength, double resonance and nuclear overhauser effect (NOE), variable temperature probe. 2D-NMR spectroscopy: Principle, comparison with 1D-NMR, informations provided by 2D-NMR experiments: COSY, NOESY, HSQC and HMBC.	15
III	Mass Spectrometry Introduction, ion production - EI, CI, FD and FAB, Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, Nitrogen rule, molecular weight determination molecular formula from isotopic ratio data, isotope profile of halogen compounds, fragmentation pattern - simple cleavage, retro-Diels Alder, Hydrogen transfer rearrangement like scrambling, ortho effect, McLafferty rearrangement, fragmentation patterns of hydrocarbons, alcohols, phenols, ethers, aldehydes, ketones, esters, carboxylic acids, amines, nitro, amides, nitriles.	15
IV	Carbon-13 NMR Spectroscopy General considerations: Comparison between ¹H and ¹³C-NMR, Proton coupled and proton-decoupled ¹³C-NMR, Chemical shifts for different carbon environments (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), Coupling constants, Nuclear Overhauser effect in ¹³C-NMR. Introduction to DEPT NMR and information provided by various DEPT experiments (DEPT-45, DEPT-90, and DEPT-135).	15

Composite Problems Problems involving the application of the above spectroscopic techniques (UV/Visible, IR, NMR and Mass) for structural elucidation of organic molecules.			
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
● Class Participation:	5	Written Examination	
● Seminar/presentation/assignment/quiz/class test etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Introduction to Spectroscopy-A Guide for Students of Organic Chemistry, 2nd Edn. By Donald L. Pavia, Gary M. Lampman and George			
2. S. Kriz. Saunders Golden Sunburst Series. Harcourt Brace College Publishers, New York.			
3. Spectrometric Identification of Organic Compounds, R. M. Silverstein, G. C. Bassler and T. C. Morrill, John Wiley.			
4. Application of Spectroscopy of Organic Compounds, J. R. Dyer, Prentice Hall.			
5. Spectroscopic Methods in Organic Chemistry, D. H. Williams and I. Fleming, Tata McGraw-Hill.			
6. Spectroscopy of Organic Compounds by P. S. Kalsi, Wiley Estern, New Delhi.			
7. Organic Spectroscopy by William Kemp, John Wiley.			
8. Organic Mass Spectrometry by K.G. Das & E.P. James, Oxford & IBH Publishing Co.			
9. Organic Spectroscopy (Principles & Applications) by Jagmohan.			

Session: 2025-26			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Physical Chemistry-III		
Course Code	M24-CHE-302		
Course Type	CC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know about the details of literature survey in research, different indexing used in research, research reports and patents CLO 2: To know about the details of Thermal Analysis techniques and their applications CLO 3: To discuss preparation of nanomaterial through various techniques, electronic structure and properties of nanomaterials and applications of nanomaterials CLO 4: To discuss environmentally oriented electrochemistry with examples and discuss the applications of ion-selective electrodes		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Research Methodology: Scientific document: Organization and writing of research paper, short communications, monographs, review articles, abstract, keywords, technical and survey reports, authored books and edited books and dissertation. Primary sources of literature survey, journals, patents etc. secondary sources of literature survey, books, reference books and text Books, Citation Index, impact Factor, i-10 index and h index, Journals related to Chemistry in the region and country, electronic forms of Journals, IPR and Patents.		15
II	Thermal Analysis Introduction to thermal analysis, thermogravimetry (TG), static and dynamic thermogravimetry, Instrumentation, thermogram, factors affecting thermograms, application of thermogravimetry. Differential thermal analysis (DTA), DTA curves, factors affecting DTA curves,		15

	applications of DTA, Differential Scanning Calorimetry (DSC) Introduction, Instrumentation, Power compensated and Heat Flux DSC, factors affecting DSC curves, applications of DSC. Hyphenated thermal techniques, Evolved gas analysis (TG-MS, TG-FTIR)	
III	Material Chemistry Definition of nanomaterials, Thermodynamics and Kinetics of Nucleation, Various techniques for the preparation of nanomaterials, Thin Films and Langmuir-Blodgett films - Preparation techniques, evaporation/sputtering, chemical processes, MOCVD, sol-gel. Langmuir-Blodgett (LB) film, growth techniques, photolithography, properties and applications of thin and LB films. Electronic structure and properties of nanomaterials, optical, electrical and magnetic properties, diffusion and chemical behaviour, applications of nanomaterials.	15
IV	Environmentally oriented electrochemistry Electrochemistry of water splitting, electrolysis of sea water, electrochemical reduction of CO ₂ , Electrochemical sewage disposal, electrochemical decontamination of soil. Ion Selective Electrodes Electrical Properties of membrane, glass electrode with special reference to H ⁺ , Na ⁺ , K ⁺ ions, operation of solid membrane electrode, operation of liquid membrane electrode, coated type ion electrode, Applications of ion selective electrode in determination of some toxic metals and some anions (F ⁻ , Cl ⁻ , Br ⁻ , I ⁻ and NO ₃ ⁻).	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Handbook of Thermal Analysis and Calorimetry; M. E. Brown.		
2. Instrumental methods of Analysis: Willard, Merritt & dean.		
3. Advanced Analytical Chemistry: Meiter and Thomas.		
4. Instrumental methods of chemical analysis: Braun.		
5. Physical Biochemistry: Applications to Biochemistry and Molecular Biology by D. M. Freifelder.		
6. Biophysical Chemistry: Principles and Techniques by A. Upadhyay, Himalaya Publishing House.		
7. An Introduction to Nanoscience & Nanotechnology by A. Nouailhat, Wiley.		
8. Nano-The Essentials by T. Pradeep, Tata McGraw Hill		
9. Nanotechnology Principles and Practices by S.K. Kulkarni,		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Inorganic Chemistry Special-I		
Course Code	M24-CHE-303		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To Learn about alkyl, aryls of transition metals and fluxional behavior of organometallic compounds CLO 2: To Learn about Compounds of Transition Metal-Carbon Multiple Bonds and Transition Metal Compounds with Bonds to Hydrogen CLO 3: To learn about Transition Metal π -Complexes CLO 4: To learn about Homogeneous catalysis		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Alkyls and Aryls of Transition Metals Types, routes of synthesis, stability and decomposition pathways, organocopper in organic synthesis Fluxional Organometallic compounds Fluxionality and dynamic equilibria in compounds such as η^2 -olefin, η^3 -allyl and dienyl complexes, Carbonyl scrambling.	15	
II	Compounds of Transition Metal-Carbon Multiple Bonds, Alkylidenes, alkylidynes, low valent carbenes and carbynes- synthesis, nature of bond, structural characteristics, nucleophilic and electrophilic reactions on the ligands, role in organic synthesis Transition Metal Compounds with Bonds to Hydrogen: bonding and different types.	15	
III	Transition Metal π-Complexes Transition metal π -complexes with unsaturated organic molecules, alkenes, alkynes, allyl, diene, dienyl, arene and trienyl complexes, preparations, properties, nature of bonding and structural features. Important reactions relating to nucleophilic and electrophilic attack on ligands and to organic synthesis.	15	

IV	Stoichiometric reactions for catalysis: lithium, Magnesium, zinc, cadmium, mercury, aluminium, Thallium, tin and silicon, homogeneous catalytic hydrogenation, Zeigler-Natta polymerization of olefins, catalytic reactions involving carbon monoxide such as hydrocarbonylation of olefins (oxo reaction), oxopalladation reactions, activation of C-H bond.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Principles and Application of Organotransition Metal Chemistry, J.P. Collman, L.S. Hegedus, J.R. Norton and R.G. Finke, University Science Books.		
2. The Organometallic Chemistry of the Transition Metals; R.H. Crabtree, John Wiley.		
3. Organometallic Chemistry, R.C. Mehrotra and A. Singh, New Age International.		
4. Coordination Chemistry; Banerjee; Tata McGraw Hill.		
5. Concepts and Models of Inorganic Chemistry; B. Douglas, D.H. McDaniel and J.J. Alexander; John Wiley and Sons Inc.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Physical Chemistry Special-I		
Course Code	M24-CHE-304		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To apply of approximation methods to analyse multi-electron systems and to identify molecular term symbols. CLO 2: To apply MO, VB, and Huckel theories, to analyze bonding in diatomic and conjugated systems. CLO 3: To know about photochemical behaviour of the chemical systems at the quantum level CLO 4: To discuss the micelles and micellization and related phenomena. To be acquainted about the intermolecular forces involved in liquids and micelle solutions		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Quantum Mechanics-I Problem of two electrons. Time-independent perturbation theory for non-degenerate and degenerate cases. Ground and first excited state of helium atom. Variation theorem and variation methods. Variation treatment of ground state of Helium. Electron spin, Pauli Exclusion principle and Slater determinants. Brief overview of Hartree-Fock SCF method. Electron correlation. Coupling of angular momentum for many electron system, spin-orbit coupling, Molecular Term symbols.		15
II	Quantum Mechanics-II Born-Oppenheimer approximation, atomic units, the hydrogen molecule ion, its symmetric and antisymmetric solution (without actual evaluation of various integrals). Valence bond and MO treatment of hydrogen molecule. Comparison of the MO and VB treatments and their equivalence limit. Configuration Interaction. Extension of MO theory to		15

	other systems- Homonuclear and heteronuclear diatomics. The pi-electron approximation, Huckel theory of conjugated systems. Applications to ethylene, butadiene, cyclobutadiene and cyclopropenyl molecules. Calculation of properties- Delocalization energy, electron density, bond order.		
III	Quantum Photochemistry Types of Photophysical Pathways, Radiative and Non-Radiative transitions, Einstein Treatment of Absorption and Emission Phenomena, Probability of Induced Emission and Its Application to Lasers, Time-dependent Schrödinger equation, Time-dependent perturbation theory for photochemical systems, Transition moment integral, Theoretical Absorption Intensity, Oscillator Strength, Rules governing the transition between two energy states.	15	
IV	Micelles Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization-phase separation and mass action models, solubilization, emulsions, micro emulsion. General Properties of Liquids Liquids as dense gases, liquids as disordered solids, thermodynamics relations of internal pressure and its significance in liquids, equation of state, critical constants, Different types of intermolecular forces in liquids.	15	
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
● Class Participation:	5	Written Examination	
● Seminar/presentation/assignment/quiz/class test etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Quantum Chemistry, I. N. Levine, 7 th edition, Pearson Education India.			
2. Quantum Chemistry, Donald A. McQuarrie, Viva.			
3. Fundamentals of Photochemistry, K.K. Rohtagi-Mukherjee, 3 rd Edition, New Age.			
4. Significance of liquid structures, H. Eyring.			
5. Chemical Kinetics, K.J. Laidler, McGraw Hill.			
6. Theories of Chemical Reaction Rates, K.J. Laidler, McGraw Hill.			
7. Theory of Rate Processes, S. Glasstone, K.J. Laidler and H. Eyring, McGraw Hill.			
8. Micelles, Theoretical and Applied Aspects, Y. Moroi, Plenum Press.			
9. Significant Liquid Structures, H. Eyring and M. S. Jhon, John Wiley & Sons.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Organic Chemistry Special-I		
Course Code	M24-CHE-305		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the principle of oxidation, oxidative processes related to Hydrocarbons-alkenes, aromatic rings, activated and unactivated saturated C-H groups, alcohols, diols, aldehydes, ketones, ketals and carboxylic acids, amines, hydrazines, and sulphides. CLO 2: To understand the general pathways of reduction reactions. Reduction of Hydrocarbons – alkanes, alkenes, alkynes, substituted and unsubstituted aromatic rings, carbonyl compounds-aldehydes, ketones, acids and their derivatives, Epoxides, compounds containing nitro, nitroso, azo and oxime groups. CLO 3: To understand the light-induced reactions in carbonyl compounds (Paterno-Büchi reaction, photoreduction, etc.), photochemistry of unsaturated systems (olefins, 1,3-butadiene) CLO 4: Understanding of photochemical rearrangements (Di-π-methane, Photo-Fries, Barton, Hoffman-Löffler-Freytag) and their applications in biological systems, including vision mechanisms and neonatal jaundice treatment.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours

I	Oxidation Introduction, Different oxidative processes, Hydrocarbons- alkenes, aromatic rings, saturated C-H groups (activated and unactivated). Alcohols, diols, aldehydes, ketones, ketals and carboxylic acids. Amines, hydrazines, and sulphides.	15
II	Reduction Introduction, Different reductive processes, Hydrocarbons—alkanes, alkenes, alkynes and aromatic rings. Carbonyl compounds-aldehydes, ketones, acids and their derivatives. Epoxides. Nitro, nitroso, azo and oxime groups. Hydrogenolysis.	15
III	Photochemistry Excitation and excited states, Franck-Condon Principle, Jablonski diagram, energy transfer photosensitization, quenching, quantum yield, excimer and exciplex complex, P-type and E-type delayed fluorescence Photochemistry of carbonyl compounds (Norrish type I and type II changes, photoreaction of cyclic ketones, Paterno-Buchi reaction and Photoreduction. Photochemistry of olefins and 1,3-Butadiene (cis-trans isomerisation, dimerization, and cycloadditions).	15
IV	Photochemistry Di- π -methane rearrangement, enone and dienone rearrangements, photochemistry of aromatic compounds (substitution, isomerization, cyclization and cycloaddition reactions), Photo-Fries rearrangement, photolysis of nitrile esters and Barton reaction, Hoffman-Loeffler-Freytag reaction, photochemistry of vision and neonatal jaundice.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Some Modern Methods of Organic Synthesis, W. Carruther, Cambridge Univ. Press.		
2. Advanced Organic Chemistry, Reactions Mechanism and Structure, J. March, John Wiley.		
3. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic & Professional.		
4. Advanced Organic Chemistry and Reaction Mechanisms, Reinhard Bruckner, Academic Press.		
5. Organic Chemistry, Jonathan Clayden, Nick Greeves, and Stuart Warren, Oxford University Press.		
6. Organic Photochemistry, J Coxan & B. Halton, Cambridge University Press.		
7. Introductory Photochemistry, A. Cox and T. Camp McGraw Hill.		
8. Organic Photochemistry, V. Ramamurthy, CRC Press First Edition, 1997.		
9. Organic Photocatalysts for Energy and Synthesis Emily R. Smith, James M. R. Narayanam Publisher: Royal Society of Chemistry Year: 2024.		
10. Photoinduced Reactions in Organic Synthesis, Stefano Protti, Maurizio Fagnoni, Publisher: Wiley-VCH, Year: 2020.		

11. Reaction Mechanisms in Organic Chemistry by S.M. Mukherjee and S.P. Singh,
Lakshmi Publications.

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Pharmaceutical Chemistry Special-I		
Course Code	M24-CHE-306		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Become familiar with the basic concepts of synthon approach and to apply the concept of disconnection approach for the synthesis of drug molecules. CLO 2: To apply the protection and deprotection strategy for important functional groups namely alcoholic, amino, carbonyl and carboxylic groups. CLO 3: To be acquainted with mechanistic details of the methods of preparation and reactions of five-membered, dihetero-atomic molecules, 1,2- and 1,3-azoles. CLO 4: Discuss the concept related to the synthesis and reaction of different natural products.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting at-least one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Synthon approach-I Definition of terms- Disconnection, synthons, functional group interconversions (FGI), synthetic equivalents. General principles of the disconnection approach, the importance of order of events in organic synthesis, one group C-X and two group C-X, One group C-C disconnections-alcohols and carbonyl compounds, chemoselectivity, reversal of polarity, amine synthesis.		15
II	Synthon approach-II Two group C-C disconnections-1, 3 & 1,5-difunctionalized compounds, Stereochemistry in organic synthesis-stereoselectivity, stereospecificity, regioselectivity and regiospecificity.		15

	Synthon approach in the synthesis of the following drugs: Salbutamol, Propanolol, moxnidazole, nafimidone, drildone, belfosih. Ocfentanil, afornine Principle of protection of alcoholic, amino, carbonyl and carboxylic groups.			
III	Heterocyclic Compounds - I Systematic (Hantzsch-Widman) nomenclature for monocylic and fused ring systems. Methods of synthesis and Reactions including mechanism of the following five-membered 1,2- and 1,3-heterocycles: pyrazole, imidazole, oxazole, isooxazole, thiazole, isothiazole; their basic character.	15		
IV	Heterocyclic Compounds - II Methods of synthesis and Reactions including mechanism of the following six-membered heterocycles: purines and pyrimidines. Caffeine, xanthine, theobromine, theophylline. Methods of synthesis and Reactions including mechanism of-Indoles, quinolines and isoquinolines. Flavanoids: Occurrence, nomenclature and general methods of structure determination, isolation, importance and synthesis of Cyanin, Quercetin, Diadzein and Chrysin.	15		
Total Contact Hours		60		
Suggested Evaluation Methods				
Internal Assessment: 30		End Term Examination: 70		
➤ Theory		30	➤ Theory:	70
● Class Participation:		05	Written Examination	
● Seminar/presentation/assignment/quiz/class test etc.:		10		
● Mid-Term Exam:		15		
Part C-Learning Resources				
Recommended Books/e-resources/LMS:				
1. Designing Organic Synthesis, S. Warren, Wiley.				
2. Some Modern Methods of Organic Synthesis, W. Carruthers, Cambridge Univ. Press.				
3. Modern Synthetic Reactions, H. O. House, W.A. Benzamin.				
4. Advanced Organic Chemistry Reactions, Mechanisms a Structures, J. March, Wiley.				
5. Advanced Organic Chemistry Part B. F.A. Carey and R.J. Sundberg, Plenum Press.				
6. Organic Chemistry, Vol. 2, I. L. Finar, ELBS.				

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Inorganic Chemistry Special-II		
Course Code	M24-CHE-307		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To Learn about Reaction Mechanism of Transition Metal Complexes CLO 2: To Learn about Electron transfer reactions in transition metal complexes CLO 3: To learn about Photochemistry of transition metal complexes CLO 4: To learn about solid state, glasses, ceramics and alloys		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Reaction Mechanism of Transition Metal Complexes Energy profile of a reaction, reactivity of metal complexes, kinetic application of valence bond and crystal field theories, kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favor of conjugate mechanism, anation reactions, reactions without metal ligand bond cleavage. ligand Substitution reactions in square planar complexes, factors affecting substitution reactions in square planar complexes, the Trans effect, mechanism of the substitution reactions.		15
II	Electron Transfer Reactions Redox reactions, electron transfer reactions, general discussion and kinetic rate laws., mechanism of one electron transfer reactions, outer-sphere type reactions, cross reactions and Marcus-Hush theory, inner sphere type reactions, two electron transfer reactions, metal ion		15

	catalyzed reactions, mixed valence complexes and their electron transfer.		
III	Excited States of Metal Complexes Electronically excited states of metal complexes: charge-transfer spectra, charge transfer transition, photosubstitution reactions, photo rearrangements, photoisomerisation, photoredox processes conditions of excited states to be useful redox reaction Illustration of some reducing and oxidizing character of Ru(2+) tris-bipyramidal complex. Transformation of chemical energy into light energy Metal Complex Sensitizers Metal complex sensitizer, photosensitised reactions in metal complexes, water photolysis, nitrogen fixation and carbon dioxide reduction	15	
IV	Solid State Crystalline and non-crystalline materials, Glass transition temperature (Tg) and melting temperature (Tm), classes of compounds of the type A2B3 (corundum structure), and AB3 (Cu3Au, ReO3), Glasses, ceramics and silicates: Types and uses. Alloys: Interstitial and substitutional alloys, superconducting alloys, Hume-Rothery rules and Meissner effect.	15	
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
● Class Participation:	5	Written Examination	
● Seminar/presentation/assignment/quiz/class test etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Mechanism of Inorganic Reactions; F.Basolo and R.G. Pearson, John Wiley and Sons, New York.			
2. Inorganic Chemistry; K.F. Purcell, J.C. Kotz; Holt-Sanders International Editions; Philadelphia.			
3. Concepts of Inorganic Photochemistry, A.W. Adamson and P.D. Fleischauer, Wiley.			
4. Photochemistry of coordination compounds, K.Balzani and V.Carassti, Academic press.			
5. Elements of Inorganic Photochemistry; G.J. Ferraudi, Wiley.			
6. An Introduction to Crystal Chemistry; R.C. Evans, Cambridge University Press.			
7. Introduction to solid state Physics; C. Kittel, Wiley New York.			
8. Solid State Chemistry; N.B. Hannay; Prentice.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Physical Chemistry Special-II		
Course Code	M24-CHE-308		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand and apply the concepts of ensemble averaging and different statistical ensembles (microcanonical, canonical, grand canonical) along with their distribution laws. Derive and interpret classical distribution laws including Maxwell-Boltzmann and Boltzmann distributions, and velocity distributions. CLO 2: Explain and apply quantum statistics (Bose-Einstein and Fermi-Dirac) to systems like photon and electron gases, and distinguish between degenerate and non-degenerate systems. CLO 3: Use partition functions to calculate thermodynamic properties and analyze molecular systems (monoatomic, diatomic, polyatomic). CLO 4: Relate statistical thermodynamics to equilibrium constants and free energy functions (Helmholtz, Gibbs). Understand the principles of non-equilibrium thermodynamics, Onsager's relations, entropy production, and stationary states.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Statistical Mechanics Ensemble averaging, postulates of ensemble averaging. Micro canonical, canonical and grand canonical ensembles, corresponding distribution laws (using Lagrange's method of undetermined multipliers).		15

	Maxwell- Boltzmann statistics, Boltzmann distribution, derivation of the Boltzmann distribution expression, determination of the Boltzmann constant, Maxwell distribution law of velocities from Boltzmann distribution expression.	
II	Quantum Statistics The Bose-Einstein statistics, statistics of a photon gas, the Fermi-Dirac statistics, Fermi-Dirac systems, extreme gas degeneration, slight gas degeneration, electron gas in metals, thermionic emission and comparison of two statistics, non-degenerate and degenerate systems.	15
III	Statistical Thermodynamics – I Partition function and thermodynamic properties, partition function and factorization of partition function, translational partition function, translational thermodynamic function, atoms and monoatomic molecules, Sackur-Tetrode equation, diatomic molecules, separation of internal partition function. Rotational and vibrational energies, entropy due to internal degrees of freedom. Rotational partition function, rotational partition function for polyatomic molecules, vibrational partition function.	15
IV	Statistical Thermodynamics – II Determination and calculation of thermodynamic properties i.e. internal energy, entropy, Helmholtz and Gibbs free energy, ortho and para hydrogen states, free energy functions. Relationship of Partition function and equilibrium constant with different systems. Non-equilibrium Thermodynamics Meaning and scope of irreversible thermodynamics. Thermodynamic criteria for non-equilibrium states, Phenomenological laws-linear laws, Gibb’s equation, Onsager’s reciprocal relation, Entropy production-specific laws of entropy production, Non-equilibrium stationary states.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Introduction to Statistical Thermodynamics, H. Dole.		
2. Theoretical Chemistry, S. Glasstone, Affiliated East-West Press.		
3. Thermodynamics, Lewis and Randall.		
4. Chemical Physics, J.C. Slater.		
5. Non-equilibrium Thermodynamics, C. Kalidas.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Organic Chemistry Special-II		
Course Code	M24-CHE-309		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the role of Li, Mg, Zn, Cu, S, Si, and B reagents in organic synthesis—including their preparation, reactivity, mechanisms, and applications in bond-forming reactions. CLO 2: Master retrosynthetic analysis concepts: synthon identification, synthetic equivalents, functional group interconversion (FGI), and strategic disconnection approaches (C-X and C-C bonds). Explore selectivity principles (chemo-/regio-/stereo-selectivity) in reaction design. CLO 3: Apply advanced strategies like polarity reversal (umpolung), Wittig olefination, alkyne/nitro compound chemistry, and ring-forming reactions (3-6 membered rings) for target molecule synthesis. CLO 4: To develop the skill of protection/deprotection strategies (alcohols, amines, carbonyls, acids) in multistep organic synthesis, and multi-step disconnections using Diels-Alder reactions, 1,3-/1,5-difunctional systems, Michael additions, and Robinson annelation for complex molecule assembly.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Organometallic Reagents		15

	Principle, preparations, properties, and applications of the reagents of the following metals/non-metals in organic synthesis with mechanistic details: Li, Mg, Zn, Cu, S, Si and B.	
II	Disconnection Approach-I An introduction of synthons and synthetic equivalents, general principles of the disconnection approach, functional group interconversions, the importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections, one group C-C disconnection, chemoselectivity, regioselectivity, regiospecificity, stereoselectivity, and stereospecificity.	15
III	Disconnection Approach-II Reversal of polarity, amine synthesis, use of Wittig reagents, use of acetylene and aliphatic nitro compounds in organic synthesis, synthesis of three-membered rings, photochemistry in organic synthesis-synthesis of four-membered rings, uses of ketenes in organic synthesis, synthesis of five and six-membered rings.	15
IV	Disconnection Approach-III Protective Groups: Introduction, principle of protection of alcoholic, amino, carbonyl, and carboxylic groups, Protection and deprotection of Alcohols: ethers, silyl ethers, acetals, esters, Carbonyl Groups: acetals/ketals, dithioacetals/dithioketals, Amino Groups: carbamates, amides, Carboxylic Groups: esters, silyl esters, amides. Two group C-C disconnections: Diels Alder reactions, 1,3-difunctionalized compounds and α,β -unsaturated carbonyl compounds, Control in carbonyl condensations, 1,5-difunctionalized compounds-Michael addition and Robinson Annellation.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Designing Organic Synthesis, S.Warren, Wiley.		
2. Some Modern Methods of Organic Synthesis, W. Carruthers, Cambridge Univ. Press.		
3. Advanced Organic Chemistry Reactions, Mechanisms and Structures, J. March, Wiley.		
4. Advanced Organic Chemistry Part B. F.A. Carey and R.J. Sundberg, Plenum Press.		
5. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic & Professional.		
6. Structure and Mechanism in Organic Chemistry, C. K. Ingold, Cornell University Press.		
7. Advanced Organic Chemistry and Reaction Mechanisms, Reinhard Bruckner, Academic Press.		
8. Organic Chemistry, Jonathan Clayden, Nick Greeves, and Stuart Warren, Oxford University Press.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Pharmaceutical Chemistry Special-II		
Course Code	M24-CHE-310		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To discuss antineoplastic agents alkylating agents, antimetabolites, antiviral agents and antimalarials drugs. CLO 2: To understand penicillins in detail, lactamase inhibitors, cephalosporins, sulfonamides, tetracyclines, aminoglycosides, macrolides, quinolones and lincomycin. CLO 3: To inform about prostaglandins, NSAIDS, antipyretic-analgesics. CLO 4: To know about the antifertility agents, ovulation inhibitors and related hormonal contraceptives. Concept of antihypertensive agents, calcium channel blockers, ACE inhibitors and alpha-blockers, beta-blockers and centrally acting adrenergic drugs.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting at-least one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	General mode of action, Medicinal Uses and Synthesis of Important Drugs in the Following Categories. Antineoplastic Agents: Metastasis, classification, mode of action of alkylating agents (synthesis of melphalan, thiotepa, busulfan, lomustine) and antimetabolites (synthesis of methotrexate, 5-fluorouracil, 6-mercaptopurine), hormone-based therapies, plant products, radiotherapeutic agents. Taxol related compounds. Antiviral agents: RNA and DNA viruses, an introduction to AIDS, how HIV infects the system, mode of action of nucleoside reverse		15

	transcriptase inhibitors- AZT, ddI, ddC, d4T & 3TC and HIV-protease inhibitors-Ritonavir. Synthesis of AZT. An overview of HIV entry inhibitors, Integrase inhibitors, Chemokine receptor binders, Inhibitors of gp41 fusion activity. Antimalarials: Cinchona alkaloids, 4-aminoquinolines, 8-aminoquinolines, Mefloquine, 9-aminoacridines. Synthesis of Mefloquine, chloroquine, primaquine.	
II	Antibiotics Penicillins: Discovery, mode of action, SAR, Penicillins and semi-synthetic penicillins, problems of sensitivity to acids, β -lactamases and narrow spectrum of activity; solving these problems leading to the development of penicillin V, oxacillin, cloxacillin, ampicillin, amoxycillin, carbenicillin and carfecillin; β -lactamase inhibitors-Clavulanic acid, Olivanic acids. Cephalosporins: Classification, SAR, synthesis of cephalosporin-C, recent advances of fourth generation cephalosporins Sulfonamides-SAR, mode of action. Sulfanilamide analogs- synthesis of Sulfathiazole, sulfadiazine, sulfacetamide. Tetracyclines and aminoglycosides: Structure, mode of action, SAR, streptomycin, neomycin, gentamycin; Macrolides- mode of action, erythromycin, azithromycin; Synthesis of chloramphenicol. Quinolones, fluoroquinolones: Structure, mode of action, synthesis of nalidixic acid, ciprofloxacin and Lincomycin.	15
III	Prostaglandins: General Introduction, nomenclature of prostaglandins and eicosanoid biosynthesis. Non-Steroidal anti-inflammatory agents: Classification, mode of action, COX-2 inhibitors, salol principle. Synthesis of celecoxib, valdecoxib, aspirin, phenylbutazone, mefenamic acid, indomethacin, piroxicam, diclofenac, Naproxen. Antipyretic-Analgesics: Opioid antagonists and agonists-codeine and heroin, synthesis of meperidine, methadone, dextropropoxyphene.	15
IV	Antifertility agents: Ovulation inhibitors and related hormonal contraceptives- norethindrone, norethynodrel, estradiol and mestranol. Recent Advances. Antihypertensive agents: Classification, Hypertension, Renin-Angiotensin system, mode of action, Calcium channel blockers, ACE inhibitors and α -blockers, β -blockers, centrally acting adrenergic drugs, Synthesis of atenolol, clonidine, methyldopa, guanabenz, diltiazem, captopril, enalapril.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	05	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Ed. Robert F. Dorge.		

2.	Burger's Medicinal Chemistry and Drug Discovery Vol-I Ed. M.E. Wolf, John Wiley.
3.	Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill.
4.	Organic Chemistry Vol.-2 I.L. Finar, ELBS.

Session: 2025-26			
Part A - Introduction			
Name of Programme		M.Sc. Chemistry	
Semester		III	
Name of the Course		Inorganic Chemistry Special Practical-I	
Course Code		M24-CHE-311A	
Course Type		PC-7	
Level of the course		500-599	
Pre-requisite for the course (if any)		Chemistry as a subject at UG level	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO : To learn and perform the experiments on different instruments like spectrophotometry, conductometry, pH-metry and potentiometry	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	Instrumentation I Spectrophotometric Analysis To find out the λ_{max} of the different substances II Conductometric Titrations Strong acid vs strong base Strong acid vs weak base Weak acid vs strong base Precipitation titrations To Validate the Ostwald's Dilution law Any other experiments related to this instrumentation III Potentiometric Titrations Strong acid vs strong base Strong acid vs weak base Weak acid vs strong base Any other experiments related to this instrumentation IV pH metric Titrations Strong acid vs strong base Strong acid vs weak base Weak acid vs strong base Any other experiments related to this instrumentation V Any other techniques introduced		120
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70

● Class Participation:	5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. A Text Book of Quantitative Analysis: A. I. Vogel, ELBS, London. 2. Practical Chemistry, A.M. James and F.E. Prichard, Longman.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Physical Chemistry Special Practical-I		
Course Code	M24-CHE-311B		
Course Type	PC-7		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1 : To apply the technique of potentiometry for determining activity coefficients of different electrolytes, determining stability constants of the complexes and finding the solubility of sparingly soluble salts CLO 2 : The potentiometry technique is used to perform the acid-base titrations, studying the equilibrium constant for redox reactions and determining liquid junction potential CLO 3 : To apply the technique of polarimetry for determining the percentage of optically active substance in a mixture, finding out the relative strength of acids and effect of substituents on rate constant of inversion kinetics CLO 4 : To develop the ability to compile interpreted information in the form of lab record and to face viva-voce		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics	Contact Hours	
	Potentiometry 1. Determination of activity coefficient of Ag^+ in the different solution of silver nitrate. 2. Determination of solubility of silver halides in water. 3. Determination of first and second ionization constant of phosphoric acid. 4. Study of silver-ammonia complex and determination of the stability constant. 5. Determination of strength of ferrous ammonium sulphate using potassium dichromate or ceric sulphate and determination of redox potential. 6. Determination of strength of HCl and CH_3COOH in a mixture using NaOH.	120	

	7. Titration of weak acid with strong base using quinhydrone and determination of dissociation constant of the acid. 8. Study of equilibrium constant of the reaction $\text{Fe}^{++} + \text{Ag}^{+} \rightarrow \text{Fe}^{+++} + \text{Ag}$ 9. To determine the degree of hydrolysis of aniline hydrochloride. 10. Titration of Potassium halides mixture (two/three) with AgNO_3 potentiometrically Polarimetry 1. Determine the percentage of two optically active substances in a mixture polarimetrically. 2. Determination of relative strength of acids by the study of inversion of sucrose. 3. Investigate the effect of substitution of chloride ions on rate constant of inversion of cane sugar by using mono- and tri-chloroacetic acids as catalysts. Note: Any experiment may be introduced/deleted in the practical class based on the availability / non-availability of the instruments / chemicals.	
Total Contact Hours		120
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practical	30	➤ Practical: 70
● Class Participation:	5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Practical Physical Chemistry, S.R. Palit and S.K. De, Science. 2. Senior Practical Physical Chemistry, B.D. Khosla, V.C. Garg and A. Gulati, S. Chand & Co. 3. Experimental Physical Chemistry, R.C. Das and B. Behera, McGraw Hill. 4. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman. 5. Findley’s Practical Physical Chemistry, B.P. Lavitt, Longman. 6. Systematic experimental Physical Chemistry, T.K. Chandershekhar & S.K. Rajbhoj 7. A Comprehensive guide to physical chemistry experiments and viva questions, Neelam Seedhar, Notion Press.		

Session: 2025-26			
Part A - Introduction			
Name of Programme		M.Sc. Chemistry	
Semester		III	
Name of the Course		Organic Chemistry Special Practical-I	
Course Code		M24-CHE-311C	
Course Type		PC-7	
Level of the course		500-599	
Pre-requisite for the course (if any)		Chemistry as a subject at UG level	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO 1: To understand the methods of separation of binary (liquid-liquid, liquid-solid, or solid-solid) organic mixtures, qualitative analysis of each compound, and preparation of their derivatives. CLO 2: Characterize the separated organic compounds by interpreting their ¹ H NMR and FT-IR spectra and develop the ability to compile the results in the form of a lab record.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	1. Qualitative Analysis: Separation of components of a binary or ternary (liquid-liquid, liquid-solid or solid-solid) organic mixture using physical and chemical methods. Characterization of these components with the help of chemical analysis and derivative formation. 2. Spectroscopic confirmation of the components of binary or ternary mixtures using IR and NMR tools (IR & NMR spectra will be provided).		120
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70
● Class Participation:	5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

1. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2023). *Vogel's Textbook of Practical Organic Chemistry* (6th ed.). Pearson. Harlow, England.
2. Mann, F. G., & Saunders, B. C. (2018). *Practical Organic Chemistry* (3rd ed.). Wiley. Hoboken, NJ.
3. Mohrig, J. R., Hammond, C. N., & Schatz, P. F. (2020). *Modern Projects and Experiments in Organic Chemistry* (2nd ed.). W.H. Freeman. New York, NY.
4. Doxsee, K. M., & Hutchison, J. E. (2021). *Green Organic Chemistry: Strategies, Tools, and Laboratory Experiments* (1st ed.). Cengage Learning. Boston, MA.
5. Leonard, J., Lygo, B., & Procter, G. (2019). *Advanced Practical Organic Chemistry* (3rd ed.). CRC Press. Boca Raton, FL.
6. Harwood, L. M., & Moody, C. J. (2020). *Experimental Organic Chemistry* (2nd ed.). Oxford University Press. Oxford, UK.
7. Lehman, J. W., & Morrill, T. B. (2021). *Techniques in Organic Chemistry* (4th ed.). Springer. Cham, Switzerland.
8. Shriner, R. L., Hermann, C. K. F., & Morrill, T. C. (2018). *The Systematic Identification of Organic Compounds* (9th ed.). Wiley. Hoboken, NJ.

Session: 2025-26			
Part A - Introduction			
Name of Programme		M.Sc. Chemistry	
Semester		III	
Name of the Course		Pharmaceutical Chemistry Special Practical-I	
Course Code		M24-CHE-311D	
Course Type		PC-7	
Level of the course		500-599	
Pre-requisite for the course (if any)		Chemistry as a subject at UG level	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO : To develop the understanding for organic synthesis, different isolation, purification and estimation techniques used for samples of medicinally important compounds.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	16	16
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
Preparations: 1) Preparations of organic compounds of medicinal interest. 2) Techniques in isolation and extraction of crude drugs, purification of various active principles having medicinal, industrial and chemical importance. 3) Quantitative estimation of drugs in biological samples. 4) Identification of microbes on the basis of Gram staining, sterility testing, microbial assays.			120
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
● Class Participation:	05	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10	
● Seminar/ Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. "A Handbook of Organic Analysis Qualitative and Quantitative" by H.T. Clarke and revised by B.Maynes, Edward Arnold (Pub.), Ltd. London, 1975).			
2. "Systematic Qualitative Organic Analysis" by H.Middleton, Edward Arnold (Publishers) Ltd., London 1959.			
3. "A Text Book of Practical Organic Chemistry including Qualitative Organic Analysis" by Arthur I. Vogel, Longmans Green and Co., Ltd., London 1966.			
4. "Elementary Practical Organic Chemistry" by Arthur I. Vogel, CBS Publishers & Distributors.			
5. "A Guide to spectroscopy in Organic Chemistry' by PAVY			

6. "Spectrometric Identification of Organic Compounds", Fifth Ed., R.M. Silverstein, G.S. Bassler and T.C. Morrill, John Wiley and Sons, New York.
7. "Organic Spectroscopy", 3rd Ed., by William Kemp. John Wiley & Sons.
8. "Spectroscopic" Methods in Organic Chemistry, D.H. Williams & Ian Fleming.
9. Vogel's Text Book of Practical Organic Chemistry by B.S. Furness et. al., Longman Group Ltd.

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Inorganic Chemistry Special Practical-II		
Course Code	M24-CHE-312A		
Course Type	PC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO : To prepare selected Inorganic Compounds and their study by various spectroscopic methods (IR, NMR, EPR etc.)		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	Preparations: Preparation of selected Inorganic Compounds and their study by spectroscopic methods (IR, NMR, EPR etc.) I Choloropentaamminecobalt (III) Chloride II Nitro/Nitritopentaamminecobalt (III) Chloride (Distinction between nitro and nitrito by IR) III Potassium trioxalatoferrate (III) IV Chromous acetate V Cis and trans [Co(en) ₂ Cl ₂] VI Tris(acetyl-acetonato) manganese (III) VII Preparation of Ferrocene VIII Tris thioureacopper(I) sulfate IX Tris(acetylacetonato)chromium(III)		120
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70
● Class Participation:	5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS: 1. Synthesis and Characterization of Inorganic compounds. W. L. Jolly, Prentice Hall, Englowood. 2. A Text Book of Quantitative Analysis: A. I. Vogel, ELBS, London. 3. Inorganic Preparations: W. G. Palmer.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Physical Chemistry Special Practical-II		
Course Code	M24-CHE-312B		
Course Type	PC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1 : To apply the conductometry method for performing conductometric acid -base titrations and Determining equivalent conductance of weak and strong electrolytes CLO 2 : To apply the conductometry method for Determining solubility of sparingly soluble silver salts and Determining CMC of surfactants CLO 3 : To apply the technique of spectrophotometry for Verifying Lambert-Beer's law and Determining composition of various mixtures CLO 4 : To develop the ability to compile interpreted information in the form of lab record and face viva-voce		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics	Contact Hours	
	Conductometry 1. Conductometric titration of: (i) Strong acid vs. strong base, (ii) Strong acid vs. weak base, (iii) Weak acid vs. strong base, (iv) Weak acid vs. weak base, (v) $\text{CH}_3\text{COOH} + \text{HCl}$ vs. NaOH, (vi) CuSO_4 vs. NaOH. 2. Determination of the equivalent conductance of weak acid (benzoic/ acetic acid) at several concentrations and the dissociation constant of the acid. 3. Determination of the equivalent conductance of strong electrolytes such as HCl, KCl, KNO_3 and NaCl and the validity of Onsagar equation. 4. Study of degree of hydrolysis of aniline hydrochloride. 5. Determine the critical micelle concentration (CMC) of surfactants by conductivity method. Colorimetry/Spectrophotometry	120	

	1. Verification of the Lambert-Beer’s law using aqueous solutions of KMnO_4, $\text{K}_2\text{Cr}_2\text{O}_7$ and CuSO_4. 2. Study of iron-tiron and iron-salicylic acid complexes. 3. Determination of the composition of Potassium dichromate and potassium permanganate mixture spectrophotometrically: 4. Determine the dissociation constant of an indicator spectrophotometrically. Note: Any experiment may be introduced/deleted in the practical class based on the availability / non-availability of the instruments / chemicals.	
Total Contact Hours		120
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practical	30	➤ Practical: 70
● Class Participation:	5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Practical Physical Chemistry, S.R. Palit and S.K. De, Science. 2. Senior Practical Physical Chemistry, B.D. Khosla, V.C. Garg and A. Gulati, S. Chand & Co. 3. Experimental Physical Chemistry, R.C. Das and B. Behera, McGraw Hill. 4. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman. 5. Findley’s Practical Physical Chemistry, B.P. Lavitt, Longman. 6. Systematic experimental Physical Chemistry, T.K. Chandershekhar & S.K. Rajbhoj 7. A Comprehensive guide to physical chemistry experiments and viva questions, Neelam Seedhar, Notion Press.		

Session: 2025-26			
Part A - Introduction			
Name of Programme		M.Sc. Chemistry	
Semester		III	
Name of the Course		Organic Chemistry Special Practical-II	
Course Code		M24-CHE-312C	
Course Type		PC-8	
Level of the course		500-599	
Pre-requisite for the course (if any)		Chemistry as a subject at UG level	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO 1: To understand the basics of quantitative analysis and application in analysis of the Amino group, hydroxyl group, acetoxy group, carbonyl group, unsaturation, reducing and non-reducing sugars. CLO 2: To understand the saponification value and iodine value of fats and oils, formalin and glycine. Determination of the molecular weight.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	1. Quantitative estimation of the following: Amino group, hydroxyl group, acetoxy group, carbonyl group, unsaturation, reducing and non-reducing sugars. 2. Saponification value and iodine value of fats and oils, formalin and glycine, Determination of the molecular weight of acid by titration and by the silver salt method.		120
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical		30	➤ Practical: 70
● Class Participation:		5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:		10	
● Mid-Term Exam:		15	
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2023). Vogel’s textbook of practical organic chemistry (6th ed.). Pearson Education.			
2. Mann, F. G., & Saunders, B. C. (2018). Practical organic chemistry (3rd ed.). Wiley.			

3. Harris, D. C., & Lucy, C. A. (2020). Quantitative chemical analysis (10th ed.). W. H. Freeman.
4. Ahluwalia, V. K., & Dhingra, S. (2019). Advanced practical chemistry (2nd ed.). CRC Press.
5. Reaction Mechanisms in Organic Chemistry by S.M. Mukherjee and S.P. Singh, Lakshmi Publications.

Session: 2025-26				
Part A - Introduction				
Name of Programme		M.Sc. Chemistry		
Semester		III		
Name of the Course		Pharmaceutical Chemistry Special Practical-II		
Course Code		M24-CHE-312D		
Course Type		PC-8		
Level of the course		500-599		
Pre-requisite for the course (if any)		Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO : To develop the understanding about different forms of dosage e.g., emulsion(s), solution(s), cream(s), ointment(s), lotion(s) their preparations and evaluations.		
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	16	16
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time (Spread over two sessions)			6 hours	
Part B- Contents of the Course				
Unit	Topics			Contact Hours
	Preparation and evaluation of the followings: Emulsion, simple syrup, aqueous iodine solution, strong iodine solution, calamine lotion, boroglycerine, tannic acid glycerine, phenol glycerine, peppermint water, rose water, camphor water, formulation of simple and medicated ointments, magnesium hydroxide mixture (milk of magnesium), simple and complex powders, cough mixture, cold cream, vanishing cream and lotions.			120
Total Contact Hours				120
Suggested Evaluation Methods				
Internal Assessment: 30			End Term Examination: 70	
● Class Participation:		05	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:		10		
● Mid-Term Exam:		15		
Part C-Learning Resources				
Recommended Books/e-resources/LMS:				
1. "A Handbook of Organic Analysis Qualitative and Quantitative" by H.T. Clarke and revised by B. Maynes, Edward Arnold (Pub.), Ltd. London, 1975).				
2. "Systematic Qualitative Organic Analysis" by H.Middleton, Edward Arnold (Publishers) Ltd., London 1959.				
3. "A Text Book of Practical Organic Chemistry including Qualitative Organic Analysis" by Arthur I. Vogel, Longmans Green and Co., Ltd., London 1966.				
4. "Elementary Practical Organic Chemistry" by Arthur I. Vogel, CBS Publishers & Distributors.				
5. "A Guide to spectroscopy in Organic Chemistry' by PAVY				

6. "Spectrometric Identification of Organic Compounds", Fifth Ed., R.M. Silverstein, G.S. Bassler and T.C. Morrill, John Wiley and Sons, New York.
7. "Organic Spectroscopy", 3rd Ed., by William Kemp. John Wiley & Sons.
8. "Spectroscopic" Methods in Organic Chemistry, D.H. Williams & Ian Fleming.
9. Vogel's Text Book of Practical Organic Chemistry by B.S. Furness et. al., Longman Group Ltd.

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	III		
Name of the Course	Applied Chemistry		
Course Code	M24-OEC-305		
Course Type	OEC		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the basics of polymers and polymerizations CLO 2: To discuss about different types of polymer composites CLO 3: The students will be understand the mechanism of drug action CLO 4: The students will have the knowledge of common drugs		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleastone question from each unitand the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Polymer Polymer basic concepts: monomers, degree of polymerization, classification of polymers, types of polymerization, Concept of no. average molecular weight and mass average molecular weight, Methods of determining molecular weights, concept of kinetic chain length Polydispersity index, kinetics of polymerization (addition and chain polymerization). Thermoplastics and Thermoseting Polymers, Glass transition temperature and (melting point, factors affecting Tg and Tm),		8
II	Polymer Composites Thermal properties of polymers, Flame retardant polymers, Flame retarding Polymer composites, its classification, polymer composites using filler reinforcement, Biocomposites, application of biocomposites in automobiles and in construction materials. Polymer nanocomposites, Properties of polymer nanocomposites, application of polymer nanocomposites		7
III	Medicinal Chemistry Concept of drug and drug development, lead compound and lead modification, prodrugs and soft drugs, an elementary idea of structure reactivity relationship (SAR), Elementary idea about drug action: the		8

	receptor role, neurotransmitters and receptors, ion channels and their control, membrane bound enzymes-activation/deactivation, chemical basis of messenger induced change of shape by the receptor.	
IV	Some Common Drugs Definition, uses and side effects of the following categories of drugs: Antipyretics, analgesics & anti-inflammatory agents (paracetamol, aspirin, mefenamic acid, ibuprofen and diclofenac), antimalarial (Chloroquine, chloroguanide), Anticancer (Chlorambucil, cyclophosphamide), Cardiovascular drugs (sorbitrate, diltiazem), Antifertility agents (introduction to hormonal and nonhormonal contraception only).	7
Total Contact Hours		30
Suggested Evaluation Methods		
Internal Assessment: 15		End Term Examination: 35
➤ Theory	15	➤ Theory: 35
● Class Participation:	4	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	4	
● Mid-Term Exam:	7	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Textbook of Polymer Chemistry, F. W. (Jr) Billmeyer, Wiley, New York.		
2. Polymer Science, V. R. Gowarikar, N. V. Viswanathan and Jayadev Sridhar, New Age International		
3. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, Ed. Robert F. Dorge.		
4. Burger's Medicinal Chemistry and Drug Discovery, Vol-I, Ed. M.E. Wolf, John Wiley.		
5. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill.		

Session: 2025-26			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Inorganic Chemistry-III		
Course Code	M24-CHE-401		
Course Type	CC-11		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To learn about the statistical evaluation of various experimentation data CLO 2: To know about the concept of molecular luminescence and sewage, fertilizers and their various aspects in life CLO 3: To learn about the polarographic techniques and application of group theory in investigation of IR spectra of various compounds CLO 4: To know about the Mössbauer spectroscopy, ESR spectroscopy and their application		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Errors and Evaluation Definition of terms in mean and median. Precision-standard deviation, relative standard deviation. Accuracy-absolute error, relative error. Types of error in experimental data-determinate (systematic), indeterminate (or random) and gross. Sources of errors and the effects upon the analytical results. Methods for reporting analytical data, confidence limits, Statistical evaluation of data-indeterminate errors, Test of significance. Significance of the F test, the student 't' test and the Chi-square test.		15
II	Sewage and fertilizers Sewage treatment (Primary, Secondary and Tertiary), Biochemistry of sewage, Water quality parameters, Nitrogen cycle; ammonification, nitrification, denitrification, fixation of nitrogen, biochemistry and ecology of nitrogen fixation, Nitrogenase (Mo-, V- and Fe- nitrogenase), factors limiting biological nitrogen fixation, fertilizers -nitrogen and phosphorus fertilizers in agriculture, surfactants - cationic, anionic and		15

	non-ionic, specific properties, degradation of surfactants. Molecular luminescence Fluorimetry and Phosphorimetry: Introduction, principles of fluorescence and phosphorescence, interpretation of fluorescence spectra, factors affecting fluorescence and phosphorescence, fluorescence intensity and concentration, instrumentation for fluorimetry, applications of fluorimetry. Phosphorimetry, instrumentation, applications, comparison between fluorimetry and phosphorimetry.	
III	Polarography General principles, diffusion controlled current, dropping mercury electrode, Ilkovic equation (without proof), Half-wave potential, over potential, Evaluation of Polarographic waves, conditions for performing Polarographic determinations and applications of Polarography, theories of hydrogen overvoltage (Tafel's theory, Recombination theory and Volmer, Erdy and Gruss theory/theory of slow discharge of ions). Vibrational Spectroscopy Symmetry, shapes and number of IR modes AB ₂ , AB ₃ , AB ₄ , AB ₅ and AB ₆ (Group theoretical treatment) mode of bonding of ambidentate ligands like Nitro, thiocyanate and diketonato complexes,	15
IV	Mossbauer Spectroscopy Basic principles, spectral parameters and spectrum display. Application of the technique to the studies of (1) bonding and structures of Fe ²⁺ and Fe ³⁺ compounds including those of intermediate spin, (2) Sn ²⁺ and Sn ⁴⁺ compounds – nature of M-L bond, coordination number, structure and (3) detection of oxidation state. Photoelectron Spectroscopy Basic principles; photo-electric effect, ionization process, Koopman's theorem. Photoelectron spectra of simple molecules, ESCA, chemical information from ESCA.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
10. A Textbook of Quantitative Inorganic Analysis, A.I. Vogel; ELBS, London.		
11. Fundamentals of Analytical Chemistry; D.A. Skoog, O.M. West and F.J. Holler; W.B. Saunders.		
12. Instrumental methods of Analysis; L.L. Merits, R.H. Willard and J.A. Dean; Van Nostrand-Reinhold.		
13. Physical methods in Chemistry; R.S. Drago; Saunders.		
14. Fundamentals of Molecular Spectroscopy; C. N. Banwell; McGraw Hill.		
15. Introduction to polarography and allied techniques: Kamla Zutshi.		
16. Symmetry and spectroscopy: An introduction to vibrational and electronic spectroscopy: Daniel C Harris.		

Session: 2025-26			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Organic Chemistry-III		
Course Code	M24-CHE-402		
Course Type	CC-12		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the role of Molecular Orbitals in analysing Pericyclic Reactions. CLO 2: To interpret the stereochemical course of a Pericyclic Reaction and identify the product. To understand the concepts of aromaticity, non-aromaticity, anti-aromaticity, homoaromaticity, and pseudo-aromaticity, aromaticity in charged rings, and the application of $^1\text{H-NMR}$ in determining the aromatic character of annulenes. CLO 3: To understand the mechanism and synthetic applications of the above listed name reactions CLO 4: Explore transition-metal reagents in organic synthesis, focusing on: Principles, Preparations, Mechanistic details in organic synthesis		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Pericyclic Reactions Molecular orbital symmetry, frontier orbital of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system classification of pericyclic reactions. Woodward-Hoffmann correlation diagram. FMO & PMO approach, Electrocyclic reaction - conrotatory and disrotatory motions. $4n$, $4n+2$, allyl systems, Ring opening of cyclopropyl halides and tosylates, cycloadditions-antarafacial and suprafacial additions, $4n$ and $4n+2$ systems, $2+2$ addition of ketenes, 1,3-dipolar cycloadditions and cheletropic reactions.		15
II	Pericyclic Reactions Sigmatropic Rearrangements-suprafacial and antarafacial shifts of H, sigmatropic shifts involving carbon moieties, retention and inversion of		15

	configuration, [3,3] and [5,5] sigmatropic rearrangements, Sommelet-Hauser, Claisen and Cope rearrangements. Introduction to ene reactions. Simple problems on Pericyclic reactions. Aromaticity Concept of aromaticity, non-aromaticity, anti-aromaticity, homoaromaticity, and pseudo-aromaticity. Aromaticity in charged rings and application of 1H-NMR in determining the aromatic character of annulenes.	
III	Name Reactions in Organic Chemistry Mechanism and synthetic applications of Arndt-Eistert synthesis, Beckmann, Hofmann, Curtius, Lossen, Schmidt, Favorskii, Neber, Fritsch-Butenberg-Wiechell, Baeyer-Villiger, Benzil benzilic acid rearrangements, Darzens synthesis, Stork enamine reaction, Shapiro reaction, Sharpless asymmetric epoxidation reactions.	15
IV	Transition Metals in Organic Synthesis Preparations and applications of the reagents of the following metals in organic synthesis with mechanistic details: Pd, Ni, Fe, Co, Cr and Ti compounds.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test, etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic & Professional.		
2. Pericyclic Reactions, S.M. Mukherji Macmilan India.		
3. The Conservation of Orbital Symmetry, R.B. Woodward and R. Hoffmann" Verlag Chemie Academic Press.		
4. Problem Solving approach to Orbital Symmetry, R.E. Lehr and A.P. Merchand.		
5. Organic Reactions and Orbital Symmetry, T.L. Gilchrist and R.C. Storr, Cambridge University Press, Cambridge, 2 nd Edn. 1979.		
6. Some Modern Methods of Organic Synthesis, W. Carruthers, Cambridge Univ. Press.		
7. Modern Synthetic Reactions, H.O. House, W. A. Benzamin.		
8. Advanced Organic Chemistry Reactions, Mechanisms and Structures, J. March, Wiley.		
9. Advanced Organic Chemistry Part B. F.A. Carey and R.J. Sundberg, Plenum Press.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Inorganic Chemistry Special-III		
Course Code	M24-CHE-403		
Course Type	DEC-3		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know about the concept of electroanalytical techniques and their applications CLO 2: To know about the atomic absorption spectroscopy and flame photometry CLO 3: To learn about the spectrophotometric techniques and about of ESR spectroscopy CLO 4: To learn about the concept and applications of NMR spectroscopy and about Nephelometry and Turbidimetric techniques		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Electro analytical methods of Analysis Current-voltage relationship during an electrolysis, decomposition potential, constant current electrolysis, constant cathode potential electrolysis, apparatus, electrodes, mercury cathode, physical properties of deposition, chemical factors of importance in electrodeposition. Applications of electrogravimetry. Coulometric analysis Coulometric methods of constant electrode potential and coulometric titrations. Apparatus and applications. Amperometric titrations Basic principle, types of curves with special reference to use of indicator and compensation reaction curve. Fundamental concept of Cyclic voltammetry	15	
II	Flame photometry Theory of flame photometry, flame temperature, Emission Flame	15	

	photometry - intensity of spectral lines, selection of optimum working conditions, application of flame photometry in trace metal analysis. Atomic Absorption Spectroscopy General principles, resonance line, its natural width, Doppler effect, broadening due to pressure, Hollow cathode lamp. Application to alkali and alkaline earth metals.	
III	Spectrophotometry and Colorimetry Fundamental concepts, instrumentation for absorption measurements, interferences, application of absorption spectroscopy and Colorimetry to analysis of inorganic substance. Electron Spin Resonance Spectroscopy Hyperfine coupling, spin polarization for atoms and transition metal ions, spin-orbit coupling and significance of g-tensor, application to transition metal complexes (having one unpaired electron) and inorganic free radicals such as PH_4^- , F_2^- and $[\text{BH}_3]^-$. Double resonance in EPR.	15
IV	Nephelometry and Turbidimetry Theory - light scattering, choice and comparison between nephelometry and turbidimetry, factors affecting measurement, instrumentation, applications Nuclear magnetic Resonance Basic Principle of NMR, Nuclear relaxation, Factors affecting nuclear relaxation, effect of chemical exchange on spectrum and evaluation of reaction rate of fast reactions, Double resonance, Lanthanide shift reagents, an overview of NMR of other nuclides with emphasis on ^{31}P , ^{19}F , ^{195}Pt and ^{119}Sn NMR. Application in inorganic chemistry	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Fundamentals of Analytical Chemistry; D.A. Skoog, O.M. West and F.J. Holler; W.B. Saunders.		
2. Instrumental methods of Analysis; L.L. Merritt, R.H. Willard and J.A. Dean; Van Nostrand-Reinhold.		
3. Physical methods in Chemistry; R.S. Drago; Saunders.		
4. Introduction to Magnetic Resonance; McLachlan and Carrington; Chapman and Hall.		
5. NMR, NQR, EPR and MB Spectroscopy in inorganic Chemistry, R.V. Parish, Ellis Horwood.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Physical Chemistry Special-III		
Course Code	M24-CHE-404		
Course Type	DEC-3		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To discuss about the different types of polymers, biodegradable polymers, dendrimers glass transition temperature and related properties CLO 2: To explain the different methods for the determination of molecular weight of polymers and to discuss about parameters of polymer chains, thermodynamic properties of mixing and thermodynamic relations for dilute polymer solutions. CLO 3: Understand the kinetics and mechanisms of fast and chain reactions. Explain apparent activation energy, chain lengths, and theories of branching and explosions. Describe modern techniques for studying fast reactions (e.g., flash photolysis, flow methods, relaxation and shock tube techniques). Analyze kinetic data to interpret reaction mechanisms. CLO 4: To learn about classification, properties and applications of liquid crystal material		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Polymers		15

	Recapitulation and basics of polymers and polymerizations (step and radical chain). Biodegradable polymers; Polyglycolic acid (PGA), Polylactic acid (PLA): basic idea about preparation, properties and applications. Hyperbranched–star polymers, Dendrimers (basic idea about preparation, properties and applications), Polymer composites. Properties of commercial polymers: Polyethylene, polyvinylchloride, polyamides, polyesters. Glass transition temperature (T _g), factors influencing the glass transition temperature, effect of molecular weight and melting point on glass transition temperature, plasticizers, importance of glass transition temperature.	
II	Determination of Molecular Weight of Polymers Molecular weight determination of polymers. Sedimentation or ultracentrifugation: Sedimentation velocity method, sedimentation equilibrium method. Light scattering: Debye and Zimm plot methods, comparison of Zimm and Debye methods, Determination of molecular weight by Gel Permeation Chromatography. Thermodynamics of Polymer Solutions Entropy of mixing and enthalpy of mixing by lattice model, Flory Huggins lattice theory, limitations of lattice model, entropy of mixing by free volume theory, heat and free energy of mixing, partial molar quantities i.e., chemical potential, heat of dilution and partial molar entropy of mixing, excluded volume, thermodynamic relations for dilute polymer solutions.	15
III	Kinetics of Fast Reactions General treatment of chain reaction, apparent activation energy of chain reactions, chain lengths, theories of branching chain and explosion (hydrogen-oxygen reaction). Modern techniques in gas phase and in solution, flash photolysis, flow methods, relaxation techniques (temperature jump, pressure jump) and shock tube technique.	15
IV	Liquid Crystals Mesomorphic behaviour, thermotropic liquid crystals, positional order, bond orientational order, nematic and smectic mesophases; molecular arrangement in smectic A and smectic C phases, smectic – nematic transition and clearing temperature – homeotropic, planar and schlieren textures, twisted nematics, chiral nematics, optical properties of liquid crystals. Dielectric susceptibility and dielectric effects. Lyotropic phases and their description of ordering in liquid crystals.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Principles Of Polymer Chemistry, P.J. Flory, Cornell University Press. 2. Physical Chemistry of Polymers, A. Tager, Mir Publishers.		

3. Physical Chemistry of Macromolecules, C. Tanford, John Wiley & Sons.
4. Polymer Science, V. R. Gowarikar, N. V. Viswanathan and Jayadev Sridhar, New Age International.
5. Chemical Kinetic Methods: Principles of Fast Reaction Techniques and Applications, C. Kalidas, New Age.
6. Thermotropic Liquid Crystals, G.W. Gray, John Wiley.
7. Handbook of Liquid Crystals, Kelker and Hatz, Verlag Chemie.
8. Applications of Liquid Crystals, G. Meier, E. Sackmann and J.G. Grabmaier, Springer Verlag.

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Organic Chemistry Special-III		
Course Code	M24-CHE-405		
Course Type	DEC-3		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand enzyme fundamentals: nomenclature, classification, extraction/purification; lock-key vs. induced fit hypotheses; kinetics of enzyme reactions; inhibition types; and mechanisms of action for key chymotrypsin; nomenclature and biological roles of prostaglandins. Chemical Synthesis of PGE₂ and PGF_{2α} CLO 2: Analyze terpenoid structure determination (general methods), synthesis (listed compounds), and biosynthesis pathways. CLO 3: Study cholesterol: nomenclature, structural analysis, synthesis routes, stereochemistry; conversion into testosterone, progesterone, and cholanic acids; Johnson's hydrochrysene approach for androsterone synthesis. CLO 4: Explore alkaloids: physiological roles, classification by nitrogen ring systems, isolation techniques, structural analysis methods; and detailed study of listed alkaloids (structure, stereochemistry, synthesis, and biosynthesis).		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Enzymes Introduction and historical perspective, chemical and biological catalysis, and remarkable properties of enzymes like catalytic power, specificity		15

	including reaction specificity, substrate specificity, stereospecificity. Nomenclature and classification, extraction and purification. Fischer's lock and key and Koshland's induced fit hypothesis, concept, and identification of active site by the use of inhibitors and affinity labelling. Enzyme kinetics, Michaelis-Menten and Lineweaver-Burk plots, reversible and irreversible inhibition. Prostaglandins: General introduction, nomenclature, and biological roles of prostaglandins. Chemical Synthesis of PGE ₂ and PGF _{2α} .	
II	Terpenoids: Introduction, classification, essential oils, methods for extraction of essential oils, Isoprene and special isoprene rule. General aspects of structure determination of terpenoids. Structure elucidation and synthesis of Geraniol, α-terpineol, α-pinene, camphor, farnesol and squalene. Biogenetic isoprene rule, Biogenesis, biosynthesis of terpenoids.	15
III	Steroids: Introduction, nomenclature of steroids. Structure elucidation of cholesterol, synthesis (Woodward) and stereochemistry of cholesterol. Biological functions of cholesterol. Methods for the following conversions. (i) Cholesterol → Testosterone (ii) Cholesterol → Progesterone (iii) Cholesterol → 5-α and 5-β-cholanic acids. Johnson's hydrochrysene approach towards the synthesis of Androsterone.	15
IV	Alkaloids Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, stereochemistry, synthesis, and biosynthesis of the following: Ephedrine, Quinine and Reserpine.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test, etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Organic Chemistry, Vol. 2, I.L. Finar, ELBS.		
2. Natural Products: Chemistry and Biology Significance, J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Banthorpe and J.B. Harborne, Longman, Essex.		
3. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill.		
4. Biochemistry, A.L. Lehninger.		
5. Outlines of Biochemistry, Cohn & Stumpf.		
6. Enzymes, Biochemistry, Biotechnology, Clinical Chemistry, T. Palmer and P.L. Bonner		
7. Lehninger Principles of Biochemistry, D.L. Nelson, M.M. Cox		
8. Chemistry of alkaloids by Pelletier, S. W. Publisher: Van Nostrand Reinhold Inc.,U.S. (17 September 1970).		
9. Medicinal natural products: A biosynthetic approach. by Dewick, P. M. Publisher Wiley.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Pharmaceutical Chemistry Special-III		
Course Code	M24-CHE-406		
Course Type	DEC-3		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know about the procedure followed in drug design, in-depth knowledge of lead compounds and their modification. Concepts of prodrugs-drug latentiation, carrier linked- & bioprecursor prodrugs, structure-activity relationship and to understand significance of isosterism & bioisosterism CLO 2: To understand the details of quantitative structure-activity relationship and its parameters. To have understanding about co-enzymes and related terms. CLO 3: To understand the concept related to adsorption, dissociation, metabolism and elimination phenomenon for drugs. CLO 4: To understand the concept of Enzyme kinetics- Michaelis-Menten, Lineweaver-Burk plots, Enzyme inhibitors- reversible, irreversible, suicide inhibitors. Mechanism of enzyme Action-Transition-state theory.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting at-least one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Drug Design Introduction, Procedure followed in drug design-Screening of natural compounds, isolation, purification, structure determination, Search for lead Compounds, Molecular Modification of Lead Compound, prodrugs- utility, drug latentiation, carrier linked and bioprecursor		15

	prodrugs, Prodrugs of compounds containing alcohols, carboxylic acids, amines and carbonyl groups, drug synergism, hard and soft drugs. Structure-Activity Relationship (SAR), isosterism, Bioisosterism, Factors affecting Bioactivity, Theories of Drug Activity; Occupancy theory, Rate theory, Induced Fit theory.	
II	Quantitative structure-activity relationships (QSAR) Development of QSAR, Physicochemical parameters- Lipophilicity parameter, Polarizability, Electronic parameter, Ionization Constants, steric Parameters- Taft's steric factor, molar refractivity, Verloop steric parameter, chelation parameters, Surface activity parameter, redox potential, hansch analysis, Craig plot, Topliss Scheme, Free-Wilson Approach. Co-Enzyme Chemistry Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD^+ , NADP^+ , FMN, FAD, Mechanisms of reactions catalyzed by the above cofactors.	15
III	Pharmacokinetics & Biopharmaceutics: Compartment Concepts: One Compartment open model/ Multicompartmental models. Absorption Kinetics of oral drugs (absorption and elimination) after one dose or multiple doses; Zero-order absorption model, First-order absorption model, Significance of absorption rate constant and physiologic factors related to oral absorption Distribution and Protein Binding; Physiologic factors and Volume of distribution; Kinetics of protein binding; Apparent volume of distribution Biotransformation / Metabolism: phase I and II Elimination and Clearance Elimination rate constant, half-life, clearance; Concepts: Drug clearance, Renal clearance, Hepatic clearance. Kinetics of Intravenous (IV) Drugs, IV Bolus, IV infusion, IV intermittent infusion, Multiple daily dosage regimens; Nonlinear pharmacokinetics and clinical application of pharmacokinetics; examples of Pharmacokinetics Calculations; Drug concentration vs. time curves; Loading doses and time to reach steady state	15
IV	Enzymes Introduction and historical perspective, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification, extraction and purification. Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labeling. Enzyme kinetics, Michaelis-Menten and Lineweaver-Burk plots. Enzyme inhibitors- reversible, irreversible, suicide inhibitors. Mechanism of Enzyme Action. Transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70

● Class Participation:	05	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. An Introduction to Medicinal Chemistry, G. L. Patrick, Oxford University Press.		
2. Medicinal Chemistry, An Introduction, G. Thomas, John Wiley.		
3. Principles of Biochemistry, A. L. Lehninger, Worth Publishers.		
4. Outlines of Biochemistry, E. E. Conn and P. K. Stumpf, John Wiley.		
5. Enzymes: Biochemistry, Biotechnology and Clinical Chemistry, T. Palmer, Woodhead Publishers.		
6. Bio-Pharmaceutics and Pharmacokinetics, New Edition, Brahmanakar Jaiswal, A Treatise Vallabha Prakashan; ISBN-10 8185731934, ISBN-13 978-8185731476.		
7. Biopharmaceutics and pharmacokinetics, Jayant S Kulkarni and AP Pawar, India, 2020, CBS Publishers and Distributors PVT Ltd, ISBN-10 8123913079, ISBN-13 978-8123913070.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Inorganic Chemistry Special-IV		
Course Code	M24-CHE-407		
Course Type	DEC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know about the various types of metalloenzymes and their mode of action CLO 2: To learn about the concept of supramolecular chemistry and their applications CLO 3: To know about the various principles of Bio-Inorganic Medicine and their mode of action CLO 4: To learn about the chromatographic techniques and of solvent extraction and their uses		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Metalloenzymes Zinc enzymes – carboxypeptidase and carbonic anhydrase, alkaline phosphatase and alcohol dehydrogenase, Copper enzymes – superoxide dismutase. Molybdenum oxo transferase enzymes – xanthine oxidase	15	
II	Supramolecular Chemistry Concepts and language. 1. Molecular recognition: Molecular receptors for different types of molecules including anionic substrates, design and synthesis of co-receptor molecules and multiple recognition. 2. Supramolecular reactivity and catalysis. 3. Transport processes and carrier design. 4. Supramolecular devices. Some examples of self-assembly in supramolecular chemistry	15	
III	Principles of Bio-Inorganic Medicine Evaluation of modern therapeutical, means of administering chemicals to humans, concentration effects, and dose-response relationship, future	15	

	developments and trends in bio-inorganic therapy. Metals in Medicine Metal deficiency and disease, toxic effects of metals, metals used for diagnosis and chemotherapy with particular reference to anticancer drugs.		
IV	Chromatography General principles, types of chromatography, absorption chromatography, partition chromatography, vapour phase chromatography, paper and thin layer chromatography, retardation factor, retention volume, mechanism and efficiency of separations. Ion-Exchange General principles, ion exchangers-natural and synthetic, ion-exchange capacity, purification of water and other applications. Solvent Extraction General Principles, extraction coefficients, Batch, continuous, and counter current extractions, applications.	15	
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
● Class Participation:	5	Written Examination	
● Seminar/presentation/assignment/quiz/class test etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.			
2. Bioinorganic Chemistry, I. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, University Science Books.			
3. Supramolecular Chemistry, J.M. Lehn, VCH.			
4. A Textbook of Quantitative Inorganic Analysis, A.I. Vogel; ELBS, London.			
5. Fundamentals of Analytical Chemistry; D.A. Skoog, O.M. West and F.J. Holler; W.B. Saunders.			
6. Dynamics of Chromatography Part I.; J.C. Gidding; Dekker, New York.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Physical Chemistry Special-IV		
Course Code	M24-CHE-408		
Course Type	DEC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand advanced theories of kinetics of unimolecular reactions. To be acquainted about the kinetics of reactions taking place in solutions. CLO 2: Understand theoretical models describing the properties of solids. CLO 3: Understand the fundamental principles of semiconductors and photovoltaic devices. CLO 4: Understand and apply advanced electrochemical concepts and techniques.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Advanced Chemical Kinetics London-Eyring-Polanyi method of calculation of energy of activation. Applications of activated complex theory of reaction rates. Temperature dependence of pre-exponential factors. Kassel's theory (RRK), Rice-Ramsperger-Kassel-Marcus (RRKM) theory. Solution Kinetics Ion-ion reaction, ion-dipole reaction, reactions between polar molecules, effect of ionic strength, kinetic salt effect, enzyme kinetics (effect of pH and temperature). Lineweaver-Burk & Eadie plots for the analysis of enzymolysis.	15	
II	Solid State – I Free electron theory of metals – Classical and Quantum mechanical models, density of states, Successes and Failures. Band theory of solids, Bloch theorem, Brillouin zones, Kronig–Penney Model, Effective mass of charge carriers, Direct and indirect band gap semiconductors, hole	15	

	concept, temperature dependence of electrical conductivity. Thermal properties of solids. Heat capacity – both classical and quantum models (Einstein, Debye models).	
III	Solid State – II Free carrier concentration in intrinsic and extrinsic semiconductors, mass action law and its applications, Generation of carriers and their recombination in semiconductors. Temperature dependence of carrier mobility. Types of junctions (metal-semiconductor, semiconductor-semiconductor), Analysis of p-n junction including I-V characteristics. Application of p-n junction in photovoltaics. Introduction to Photovoltaics. Basic PV system design. Design and physics of solar cells, I-V characteristics, Solar radiation and conversion efficiency. Parameters = J _{SC} , V _{OC} , FF) solar cell efficiency, Shockley–Queisser limit. Silicon solar cells, alternatives to silicon, III-V materials for solar cells, thin film solar cells and third generation solar cells. Brief overview of concentrator photovoltaics. Photovoltaics storage system.	15
IV	Advanced Electrochemistry Advanced concepts: Overpotential concept, Exchange current density, Butler-Volmer equation, Polarizable and non-polarizable interfaces. Tafel equations. Electrochemical Processes: Distinction between kinetically and mass transport controlled electrochemical processes. Role of diffusion, migration, and convection in electrochemical systems. Brief introduction and working principles of various electrochemical methods such as chronoamperometry, cyclic voltammetry, chronopotentiometry, coulometry, AC-impedance spectroscopy (EIS).	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Chemical Kinetics, K.J. Laidler, McGraw Hill		
2. Theories of Chemical Reaction Rates, K.J. Laidler, McGraw Hill.		
3. Theory of Rate Processes, S. Glasstone, K.J. Laidler and H. Eyring, McGraw Hill.		
4. Reaction Kinetics Oxford Press (1997), M. J. Pilling and P. W. Seakins.		
5. Kittel's Introduction to Solid State Physics, C. Kittel, Wiley India Edition		
6. Solid State Physics, <u>S.O. Pillai</u> , 10th Edition, New Age International Pvt Ltd		
7. Solid State Physics, Neil W. Ashcroft, Cengage Learning		
8. Solid State Physics, R.K. Puri, V. K. Babbar, S. Chand Publishers		
9. The Physics of Solar Cells, J. Nelson, World Scientific Publishing Company		
10. Optoelectronics of Solar Cells, Greg P. Smestad, New Age International Publishers		
11. Solar Photovoltaics: Fundamentals, Technologies and Applications, Chetan S. Solanki, 3rd Edition, PHI Learning		
12. Fundamentals of Electrochemical Science, H. B. Oldham, J. C. Myland, Academic Press.		

13. Electrochemical Methods: Fundamentals and Applications, Allen J. Bard, Larry R. Faulkner, Wiley; 2nd edition

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Organic Chemistry Special-IV		
Course Code	M24-CHE-409		
Course Type	DEC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the basic concept of drug design and development using the examples of penicillin and its modifications. CLO 2: To understand the synthesis, general mode of action, and medicinal uses of listed classes of drugs. CLO 3: Analyze the structures, reactivity, and applications of enolates and other carbanions in organic synthesis. CLO 4: To understand the Systematic nomenclature, General synthesis and reactions of Five-membered heterocycles: pyrazole, imidazole, oxazole, isoxazole, thiazole, isothiazole, General reactivity of purines and pyrimidines.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting atleast one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Drug Design Classification and discovery of new drugs, history and development of chemotherapeutic agents, therapeutic index, LD50 and ED50, naming of (new) drugs. Elementary idea about drug action: the receptor role, neurotransmitters and receptors, ion channels and their control. Membrane bound enzymes-activation/deactivation. Chemical basis of messenger induced change of shape by the receptor. Design of agonists, antagonists and partial agonists. Drug development Screening of natural products, isolation and purification, structure determination, SAR (structure-activity relationships) with reference to penicillins, synthetic analogues, isosteres and bioisosteres, concept of lead		15

	compounds (problems with penicillin G and solving the problems leading to the development of penicillin V, oxacillin, cloxacillin, ampicillin, amoxicillin, carbenicillin and carfecillin. Brief overview of pharmacokinetics and pharmacodynamics, concept of prodrug (sultampicillin) and synergism (β -lactamase inhibitors with penicillins).	
II	Synthesis, General Mode of Action, and Medicinal Uses of the Following Drugs: Antineoplastic Agents: Classification, Mechlorethamine, Chlorambucil, cyclophosphamide, carmustine, methotrexate, 6-mercaptopurine, paclitaxel (synthesis of paclitaxel excluded). Antimalarials: Classification, Chloroquine, primaquine, chloroguanide, pyrimethamine, Artemisinin and its potential derivatives (synthesis excluded). Analgesics, Antipyretics and Antiinflammatory agents: Morphine and related compounds (codeine and heroin), methadone, tramadol, aspirin, acetaminophen, indomethacin, mefenamic acid, ibuprofen, diclofenac, naproxen, celecoxib. Antifertility agents: Ovulation inhibitors and related hormonal contraceptives-norethindrone, levonorgestrel, estradiol, mestranol, non-hormonal contraceptive- centchroman (synthesis of all the drugs excluded). Cardiovascular Drugs: Sorbitrate, Calcium channel blockers: verapamil, diltiazem, beta-blockers: atenolol. AIDS and drugs against HIV: HIV infection to the system, structure, and mode of action of important drugs against HIV (nucleoside reverse transcriptase inhibitors) -AZT, ddI, ddC, d4T and 3TC (synthesis only of AZT).	15
III	Alkylation of Enolates and Other Carbon Nucleophiles Introduction, Generation, and Properties of Enolates and Other Stabilized Carbanions, Generation of Enolates by Deprotonation, Regioselectivity and Stereoselectivity in Enolate Formation from Ketones and Esters, Other Means of Generating Enolates, Solvent Effects on Enolate Structure and Reactivity. Alkylation of Enolates: Alkylation of Highly Stabilized Enolates, Alkylation of Ketone Enolates, Generation and Alkylation of Dianions, Intramolecular Alkylation of Enolates, Control of Enantioselectivity in Alkylation Reactions. Nitrogen Analogs of Enols and Enolates: Enamines and Imine Anions	15
IV	Heterocyclic compounds Systematic (Hantzsch-Widman) nomenclature for monocyclic and fused ring systems. General synthesis and reactions (including mechanism) of the following: Five-membered heterocycles: pyrazole, imidazole, oxazole, isoxazole, thiazole, and isothiazole; comparison of their basic character. General reactivity of purines and pyrimidines.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	5	Written Examination
● Seminar/presentation/assignment/quiz/class test, etc.:	10	
● Mid-Term Exam:	15	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Carey, F. A., & Sundberg, R. J. (2007). Advanced organic chemistry: Part B: Reaction and synthesis (5th ed.). Springer.
2. Carruthers, W., & Coldham, I. (2004). Modern methods of organic synthesis (4th ed.). Cambridge University Press.
3. Rappoport, Z. (Ed.). (1990). The chemistry of enols. John Wiley & Sons.
4. Smith, M. B. (2020). March's advanced organic chemistry: Reactions, mechanisms, and structure (8th ed.). Wiley.
5. Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, Ed. Robert F. Dorge.
6. Burger's Medicinal Chemistry and Drug Discovery Vol-I Ed. M.E. Wolf, John Wiley.
7. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill.
8. Organic Chemistry Vol.-2 I.L. Finar, ELBS.
9. Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical.
10. Comprehensive Heterocyclic Chemistry, A.R. Katritzky and C.W. Rees, eds. Pergamon Press.
11. Handbook of Heterocyclic Chemistry, Alan Katritzky, Christopher Ramsden, John A. Joule and Viktor Zhdankin, 3rd Edition, Elsevier.

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Pharmaceutical Chemistry Special-IV		
Course Code	M24-CHE-410		
Course Type	DEC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know the details of the biosynthetic pathways for plant secondary metabolism, acetate-malonate pathway, Acetate-mevalonate pathway, shikimic acid pathway. CLO 2: To elaborate importance of alkaloids, carotenoids- β-carotene and vitamin-A. CLO 3: To have knowledge of carbohydrate chemistry and terpenoids. CLO 4: To learn about steroids discussing nomenclature, structural elucidation (Cholesterol), ergosterol and cardiac glycosides and porphyrin compounds-chlorophyll, haemoglobin.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting at-least one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Mechanistic and biosynthetic approach to plant secondary metabolites: Acetate-malonate pathway: Biosynthesis of plant fatty acids, biosynthesis and oxidation of ricinoleic acid. Polyketides: Biosynthesis of 6-methylsalicylic acid, penicillic acid, griseofulvin. Acetate- mevalonate pathway: Biosynthesis of psoralen, gibberellic acid, cholesterol, conessine. Shikimic-acid pathway: Biosynthesis of chlorogenic acid and cichoriin, Cyanin, Quercetin, Biosynthesis of Porphyrins.		15
II	Alkaloids: Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation,		15

	degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, synthesis, biosynthesis and biological importance of the following: Ephedrine, (+)-Coniine, Nicotine, Quinine and Reserpine. Carotenoids; Structure, synthesis and biogenesis of β -carotene and Vitamin-A.	
III	Carbohydrates: Introduction, stereoisomerism, mutarotation of monosaccharides, ring structure of glucose, structure elucidation, of disaccharides, sucrose, maltose, lactose, polysaccharides, starch, glycosides, general structure elucidation. Terpene: General introduction, isoprene rule, isolation of terpenes, General methods of structure determination of terpenes, structure elucidation of citral, menthol and camphor.	15
IV	Steroids: Isolation, nomenclature, structural elucidation with special reference to Cholesterol, ergosterol and cardiac glycosides Methods for the following conversions: i) Cholesterol $\rightarrow$ Testosterone ii) Cholesterol $\rightarrow$ Progesterone Porphyrins Structures elucidation of chlorophyll, General structural features of haemoglobin (not structure elucidation).	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
● Class Participation:	05	Written Examination
● Seminar/presentation/assignment/quiz/class test etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Organic Chemistry, Vol 2, I. L. Finar, ELBS.		
2. Natural Products: Chemistry and Biology Significance, J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Banthrope and J.B. Harborne, Longman, Essex.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Inorganic Chemistry Special Practical-III		
Course Code	M24-CHE-411A		
Course Type	PC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO : To know about the basic aspects of spectrophotometric, flame photometric and turbidimetric techniques and also able to perform experiments based on these techniques		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	I Spectrophotometric analysis i) To validate the Beer's Lambert law spectrophotometrically ii) To determine the unknown amount of following metal ions present in the given sample spectrophotometrically 1. Fe 2. Ni 3. Mo 4. V 5. Cu iii) To find out the stoichiometry of the complex by Job's Method II Flame photometric analysis To determine the unknown amount of Na/K ions present in the given sample by Flame photometry III Turbidimetric analysis To determine the unknown amount of Cl ⁻ and sulphate ions present in the given sample by turbidimetry method IV Any other experiments related to these techniques		120
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70
● Class Participation:	5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		

• Mid-Term Exam:	15	Viva-voce Marks : 10
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. A Text Book of Quantitative Analysis: A. I. Vogel, ELBS, London. 2. Practical Chemistry, A.M. James and F.E. Prichard, Longman.		

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Physical Chemistry Special Practical-III		
Course Code	M24-CHE-411B		
Course Type	PC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO : To learn pH-metry and interferrometry techniques, and analyse kinetics data and perform quantum chemical calculations.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	pH-Metry - pH-titrations of: (i) Acetic acid vs. NaOH, (ii) hydrochloric acid vs. NaOH, (iii) acetic acid vs. ammonium hydroxide and (iv) HCl vs. NH₄OH. - Preparation of buffer solution of various pH and the determination of their pH values. - Determination of the buffer capacity of different buffer solutions. - To find dissociation constants of weak acids. - Determine the Hammett constant of a given substituted benzoic acid by pH measurements. Chemical Kinetics - Determine the relative strength of the acids by studying the hydrolysis of methyl acetate. - Determination of velocity constant of the reaction of ethyl acetate with NaOH and activation energy and temperature coefficient of the reaction. - Determination of the velocity constant and energy of activation of the reactions between H₂O₂ and HI. - Investigation of the reaction between acetone and iodine (with respect to H⁺, I₂ and acetone). - Determination of the order and velocity of the reaction between potassium persulphate and potassium iodide. Interferrometry - Determination of speed of sound of pure liquids / mixtures using interferrometer.		120

	Note: Any experiment may be introduced/deleted in the practical class based on the availability / non-availability of the instruments / chemicals.		
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70
● Class Participation:	5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Practical Chemistry, A.M. James and F.E. Pricherd, Longman.			
2. Practical Physical Chemistry, B.P. Levitt and Zindley's, Longman.			
3. Practical Physical Chemistry, S.R. Palit and S.K. De, Science Book Agency.			
4. Experimental Physical Chemistry, R.C. Das and B. Behra, McGraw Hill.			
5. Experiments in Physical Chemistry, Shoemaker and Garland, McGraw Hill.			
6. Systematic experimental Physical Chemistry, T.K. Chandershekhar & S.K. Rajbhoj.			
7. Experimental Physical Chemistry, V.D. Athawale and Parul Mathur, New Age International.			
8. Senior Practical Physical Chemistry, B. D. Khosla, V. C. Garg, A. Gulati, R. Chand & Co.			

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Organic Chemistry Special Practical-III		
Course Code	M24-CHE-411C		
Course Type	PC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To acquire the knowledge of the preparation of organic compounds in two or three steps, check the progress of reaction and purity through chromatography, and purification of synthesised compounds, CLO 2: To understand the application of structural drawing tools such as ChemAxon, ChemDraw, etc., for drawing the mechanism of reactions and structures of organic compounds and finding IUPAC nomenclature, ¹H NMR prediction, etc and to develop the ability to compile the obtained results in the form of a lab record.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics	Contact Hours	
	I. Preparations of organic compounds involving two and three stages: Typical preparations from which the two and three-stage preparations can be chosen are: 1. Toluene - p-nitrotoluene — p-nitrobenzoic acid — p-amino benzoic acid 2. Hydroquinone — Benzoquinone — 5- Hydroxy benzoxathiole-2-one — 5- Acetoxy benzoxathiol-2-one 3. Acetophenone — Acetophenone oxime — Acetanilide-p-Nitroacetanilide 4. Benzaldehyde — Benzoin — Benzil — Benzillic acid 5. Acetylacetone — 4,6-dimethylpyridine-2-mercaptopyrimidine — 4,6- dimethyl-2-hydrazinpyrimidine — 1-(4'-6'-dimethylpyridine-2'yl) 3,5-dimethylpyrazole	120	

	6. Nitrobenzene — m-dinitrobenzene — m-nitroaniline — m-nitrophenol 7. Phthalic acid — phthalic anhydride – phthalimide — Anthranilic acid 8. Acetophenone — Benzalacetophenone — epoxide 9. Cyclohexanone —Cyclohexanone oxime—caprolactam 10. Phthalic anhydride—o-benzoylbenzoic acid—anthraquinone. 11. O-Cholobenzoic acid —N-phenylanthranilic acid — acridone. 12. Cholobenzene—2,4-dinitrochlorobenzene —2,4-dinitrophenol 13. Bromobenzene—triphenylcarbinol-tritylchloride 14. Resorcinol—resacetophenone — 4-ethyl resorcinol 15. Resorcinol-4-methyl-7-hydroxycoumarin-6 and 8- nitro-4-methyl- 7-hydroxycoumarin 16. Phenol — salicylaldehyde —coumarin 17. Aniline — 2,4,6-tribromaniline — 1,3,5-tribromobenzene 18. Resorcinol—resacetophenone — Chalcone Any other multi-step reaction as per the requirement. II. All the students must check the progress of the reaction and purity of the final products for all the stages of preparation by thin-layer chromatography. Demonstration of different software useful in chemistry for drawing the structure of organic compounds as well as for the computational studies of small organic molecules. Draw the scheme used for a multi-step preparation (two or three) using any structural drawing tool & get the IUPAC name and predicted 1H-NMR spectrum for each compound involved in multi-step preparation. Brief idea of given terms: Molecular graphics, Molecular minimization, Molecular Docking, Pharmacophore, QSAR, Optimization, Single point energy and Spectral analysis.	
Total Contact Hours		120
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
Practical	30	Practical: 70
● Class Participation:	5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10	
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Mohrig, J. R., Hammond, C. N., & Schatz, P. F. (2024). Techniques in organic chemistry: Advanced laboratory course (5th ed.). W.H. Freeman.		
2. Zweifel, G. S., & Nantz, M. H. (2023). Modern organic synthesis: An introduction (2nd ed.). University Science Books.		
3. Jensen, F. (2022). Molecular modeling basics: Computational tools for chemical discovery. CRC Press.		
4. Kürti, L., & Czakó, B. (2025). Strategic applications of named reactions in multi-step synthesis. Elsevier.		

5. Loudon, G. M., & Parise, J. (2021). Organic chemistry: Structure and function with spectroscopy guide (8th ed.). Macmillan.
6. Bachrach, S. M. (2014). Computational organic chemistry (2nd ed.). Wiley.
7. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (1996). Vogel's textbook of practical organic chemistry (6th ed.). Prentice Hall.
8. Leonard, J., Lygo, B., & Procter, G. (2013). Advanced practical organic chemistry (3rd ed.). CRC Press.
9. Roy, K., & Gramatica, P. (2015). QSAR and molecular modeling in drug design. Springer.
10. Schlick, T. (2010). Molecular modeling and simulation: An interdisciplinary guide (2nd ed.). Springer.

Session: 2025-26			
Part A - Introduction			
Name of Programme		M.Sc. Chemistry	
Semester		IV	
Name of the Course		Pharmaceutical Chemistry Special Practical-III	
Course Code		M24-CHE-411D	
Course Type		PC-9	
Level of the course		500-599	
Pre-requisite for the course (if any)		Chemistry as a subject at UG level	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO : To understand the concept of separation and identification of binary organic mixture(s), applications related to spectroscopic and chromatographic techniques.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week		0	16
Internal Assessment Marks		0	30
End Term Exam Marks		0	70
Max. Marks		0	100
Examination Time (Spread over two sessions)			6 hours
Part B- Contents of the Course			
Unit	Topics		Contact Hours
5)	Separations and identification of components of binary organic mixture using chemical methods and spectral data.		120
6)	Applications of IR, UV, ¹ H NMR, ¹³ C NMR, Mass spectroscopy in drug analysis.		
7)	Chromatographic separations: TLC, paper and column.		
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
● Class Participation:	05	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1.	"A Handbook of Organic Analysis Qualitative and Quantitative" by H.T. Clarke and revised by B. Maynes, Edward Arnold (Pub.), Ltd. London, 1975).		
2.	"Systematic Qualitative Organic Analysis" by H. Middleton, Edward Arnold (Publishers) Ltd., London 1959.		
3.	"A Text Book of Practical Organic Chemistry including Qualitative Organic Analysis" by Arthur I. Vogel, Longmans Green and Co., Ltd., London 1966.		
4.	"Elementary Practical Organic Chemistry" by Arthur I. Vogel, CBS Publishers & Distributors.		
5.	"A Guide to spectroscopy in Organic Chemistry' by PAVY		

6. "Spectrometric Identification of Organic Compounds", Fifth Ed., R.M. Silverstein, G.S. Bassler and T.C. Morrill, John Wiley and Sons, New York.
7. "Organic Spectroscopy", 3rd Ed., by William Kemp. John Wiley & Sons.
8. "Spectroscopic" Methods in Organic Chemistry, D.H. Williams & Ian Fleming.
9. Vogel's Text Book of Practical Organic Chemistry by B.S. Furness et. al., Longman Group Ltd.

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Inorganic Chemistry Special Practical-IV		
Course Code	M24-CHE-412A		
Course Type	PC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)	Chemistry as a subject at UG level		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO : To learn about the various quantitative techniques like i.e., Gravimetric, complexometric titrations and about Back titrations, also able to perform experiments related to these techniques		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time (Spread over two sessions)		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	I Quantitative analysis: Determination of triple elements in the mixtures, ores, alloys etc. by available analytical techniques. i) Volumetrically ii) Gravimetrically iii) Instrumentation methods II Complexometric analysis i) Estimation of calcium content in chalk sample as calcium oxalate by permanganometry ii) Estimation of Hardness (Temporary as well as permanent) of water sample by EDTA iii) To determine the strength of ZnSO ₄ and MgSO ₄ present in the given solution by complexometric titration III Back Titrations i) Basic concept of back Titration ii) Determination of alkali content- present in the given antacid sample using HCl iii) Determination of acetic acid in commercial vinegar using NaOH IV Any other experiments related to these techniques		120
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70
● Class Participation:	5		

● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10
● Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. A Text Book of Quantitative Analysis: A. I. Vogel, ELBS, London. 2. Practical Chemistry, A.M. James and F.E. Pricherd, Longman.		

Session: 2025-26			
Part A - Introduction			
Name of Programme		M.Sc. Chemistry	
Semester		IV	
Name of the Course		Physical Chemistry Special Practical-IV	
Course Code		M24-CHE-412B	
Course Type		PC-10	
Level of the course		500-599	
Pre-requisite for the course (if any)		Chemistry as a subject at UG level	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO : Learning techniques like refractometry, flame photometry, quantum chemical calculations and apply distribution law, along with effective data analysis and graphical representation tools.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week		0	8
Internal Assessment Marks		0	30
End Term Exam Marks		0	70
Max. Marks		0	100
Examination Time			6 hours
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	Refractometry		120
	1. Determine the refractive index of simple organic liquids like methyl acetate, ethyl acetate, methanol, ethanol, n-hexane, chloroform.		
	2. Determine the refractivity and molar refractivity of some organic liquids like methyl acetate, ethyl acetate, methanol, ethanol, n-hexane, chloroform and hence find out the molar refractivities for CH ₂ , C, H and Cl.		
	3. Determine the composition of mixture of two liquids by refractive index measurements.		
	Flame Photometry		
	1. Determination of Na ⁺ , K ⁺ , Ca ²⁺ and Mg ²⁺ in tap water, juice, electal etc.		
	Distribution Law		
	1. Determine distribution coefficient of ammonia between chloroform and water.		
	2. Determine the formula of the complex formed between copper (II) ion and ammonia using distribution method.		
	Data-Handling/Representation		
1. Using origin-Lab draw data in different styles of graphs.			
2. Linear Curve fitting and calculation of regression coefficient by using EXCEL worksheet.			
3. Calculate activation energy using thermal analysis data by single/multiple heating rate methods using EXCEL worksheet.			

Quantum Chemical Calculations			
1. Study the effect of size of basis-set on ground state geometry of F ₂ O ₂ . Use three different basis set for your calculations. Compare the results and draw inference. [Suggested Basis Set: 6-31G(d), 6-311+G(d) and 6-311+G(3df)].			
2. Study the normal modes of vibrations for formaldehyde (Apply the required scaling) using basis sets: (i) 6-31++G(d, p) (ii) 6-311++G(d, p)			
3. Determine energy barrier for C-C rotation in case of (i) Ethane (ii) Butane. Compare the results obtained for (i) and (ii) and draw the inferences. Use different basis set like 6-31G(d), 6-31G(d,p), 6-31+G(d, p) and draw a comparison table.			
4. Determine HOMO-LUMO gap through quantum chemical calculations for (i) 1,3 butadiene (ii) 1,3,5 hexatriene. Compare the results obtained with particle-in-a-box model. Use different basis sets for calculations. [Suggested Basis Set: 6-31G, 6-31G(d,p), 6-31++G(d,p)]			
Note: Any experiment may be introduced/deleted in the practical class based on the availability / non-availability of the instruments / chemicals.			
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70
● Class Participation:	5	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Practical Chemistry, A.M. James and F.E. Pricherd, Longman.			
2. Practical Physical Chemistry, B.P. Levitt and Zindley's, Longman.			
3. Practical Physical Chemistry, S.R. Palit and S.K. De, Science Book Agency.			
4. Experimental Physical Chemistry, R.C. Das and B. Behra, McGraw Hill.			
5. Experiments in Physical Chemistry, Shoemaker and Gailand, McGraw Hill.			
6. Systematic experimental Physical Chemistry, T.K. Chandershekhar & S.K. Rajbhoj.			
7. Experimental Physical Chemistry, V.D. Athawale and Parul Mathur, New Age International.			
8. Senior Practical Physical Chemistry, B. D. Khosla, V. C. Garg, A. Gulati, R Chand & Co.			
9. https://gaussian.com/basissets/			
10. https://gaussian.com/man/			

Session: 2025-26			
Part A - Introduction			
Name of Programme		M.Sc. Chemistry	
Semester		IV	
Name of the Course		Organic Chemistry Special Practical-IV	
Course Code		M24-CHE-412C	
Course Type		PC-10	
Level of the course		500-599	
Pre-requisite for the course (if any)		Chemistry as a subject at UG level	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO 1: Perform quantitative analysis of biomolecules (carbohydrates, proteins, amino acids, cholesterol, urea) and ascorbic acid using colorimetric methods and interpret experimental data to determine concentrations. CLO 2: Apply laboratory techniques (e.g., solvent extraction, distillation, chromatography) to isolate natural products from raw materials, and document experimental procedures, results, and conclusions in a structured lab report adhering to scientific writing standards.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	1. Colorimetric determination of the following: Carbohydrates, ascorbic acid, amino acids, proteins, cholesterol, urea. 2. Extraction of organic compound from natural products: Any one of the following:– Caffeine from tea leaves. Isolation of β-carotene from carrot. Isolation of limonene from citrus rind. Isolation of nicotine from tobacco. Isolation of lactose from milk. Isolation of Casein from milk.		120
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70
● Class Participation:	5	Marks Distribution:	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10	Experiment Marks: 50	

● Mid-Term Exam:	15	Lab record Marks : 10 Viva-voce Marks : 10
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2023). Vogel's textbook of practical organic chemistry (6th ed.). Pearson Education. 2. Mann, F. G., & Saunders, B. C. (2018). Practical organic chemistry (3rd ed.). Wiley. 3. Harris, D. C., & Lucy, C. A. (2020). Quantitative chemical analysis (10th ed.). W. H. Freeman. 4. Ahluwalia, V. K., & Dhingra, S. (2019). Advanced practical chemistry (2nd ed.). CRC Press. 5. Mohrig, J. R., Hammond, C. N., & Schatz, P. F. (2020). Modern Projects and Experiments in Organic Chemistry (2nd ed.). W.H. Freeman. New York, NY. 6. Doxsee, K. M., & Hutchison, J. E. (2021). Green Organic Chemistry: Strategies, Tools, and Laboratory Experiments (1st ed.). Cengage Learning. Boston, MA. 7. Leonard, J., Lygo, B., & Procter, G. (2019). Advanced Practical Organic Chemistry (3rd ed.). CRC Press. Boca Raton, FL. 8. Harwood, L. M., & Moody, C. J. (2020). Experimental Organic Chemistry (2nd ed.). Oxford University Press. Oxford, UK. 9. Lehman, J. W., & Morrill, T. B. (2021). Techniques in Organic Chemistry (4th ed.). Springer. Chem, Switzerland.		

Session: 2025-26			
Part A - Introduction			
Name of Programme		M.Sc. Chemistry	
Semester		IV	
Name of the Course		Pharmaceutical Chemistry Special Practical-IV	
Course Code		M24-CHE-412D	
Course Type		PC-10	
Level of the course		500-599	
Pre-requisite for the course (if any)		Chemistry as a subject at UG level	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO : To develop the understanding related to different assay of drugs, their volumetric and spectrophotometric analysis, friability and disintegration test for tablets.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	16	16
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		6 hours	
Part B- Contents of the Course			
Unit	Topics		Contact Hours
	1. Determination of specific rotation of ibuprofen and determination of its percentage in the unknown sample. 2. Volumetric determination of ibuprofen in the given tablet. 3. Spectrophotometer determination of aspirin content in the soluble aspirin table. 4. Spectrophotometer determination of Paracetamol in the tablet. 5. Determination of Vitamin C in given formulation. 6. Determination of phenobarbilone in the given cough syrup. 7. To perform I.P. monograph of tablet. 8. To perform I.P. monograph of hard gelatine capsule. 9. Determination of Chloramphenicol in given capsule.		120
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
● Class Participation:	05	Marks Distribution: Experiment Marks: 50 Lab record Marks : 10 Viva-voce Marks : 10	
● Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	10		
● Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. "A Handbook of Organic Analysis Qualitative and Quantitative" by H.T. Clarke and revised by B.Maynes, Edward Arnold (Pub.), Ltd. London, 1975).			
2. "Systematic Qualitative Organic Analysis" by H.Middleton, Edward Arnold (Publishers) Ltd., London 1959.			

3. "A Text Book of Practical Organic Chemistry including Qualitative Organic Analysis" by Arthur I. Vogel, Longmans Green and Co., Ltd., London 1966.
4. "Elementary Practical Organic Chemistry" by Arthur I. Vogel, CBS Publishers & Distributors.
5. "A Guide to spectroscopy in Organic Chemistry" by PAVY
6. "Spectrometric Identification of Organic Compounds", Fifth Ed., R.M. Silverstein, G.S. Bassler and T.C. Morrill, John Wiley and Sons, New York.
7. "Organic Spectroscopy", 3rd Ed., by William Kemp. John Wiley & Sons.
8. "Spectroscopic" Methods in Organic Chemistry, D.H. Williams & Ian Fleming.
9. Vogel's Text Book of Practical Organic Chemistry by B.S. Furness et. al., Longman Group Ltd.

Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Chemistry		
Semester	IV		
Name of the Course	Skills in Chemistry		
Course Code	M24-CHE-413		
Course Type	EEC		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know about the Safety aspects of Handling the Chemicals and gases in chemical laboratories & industries CLO 2: To know how the most commonly used products are manufactured in industries. CLO 3*: To perform entrepreneurship-oriented practicals		
Credits	Theory	Practical	Total
Teaching Hours per week	1	2	3
Internal Assessment Marks	10	5	15
End Term Exam Marks	20	15	35
Max. Marks	30	20	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 5 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of 6 parts covering the entire syllabus. The examinee will be required to attempt 3 questions, selecting one question from each unit and the compulsory question.			
Unit	Topics		Contact Hours
I	Handling of Chemicals: Safety aspects in chemical laboratories & industries, emergency procedures, safe handling of glassware, Safety in storage and handling of chemicals & precautions. Large scale production, uses, storage & hazards in handling gases like oxygen, nitrogen, dry-ice, hydrogen, acetylene etc.		7
II	Industrial Product Chemistry Chemistry in manufacture of paper, sugar, fertilizers, daily use products (Soap, detergent, disinfectant, cosmetics etc), distillery.		8
III*	Practicals 1. Extract essential oils from natural sources. 2. Determination of total active content in detergent. 3. Preparation of cosmetic cream or lip balm naturally. 4. To measure the acidity / alkalinity of a soil sample. 5. To estimate total organic content / total organic carbon in soil. 6. To prepare a low-cost adsorbent from organic waste (e.g., orange peel, banana peel, sugarcane bagasse, or sawdust) and evaluate its		30*

	potential for removing pollutants (like dyes or heavy metals) from aqueous solutions. 7. To construct a simple solar cell using black tea or hibiscus extract as a natural dye, Titanium dioxide (TiO₂) as a semiconductor, and simple kitchen materials to understand solar energy conversion. Note: Any experiment may be introduced/deleted in the practical class based on the availability / non-availability of the instruments / chemicals.	
Total Contact Hours		45 (15+30*)
Suggested Evaluation Methods		
Internal Assessment:		End Term Examination:
➤ Theory	10	➤ Theory: 20
• Class Participation:	4	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	--	
• Mid-Term Exam:	6	
➤ Practical*	5	➤ Practical* 15
• Class Participation:	NA	
• Seminar/Demonstration/Viva-Voce/Lab Record, etc.:	5	
• Mid-Term Exam:	NA	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Chemical Laboratory: Safety and Techniques, Mohamed Elzagheid; Walter de Gruyter GmbH & Co KG. 2. Safety in the Chemical Laboratory and Industry by Muhammad Raza Shah. 3. Surfactants, Disinfectants, Cleaners, Toiletries, Personal Care Products Manufacturing and Formulations by NPCS Board of Consultants & Engineers . 4. Soaps, Detergents and Disinfectants Technology Handbook (3rd Revised Edition) by Ajay Kumar Gupta. 5. Industrial Chemistry, B. K. Sharma.		

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॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (3rd Semester / 5th Semester) for Under-Graduate Programmes

Computer Science

VOC

according to

Curriculum Framework for Under-Graduate Programmes

As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

(2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2025-26, Syllabus: 2025-26			
Part A – Introduction			
Subject	Computer Science		
Semester	III		
Name of the Course	Computer Hardware Maintenance		
Course Code	B25-VOC-107		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	VOC		
Level of the course (As per Annexure-I	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Identify and describe the key hardware components of a computer system. 2. Assemble a fully functional desktop computer from individual parts. 3. Diagnose and troubleshoot common hardware and software issues. 4. Install and configure operating systems and drivers. 5. Perform routine maintenance and basic upgrades on PCs.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Fundamentals of Computer Hardware: Types of computer systems, Evolution of computers, Overview of hardware vs software, Motherboard types and form factors, Chipsets and buses (PCI, SATA, USB)	11
II	Components and Peripherals: Central Processing Unit (CPU), RAM types and installation, SMPS and connectors, Storage devices (HDD, SSD, NVMe), Input/output devices and ports, BIOS/UEFI basics and configuration	11
III	PC Assembly Process: Precautions and safety (ESD), Tools for assembly, Mounting motherboard and processor, Installing RAM and storage, Connecting power supply, POST check, BIOS setup and boot configuration	11
IV	Troubleshooting and Maintenance: Common hardware problems and symptoms, Boot errors and diagnostic tools, Software troubleshooting (BSOD, driver issues, malware), Preventive maintenance, Upgrading RAM, storage, and GPU	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: 1. Identifying and handling PC components (RAM, CPU, PSU, HDD) 2. Disassembling and reassembling a desktop PC 3. Configuring BIOS/UEFI settings 4. Installing an operating system (Windows/Linux) 5. Installing device drivers and basic utilities 6. Formatting and partitioning storage drives 7. Creating dual-boot and using virtualization 8. Simulating and diagnosing hardware faults 9. Troubleshooting slow systems and driver issues 10. Running antivirus scans and clean-up tools 11. Upgrading components (RAM, SSD/HDD) 12. Backing up and restoring system data	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- **Scott Mueller**, *Upgrading and Repairing PCs*, Pearson Education, Latest Edition
- **Jean Andrews**, *A+ Guide to Hardware: Managing, Maintaining, and Troubleshooting*, Cengage Learning, Latest Edition
- **K.L. James**, *Computer Hardware and Maintenance*, PHI Learning
- **Michael Meyers**, *CompTIA A+ Certification All-in-One Exam Guide*, McGraw-Hill Education
- **Balaji Srinivasan**, *Troubleshooting, Maintaining and Repairing PCs*, Pearson Education

*Applicable for courses having practical components.

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समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (3rd / 5th Semester) for Under-Graduate Programmes
Computer Science
VOC
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2025-26, Syllabus: 2025-26			
Part A – Introduction			
Subject	Computer Science		
Semester	VI		
Name of the Course	Digital Marketing Using CANVA		
Course Code	B25-VOC-144		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	VOC		
Level of the course (As per Annexure-I	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of digital marketing and its components 2. Create visually appealing marketing content using Canva 3. Apply digital strategies for social media, branding, and email marketing 4. Plan and execute a mini digital marketing campaign using Canva assets		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Digital Marketing: Overview of digital marketing, Traditional vs digital marketing, Key components of digital marketing, Content marketing basics, Social media marketing platforms, Introduction to branding and audience targeting	11
II	Graphic Design for Marketing using Canva: Introduction to Canva interface, Creating designs using templates, Customizing fonts, colors and images, Designing social media posts, Posters and banners, Working with Canva elements and grids, Downloading and sharing content	11
III	Social Media and Content Strategy: Importance of visual content, Social media platform differences (Instagram, Facebook, LinkedIn), Creating branded content for different platforms, Designing Instagram stories and reels covers, Designing Facebook and LinkedIn posts	11
IV	Campaign Planning and Performance: Planning a mini campaign, Defining goals and target audience, Creating content calendar, Designing ads and email headers, Measuring performance using insights and analytics	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: 1. Creating a Canva account and exploring templates 2. Designing a basic social media post 3. Creating a brand logo and color palette 4. Designing a marketing poster for a product/service 5. Creating Instagram and Facebook ad creatives 6. Designing a YouTube thumbnail 7. Preparing an email header for a promotional campaign 8. Creating a business card or brochure 9. Designing carousel posts and story graphics 10. Creating a content calendar using Canva templates	30

Suggested Evaluation Methods

Internal Assessment:

> Theory

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 5
- Mid-Term Exam: 10

> Practicum

- Class Participation: NA
- Seminar/Demonstration/Viva-voce/Lab records etc.: 10
- Mid-Term Exam: NA

End-Term

Examination:

A three-hour exam for both theory and practicum.

End Term

Exam Marks:
70(50(T)+20(P))

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. **Philip Kotler**, *Marketing 5.0: Technology for Humanity*, Wiley
2. **Dave Chaffey**, *Digital Marketing: Strategy, Implementation and Practice*, Pearson
3. **Crystal King**, *Social Media Marketing Workbook*, CreateSpace
4. **Canva Design School** – <https://designschool.canva.com>
5. **HubSpot Academy** – Free Digital Marketing Certifications – <https://academy.hubspot.com>
6. **Google Digital Garage** – Fundamentals of Digital Marketing – <https://learndigital.withgoogle.com>

*Applicable for courses having practical components.

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Syllabus of Examination (4th Semester) for Under-Graduate Programmes
Computer Science
VOC
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2025-26, Syllabus: 2025-26			
Part A – Introduction			
Subject	Computer Science		
Semester	VI		
Name of the Course	Front End Framework (React)		
Course Code	B23-VOC-239		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the core concepts of component-based front-end development using React. 2. Build dynamic and responsive single-page applications using React and JSX. 3. Manage application state effectively using React hooks and context. 4. Integrate APIs and use routing for building complete client-side applications. 5. Apply front-end development skills through practical implementation using React.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u>			
The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to React and Environment Setup: React overview, Introduction to single-page applications, Differences between traditional web apps and SPA, Setting up development environment, Installing Node.js and npm, Installing and creating React app using <code>create-react-app</code> , Project structure overview, JSX syntax and rules, Rendering elements, Using functional components	11
II	Components and Props: Understanding components, Functional vs class components, Props and property passing, Children props, Reusability and component composition, Handling events, Conditional rendering, Lists and keys, Forms and form handling in React	11
III	State Management and Hooks: Introduction to <code>useState</code> , Managing local state in functional components, Event handling and state updates, Introduction to <code>useEffect</code> , Lifecycle with <code>useEffect</code> , Introduction to context API, <code>useContext</code> for global state, Lifting state up	11
IV	Routing, API Integration, and Final Project: React Router basics, Route, Switch, Link, <code>useParams</code> , <code>useNavigate</code> , Fetching data using <code>fetch()</code> or <code>Axios</code> , Connecting to REST APIs, Handling asynchronous data and loaders, Project structure planning, Mini-project: Building a functional single-page application (SPA) with routing and API integration	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: 1. Creating simple component-based UIs 2. Handling forms and user input 3. Using hooks in multiple scenarios 4. Building a small React application using routing and API 5. Deployment using GitHub Pages or Vercel	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. **Dave Ceddia**, *Pure React*, Self-published
2. **Alex Banks & Eve Porcello**, *Learning React: A Hands-On Guide to Building Web Applications Using React and Redux*, O'Reilly
3. **Robin Wieruch**, *The Road to React*, Leanpub
4. <https://reactjs.org/docs/getting-started.html> — Official React Documentation
5. **Codecademy / freeCodeCamp React courses**

*Applicable for courses having practical components.

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Syllabus of Examination (4th Semester) for Under-Graduate Programmes
Computer Science
VOC
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2025-26, Syllabus: 2025-26			
Part A – Introduction			
Subject	Computer Science		
Semester	IV		
Name of the Course	Ethical Hacking		
Course Code	B25-VOC-243		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamental concepts of ethical hacking and cybersecurity. 2. Identify and analyze security threats, vulnerabilities, and exploits. 3. Apply common hacking tools and techniques in a controlled and ethical environment. 4. Demonstrate safe and legal penetration testing practices using virtual labs. 5. Propose countermeasures and security solutions for detected threats.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Ethical Hacking and Cyber Security: Definition of hacking and types of hackers, Ethical hacking vs. unethical hacking, Scope and limitations of ethical hacking, Cybercrime and cyber laws, Phases of hacking, Legal implications and code of ethics, Introduction to security policies and compliance	11
II	Footprinting and Network Scanning: Footprinting techniques, Passive and active information gathering, WHOIS, NSLookup, Google hacking, Network scanning techniques, Nmap, IP scanning, Port scanning, Vulnerability scanning basics, Introduction to network mapping tools	11
III	System Hacking and Malware: Password cracking techniques, Keyloggers and spyware, Privilege escalation, Trojans, viruses, and worms, Backdoors and remote access tools, Buffer overflows (basic understanding), Antivirus evasion techniques (theory only), Safe practices to avoid infections	11
IV	Web and Wireless Security Basics: Common web application attacks (XSS, SQL injection, CSRF), Introduction to web vulnerability scanners (e.g., OWASP ZAP), Securing web applications (basic methods), Wireless network vulnerabilities, Types of Wi-Fi attacks (WEP cracking, rogue APs), Introduction to WPA/WPA2 security, Basic countermeasures	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: 1. Simulated hacking environment using tools like Kali Linux, Wireshark, Nmap, OWASP ZAP 2. Exercises in footprinting, scanning, password cracking, basic web app testing 3. Mini-project: Penetration test report on a simulated network or application 4. Lab safety and ethics: Students must sign an ethical conduct agreement.	30

Suggested Evaluation Methods

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. **Bachaal Uddin**, *Ethical Hacking and Cyber Security*, Wiley
2. **William Stallings**, *Network Security Essentials*, Pearson
3. **Michael T. Simpson**, *Hands-On Ethical Hacking and Network Defense*, Cengage
4. **Jon Erickson**, *Hacking: The Art of Exploitation*, No Starch Press
5. **CEH Official Study Guide**, EC-Council (moderate level only)
6. Online resource: <https://owasp.org>

*Applicable for courses having practical components.

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Syllabus of Examination (6th Semester) for Under-Graduate Programmes
Computer Science
VOC
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2025-26, Syllabus: 2025-26			
Part A – Introduction			
Subject	Computer Science		
Semester	VI		
Name of the Course	Mobile Application Development using React Native		
Course Code	B25-VOC-343		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of mobile app development and the React Native framework. 2. Build cross-platform applications using JavaScript and React Native components. 3. Integrate mobile app features like navigation, state management, and data handling. 4. Deploy and test mobile apps on Android and iOS platforms. 5. Use debugging tools and optimize application performance.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u>			
The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Mobile App Development & React Native: Mobile application basics, Native vs Hybrid vs Cross-platform apps, Introduction to React Native, Features and architecture of React Native, Environment setup (Node.js, npm, Expo CLI), Creating first React Native project, Folder structure and code walkthrough, Running apps on emulators and devices.	11
II	React Native Components and UI Design: Core components: View, Text, Image, TextInput, Button, ScrollView, FlatList, StyleSheet in React Native, Flexbox layout, Platform-specific design using Platform API, Responsive UI design principles, Using external UI libraries (e.g., NativeBase, React Native Paper), Handling user inputs.	11
III	Navigation, State Management and APIs: React Navigation: Stack, Tab, Drawer navigators, Props and state in components, useState and useEffect hooks, AsyncStorage, Fetching data using APIs, Working with JSON data, Introduction to Redux for global state management.	11
IV	Deployment, Testing and Debugging: App lifecycle, Handling errors and exceptions, Debugging techniques in React Native, Using Chrome DevTools and Flipper, Generating APK for Android, Introduction to Expo publishing, Best practices for performance and security, Project work: Developing a small mobile application.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: 1. Weekly lab sessions aligned with theory units. 2. Mini project on developing a basic mobile application.	30

Suggested Evaluation Methods

Internal Assessment:

➤ Theory

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 5
- Mid-Term Exam: 10

➤ Practicum

- Class Participation: NA
- Seminar/Demonstration/Viva-voce/Lab records etc.: 10
- Mid-Term Exam: NA

End-Term Examination:
A three-hour exam for both theory and practicum.
End Term Exam Marks:
70(50(T)+20(P))

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. **Bonnie Eisenman**, *Learning React Native*, O'Reilly Media.
2. **Adam Boduch**, *React and React Native*, Packt Publishing.
3. **Akshat Paul & Abhishek Nalwaya**, *React Native for Mobile Development*, Apress.
4. Official documentation: <https://reactnative.dev>
5. Expo Docs: <https://docs.expo.dev>

*Applicable for courses having practical components.

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Syllabus of Examination (6th Semester) for Under-Graduate Programmes
Computer Science
VOC
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2025-26, Syllabus: 2025-26			
Part A – Introduction			
Subject	Computer Science		
Semester	VI		
Name of the Course	UI / UX Design using FIGMA		
Course Code	B25-VOC-345		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Knowledge of UI / UX Design using FIGMA		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand basic principles of UI and UX design 2. Create wireframes and design interfaces using FIGMA 3. Develop simple interactive prototypes for web or mobile apps 4. Apply user feedback to improve design usability		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Basics of UI/UX Design: Introduction to UI and UX, Difference between UI and UX, Importance of user-centered design, Basic design principles, Elements of good user interface, Overview of design process	11
II	Introduction to FIGMA and Wire-framing: Figma interface and tools, Creating frames and shapes, Using text and color styles, Drawing wireframes, Designing simple layouts, Saving and sharing designs	11
III	Designing Screens and Prototyping: Creating multiple screens for a web/mobile app, Adding buttons and navigation links, Creating clickable prototypes, Using transitions and animations, Testing basic interaction	11
IV	Improving Design and Final Presentation: Collecting feedback on designs, Making improvements based on feedback, Exporting assets and design files, Building a mini design project, Presenting design to peers or teachers	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: 1. Creating a Figma account and exploring its interface 2. Drawing basic shapes and creating color styles 3. Designing a wireframe for a login screen 4. Creating a homepage layout for a mobile app 5. Adding navigation links between screens 6. Making a clickable prototype 7. Designing a simple form (e.g., contact form or signup) 8. Using icons and images in the design 9. Testing your prototype and getting peer feedback 10. Editing the design based on feedback	30

Suggested Evaluation Methods

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- **Don Norman**, *The Design of Everyday Things*, MIT Press
- **Steve Krug**, *Don't Make Me Think*, New Riders
- **Figma Learn** – <https://www.figma.com/learn>
- **Coursera / Google UX Design Course (Beginner-Friendly)**
- **Interaction Design Foundation** – <https://www.interaction-design.org>

*Applicable for courses having practical components.

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Modified Scheme of Examination for Under-Graduate Programmes

Subject: Computer Science

according to

Curriculum Framework for Under-Graduate Programmes

As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

(For the Batches Admitted From 2025-2026)

Kurukshetra University Kurukshetra
Scheme of Examination for Undergraduate programmes
Subject: Computer Science
According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)

Sem	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T + P
1	CC-1 MCC-1	B23-CSE-101	Problem Solving through C	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-2	B23-CSE-102	Computer Fundamentals	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M1	B23-CSE-103	Basics of Computer Science	1	1	10	20	30	3
			Practical	1	2	5	15	20	3
	MDC 1	B23-CSE-104	Fundamentals of Computer Science	2	2	15	35	75	3
			Practical	1	2	5	20	25	3
2	CC-2 MCC-3	B23-CSE-201	Web Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSEC-1	B23-CSE-202	Programming with C++	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M2		Programming Methodologies	1	1	10	20	30	3

		B23-CSE-203	Practical	1	2	5	15	20	3
	MDC 2	B23-CSE-204	Web Technologies Fundamentals	2	2	15	35	50	3
			Practical	1	2	5	20	25	3
3	CC-3 MCC-4	B23-CSE-301	Operating Systems	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-5	B23-CSE-302	Quantitative Foundations of Computer Science	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MDC 3	B23-CSE-303	Programming with C	2	2	15	35	50	3
			Practical	1	2	5	20	25	3
	CC-M2	B23-CSE-304	Programming using Python	1	1	10	20	30	3
			Practical	1	2	5	15	20	3
4	CC-4 MCC-6	B23-CSE-401	Data Management with DBMS	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-7	B23-CSE-402	Introduction to Computer System Design and Organization	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-8	B23-CSE-403	Object-Oriented Programming with Java	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSE-1	B23-CSE-404	Front-end Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3

5		Or							
		B23-CSE-405	Linux and Shell Programming	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-5 MCC-9	B23-CSE-501	Data Structures	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-10	B23-CSE-502	Software Engineering	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSE-2	B23-CSE-503	Foundations of Server-Side Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
		Or							
		B23-CSE-504	Cloud Computing	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSE-3	B23-CSE-505	Programming in Python	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
		Or							
		B23-CSE-506	Programming in R	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
6	CC-6 MCC-11	B23-CSE-601	Computer Networks	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-12	B23-CSE-602	Essentials of Computer Architecture and Design	3	3	20	50	70	3

			Practical	1	2	10	20	30	3
	DSE-4	B23-CSE-603	Developing Modern Web Applications using React	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
		Or							
		B23-CSE-604	Data Storage Technologies and Networks using AWS	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSE-5	B23-CSE-605	Data Analytics using Python	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
		Or							
		B23-CSE-606	Data Analytics using R	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
7	CC-H1	B23-CSE-701	Principles & Paradigms of Programming Languages	4	4	30	70	100	3
	CC-H2	B23-CSE-702	Software Testing	4	4	30	70	100	3
	CC-H3	B23-CSE-703	Data Mining and Warehousing	4	4	30	70	100	3
	DSE-6	B23-CSE-704	NoSQL Databases	4	4	30	70	100	3

8		Or							
		B23-CSE-705	Artificial Intelligence	4	4	30	70	100	3
	PC-H1	B23-CSE-706	Practical	4	8	30	70	100	6
	CC-H4	B23-CSE-801	Emerging Trends in Information Security	4	4	30	70	100	3
	CC-H5	B23-CSE-802	Principles of Design and Analysis of algorithms	4	4	30	70	100	3
	CC-H6	B23-CSE-803	Software Project Management	4	4	30	70	100	3
	DSE-7	B23-CSE-804	Big Data	4	4	30	70	100	3
		Or							
		B23-CSE-805	Machine Learning	4	4	30	70	100	3
	PC-H2	B23-CSE-806	Practical (Advanced Web Frameworks)	4	8	30	70	100	6
	OR								
	CC-H4	B23-CSE-801	Emerging Trends in Information Security	4	4	30	70	100	3
	CC-H5	B23-CSE-802	Principles of Design and Analysis of algorithms	4	4	30	70	100	3

	Research	B23-CSE-807	Project/ Dissertation	12				300	

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समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination for Under-Graduate Programmes
Subject: Computer Science
Minor to be offered to other Department
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2025-26, Syllabus: 2025-26			
Part A – Introduction			
Subject	Computer Science		
Semester	III		
Name of the Course	Programming using Python		
Course Code	B23-CSE-304		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M3		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	Knowledge of Basics of Programming using Python		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand and write Python syntax. 2. Use data types, operators, and control structures. 3. Define and use functions and modules. 4. Implement real-world solutions using Python's built-in features and file handling.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Python: setting up Python environment, writing and executing Python scripts, variables and data types, input/output, type casting, comments, operators (arithmetic, relational, logical, assignment, bitwise, identity, membership)	11
II	Control structures: conditional statements (if, if-else, elif), loops (for, while), loop control (break, continue, pass), range and enumerate functions, nested loops, basic problem-solving using loops	11
III	Functions: built-in functions, user-defined functions, function arguments and return values, scope and lifetime of variables, recursion, lambda functions, modules and importing, creating and using custom modules	11
IV	Data structures in Python: lists, tuples, sets, dictionaries, list/set/dictionary comprehensions, file handling: reading and writing text and CSV files, exception handling: try, except, finally, raising exceptions	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: 1. Write and execute a “Hello, World!” program 2. Input/output programs using variables and data types 3. Implement arithmetic and logical operations 4. Write Python code for conditional branching (if-else) 5. Use loops to generate patterns and process lists 6. Create user-defined functions with parameters 7. Use recursion to calculate factorial/Fibonacci series 8. Create and use modules (including built-in like math, random) 9. Perform operations on lists, tuples, sets, and dictionaries 10. File handling – read from and write to text files 11. Handle exceptions using try-except block	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- **Mark Lutz**, *Learning Python*, O'Reilly Media
- **Allen B. Downey**, *Think Python*, O'Reilly
- **Eric Matthes**, *Python Crash Course*, No Starch Press
- **Zelle, John M.**, *Python Programming: An Introduction to Computer Science*
- Official Python Documentation – <https://docs.python.org/3>

*Applicable for courses having practical components.

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Modified Scheme of Examination for Under-Graduate Programmes

Subject: Computer Applications

according to

Curriculum Framework for Under-Graduate Programmes

As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

(For the Batches Admitted from 2025-2026)

Kurukshetra University Kurukshetra
Scheme of Examination for Undergraduate programmes
Subject: Computer Applications
According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)

Sem	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T + P
1	CC-1 MCC-1	B23-CAC-101	Programming with Python	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-2	B23-CAC-102	Operating Systems	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M1	B23-CAC-103	Basics of Computer Science	1	1	10	20	30	3
			Practical	1	2	5	15	20	3
	MDC 1	B23-CAC-104	Fundamentals of Computer Science	2	2	15	35	75	3
			Practical	1	2	5	20	25	3
2	CC-2 MCC-3	B23-CAC-201	Logical Organization of Computer	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSEC-1	B23-CAC-202	Data Base Management Systems	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M2	B23-CAC-203	Programming Methodologies	1	1	10	20	30	3
			Practical	1	2	5	15	20	3

	MDC 2	B23-CAC-204	Web Technologies Fundamentals	2	2	15	35	50	3
			Practical	1	2	5	20	25	3
3	CC-3 MCC-4	B23-CAC-301	Object-Oriented Programming using C++	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-5	B23-CAC-302	Foundations of Web Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MDC 3	B23-CAC-303	Programming with C	2	2	15	35	50	3
			Practical	1	2	5	20	25	3
	CC-M3	B23-CAC-304	Programming using Python	1	1	10	20	30	3
			Practical	1	2	5	15	20	3
4	CC-4 MCC-6	B23-CAC-401	Computer Graphics	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-7	B23-CAC-402	Concepts of Data Structures	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-8	B23-CAC-403	Java Programming	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSE-1	B23-CAC-404	Front-end Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
		Or							
		B23-CAC-405	Linux and Shell Programming	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
5	CC-5		Data Analytics using SpreadSheets	3	3	20	50	70	3

6	MCC-9	B23-CAC-501	Practical	1	2	10	20	30	3
	MCC-10	B23-CAC-502	Computer Networks	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSE-2	B23-CAC-503	Foundations of Server-Side Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
		Or							
		B23-CAC-504	Cloud Computing	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSE-3	B23-CAC-505	Java Based Web App Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
		Or							
		B23-CAC-506	Programming in R	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-6 MCC-11	B23-CAC-601	Artificial Intelligence	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	MCC-12	B23-CAC-602	Advanced Web Development Techniques	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSE-4	B23-CAC-603	Developing Modern Web Applications using React	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
		Or							

		B23-CAC-604	Data Storage Technologies and Networks using AWS	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	DSE-5	B23-CAC-606	Data Analytics using Python	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
		Or							
		B23-CAC-607	Data Analytics using R	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
7	CC-H1	B23-CAC-701	Mobile Computing	4	4	30	70	100	3
	CC-H2	B23-CAC-702	Software Testing	4	4	30	70	100	3
	CC-H3	B23-CAC-703	Data Mining and Warehousing	4	4	30	70	100	3
	DSE-6	B23-CAC-704	NoSQL Databases	4	4	30	70	100	3
		Or							
		B23-CAC-705	Block Chain Technologies	4	4	30	70	100	3
	PC-H1	B23-CAC-707	Practical	4	8	30	70	100	6
8	CC-H4	B23-CAC-801	Information Security	4	4	30	70	100	3
	CC-H5	B23-CAC-802	Internet of Things	4	4	30	70	100	3

	CC-H6	B23-CAC-803	Software Project Management	4	4	30	70	100	3
	DSE-7	B23-CAC-804	Big Data	4	4	30	70	100	3
		Or							
		B23-CAC-805	Machine Learning	4	4	30	70	100	3
	PC-H2	B23-CAC-806	Practical	4	8	30	70	100	6
	OR								
	CC-H4	B23-CAC-801	Information Security	4	4	30	70	100	3
	CC-H5	B23-CAC-802	Internet of Things	4	4	30	70	100	3
	Research	B23-CAC-807	Project/ Dissertation	12				300	

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Syllabus of Examination for Under-Graduate Programmes
Subject : Computer Applications
Minor to be offered to other Department
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(2025-2026)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2025-26, Syllabus: 2025-26			
Part A – Introduction			
Subject	Computer Applications		
Semester	III		
Name of the Course	Programming using Python		
Course Code	B23-CAC-304		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M3		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	Knowledge of Basics of Programming using Python		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand and write Python syntax. 2. Use data types, operators, and control structures. 3. Define and use functions and modules. 4. Implement real-world solutions using Python's built-in features and file handling.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Python: setting up Python environment, writing and executing Python scripts, variables and data types, input/output, type casting, comments, operators (arithmetic, relational, logical, assignment, bitwise, identity, membership)	11
II	Control structures: conditional statements (if, if-else, elif), loops (for, while), loop control (break, continue, pass), range and enumerate functions, nested loops, basic problem-solving using loops	11
III	Functions: built-in functions, user-defined functions, function arguments and return values, scope and lifetime of variables, recursion, lambda functions, modules and importing, creating and using custom modules	11
IV	Data structures in Python: lists, tuples, sets, dictionaries, list/set/dictionary comprehensions, file handling: reading and writing text and CSV files, exception handling: try, except, finally, raising exceptions	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: 1. Write and execute a “Hello, World!” program 2. Input/output programs using variables and data types 3. Implement arithmetic and logical operations 4. Write Python code for conditional branching (if-else) 5. Use loops to generate patterns and process lists 6. Create user-defined functions with parameters 7. Use recursion to calculate factorial/Fibonacci series 8. Create and use modules (including built-in like math, random) 9. Perform operations on lists, tuples, sets, and dictionaries 10. File handling – read from and write to text files 11. Handle exceptions using try-except block	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- **Mark Lutz**, *Learning Python*, O'Reilly Media
- **Allen B. Downey**, *Think Python*, O'Reilly
- **Eric Matthes**, *Python Crash Course*, No Starch Press
- **Zelle, John M.**, *Python Programming: An Introduction to Computer Science*
- Official Python Documentation – <https://docs.python.org/3>

*Applicable for courses having practical components.

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

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Revised Scheme of Examination for Mathematics Subject in

Under Graduate Programmes

as per NEP 2020

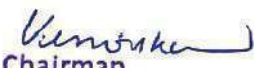
Curriculum and Credit Framework for Undergraduate Programmes
(Multiple Entry-Exit, Internships and Choice Based Credit System LOCF)

With effect from the session 2025-26 (in phased manner)

DEPARTMENT OF MATHEMATICS

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119

HARYANA, INDIA


Chairman
Deptt. of Mathematics
K.U. KURUKSHETRA.

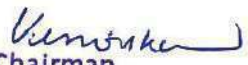
Kurukshetra University, Kurukshetra

Revised Scheme of Examination for the Mathematics Subject in Under Graduate Programmes

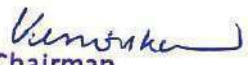
as per NEP 2020 Curriculum and Credit Framework for Undergraduate Programmes

(Multiple Entry-Exit, Internships and Choice Based Credit System LOCF) with effect from the session 2025-26 (in phased manner)

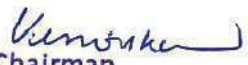
Semester	Course Type	Applicable Scheme	Course Code	Nomenclature of course	Credits			Contact hours L: Lecture P: Practical T: Tutorial			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
					Total	Theory (T)	Practical (P)	L	P	Total	T	P	T	P		T	P
1	CC-1 MCC-1	Scheme A, B & C	B23-MAT-101	CALCULUS	4	3	1	3	2	5	20	10	50	20	100	3	3
	MCC-2	Scheme C	B23-MAT-102	ADVANCED CALCULUS	4	3	1	3	2	5	20	10	50	20	100	3	3
	CC-M1	Scheme A, B & D	B23-MAT-103	BASIC CALCULUS	2	1	1	1	2	3	10	5	20	15	50	3	3
	MDC 1	Scheme A, B, C & D	B25-MAT-104	INTRODUCTORY MATHEMATICS	3	2	1	2	2	4	15	5	35	20	75	3	3
2	CC-2 MCC-3	Scheme A, B & C	B23-MAT-201	ALGEBRA AND NUMBER THEORY	4	3	1	3	2	5	20	10	50	20	100	3	3


 Chairman
 Deptt. of Mathematics
 K.U. KURUKSHETRA.

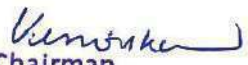
	DSEC-1	Scheme C	B23-MAT-202	PROGRAMMING IN C	4	3	1	3	2	5	20	10	50	20	100	3	3
	CC-M2	Scheme A, B & D	B23-MAT-203	BASIC ALGEBRA	2	1	1	1	2	3	10	5	20	15	50	3	3
	MDC 2	Scheme A, B, C & D	B25-MAT-204	MATHEMATICS FOR COMMERCE & SOCIAL SCIENCES	3	2	1	2	2	4	15	5	35	20	75	3	3
3	CC-3 MCC-4	Scheme A, B & C	B23-MAT-301	DIFFERENTIAL EQUATIONS-I	4	3	1	3	2	5	20	10	50	20	100	3	3
	MCC-5	Scheme B & C	B23-MAT-302	GROUPS AND RINGS	4	3	1	3	2	5	20	10	50	20	100	3	3
	MCC-2	Scheme B	B23-MAT-102	ADVANCED CALCULUS	4	3	1	3	2	5	20	10	50	20	100	3	3
	MDC 3	Scheme A, B, C & D	B25-MAT-303	APPLICABLE MATHEMATICS	3	2	1	2	2	4	15	5	35	20	75	3	3
	CC-M3	Scheme A, B & D	B25-MAT-304	DIFFERENTIAL EQUATIONS	4	3	1	3	2	5	20	10	50	20	100	3	3


 Chairman
 Deptt. of Mathematics
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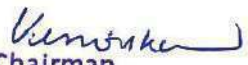
4	CC-4 MCC-6	Scheme A, B & C	B23- MAT- 401	ANALYTICAL GEOMETRY & VECTOR CALCULUS	4	3	1	3	2	5	20	10	50	20	100	3	3
	MCC-7	Scheme B & C	B23- MAT- 402	LINEAR ALGEBRA	4	3	1	3	2	5	20	10	50	20	100	3	3
	MCC-8	Scheme B & C	B23- MAT- 403	DIFFERENTIAL EQUATIONS-II	4	3	1	3	2	5	20	10	50	20	100	3	3
	DSE-1	Scheme B & C	B23- MAT- 404	PROBABILITY THEORY & STATISTICS	4	3	1	3	2	5	20	10	50	20	100	3	3
		Or															
		Scheme B & C	B23- MAT- 405	SPECIAL FUNCTIONS	4	3	1	3	2	5	20	10	50	20	100	3	3
5	CC-5 MCC-9	Scheme A, B & C	B23- MAT- 501	SEQUENCES AND SERIES	4	3	1	3	2	5	20	10	50	20	100	3	3
	MCC-10	Scheme B & C	B23- MAT- 502	MECHANICS-I	4	3	1	3	2	5	20	10	50	20	100	3	3
	DSE-2	Scheme B & C	B23- MAT- 503	LINEAR PROGRAMMING	4	3	1	3	2	5	20	10	50	20	100	3	3


 Chairman
 Deptt. of Mathematics
 K.U. KURUKSHETRA.

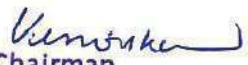
			Or														
		Scheme B & C	B23-MAT-504	COMPUTER PROGRAMMING	4	3	1	3	2	5	20	10	50	20	100	3	3
	DSE-3	Scheme B & C	B23-MAT-505	NUMBER THEORY & CRYPTOGRAPHY	4	3	1	3	2	5	20	10	50	20	100	3	3
			Or														
		Scheme B & C	B23-MAT-506	INTEGRAL TRANSFORMS AND FOURIER ANALYSIS	4	3	1	3	2	5	20	10	50	20	100	3	3
6	CC-6 MCC-11	Scheme A, B & C	B23-MAT-601	NUMERICAL ANALYSIS	4	3	1	3	2	5	20	10	50	20	100	3	3
	MCC-12	Scheme B & C	B23-MAT-602	REAL ANALYSIS	4	3	1	3	2	5	20	10	50	20	100	3	3
	DSE-4	Scheme B & C	B23-MAT-603	MECHANICS-II	4	3	1	3	2	5	20	10	50	20	100	3	3
			Or														
		Scheme B & C	B23-MAT-604	CLASSICAL MECHANICS	4	3	1	3	2	5	20	10	50	20	100	3	3


 Chairman
 Deptt. of Mathematics
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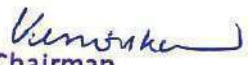
	DSE-5	Scheme B & C	B23-MAT-605	DISCRETE MATHEMATICS	4	3	1	3	2	5	20	10	50	20	100	3	3
			Or														
		Scheme B & C	B23-MAT-606	MATHEMATICAL MODELLING	4	3	1	3	2	5	20	10	50	20	100	3	3
	CC-M6	Scheme A, B & D	B25-MAT-607	NUMERICAL METHODS	4	3	1	3	2	5	20	10	50	20	100	3	3
		Scheme B & C			Total	Theory	Tutorial/ Practical	L	T	Total	Internal Assessment Marks	End term Examination Marks	Total Marks	Examination hours			
7	CC-H1	Scheme B & C	B23-MAT-701	REAL ANALYSIS-II	4	3	1	3	1	4	30	70	100	3			
	CC-H2	Scheme B & C	B23-MAT-702	COMPLEX ANALYSIS	4	3	1	3	1	4	30	70	100	3			
	CC-H3	Scheme B & C	B23-MAT-703	THEORY OF ORDINARY DIFFERENTIAL EQUATIONS	4	3	1	3	1	4	30	70	100	3			
	DSE-6	Scheme B & C	B23-MAT-704	MECHANICS OF SOLIDS	4	3	1	3	1	4	30	70	100	3			


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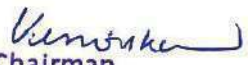
			Or											
		Scheme B & C	B23-MAT-705	DIFFERENTIAL GEOMETRY	4	3	1	3	1	4	30	70	100	3
	PC-H1	Scheme B & C	B23-MAT-706	PROGRAMMING LAB-I	4	2	2 Practical	2	4	6	15(T)+15(P)	35(T)+35(P)	100	3 +3
8	CC-H4	Scheme B & C	B23-MAT-801	ABSTRACT ALGEBRA	4	3	1	3	1	4	30	70	100	3
	CC-H5	Scheme B & C	B23-MAT-802	TOPOLOGY	4	3	1	3	1	4	30	70	100	3
	CC-H6	Scheme B & C	B23-MAT-803	MEASURE AND INTEGRATION	4	3	1	3	1	4	30	70	100	3
	DSE-7	Scheme B & C	B23-MAT-804	FIELD THEORY	4	3	1	3	1	4	30	70	100	3
			Or											
		Scheme B & C	B23-MAT-805	ADVANCED DIFFERENTIAL EQUATIONS	4	3	1	3	1	4	30	70	100	3


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	PC-H2	Scheme B & C	B23-MAT-806	PROGRAMMING LAB-2	4	0	4 Practical	0	8	8	30	70	100	3			
	Research	Scheme B & C	B23-MAT-807	DISSERTATION	12							300	300				
	Scheme of VAC, SEC and VOC courses																
Semester	Course Type	ApplicableS cheme	Course Code	Nomenclature of the Course	Credits			Contact hours L: Lecture P: Practical			Internal Assessment Marks		End term Examination Marks		Total Marks	Examination hours	
					Total	Theory (T)	Practical (P)	L	P	Tot al	T	P	T	P		T	P
3	VAC-3	Scheme C	B23-VAC-308	Mathematics in India: From Vedic Period to Modern Times	2	2	0	2	0	2	15	0	35		50	3	
4	VAC-3	Scheme A, B & D	B23-VAC-418	Mathematics in Everyday Life	2	2	0	2	0	2	15	0	35		50	3	


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4	VAC-4	Scheme C	B23-VAC-418	Mathematics in Everyday Life	2	2	0	2	0	2	15	0	35		50	3	
2	SEC-2	Scheme A, B, C & D	B23-SEC-203	Calculation Skills with Vedic Mathematics-I	3	2	1	2	2	4	15	5	35	20	75	3	3
2	SEC-2	Scheme A, B, C & D	B23-SEC-225	Numerical Ability Enhancement Skills	3	2	1	2	2	4	15	5	35	20	75	3	3
3	SEC-3	Scheme A, B, C & D	B23-SEC-303	Calculation Skills with Vedic Mathematics-II	3	2	1	2	2	4	15	5	35	20	75	3	3
3	SEC-3	Scheme A, B, C & D	B23-SEC-324	Learning MATLAB Skills	3	2	1	2	2	4	15	5	35	20	75	3	3
3	SEC-3	Scheme A, B, C & D	B23-SEC-326	Quantitative Aptitude	3	2	1	2	2	4	15	5	35	20	75	3	3
3	SEC-3	Scheme A, B, C & D	B23-SEC-327	Reasoning	3	2	1	2	2	4	15	5	35	20	75	3	3
6	SEC-4	Scheme A, B, C & D	B23-SEC-406	Basic Mathematical Techniques	3	2	1	2	2	4	15	5	35	20	75	3	3


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Course composition- Theory/Theory +Tutorial

Course Credit	Internal Assessment marks	End term exam marks	Total marks
2	15	35	50
3	25	50	75
4	30	70	100

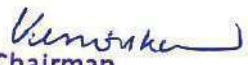
Course composition- Theory+Practical

Course Credit	Theory		Practical		Total marks
Theory +Practical	Internal Assessment marks	End term exam marks	Internal Assessment marks	End term exam marks	
1+1	10	20	5	15	50
2+1	15	35	5	20	75
2+2	15	35	15	35	100
3+1	20	50	10	20	100
0+4	NA	NA	30	70	100

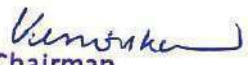
1. Internal assessment (30%) shall be broadly based on the following defined components of;

- Class participation
- Seminar/Presentation/Assignment/Quiz/class test, etc.
- Mid Term Exam

Total Internal Assessment Marks (Theory)	Class Participation	Seminar/Presentation/Assignment/Quiz/class test, etc.	Mid-Term Exam
10	4	-	6
15	4	4	7
20	5	5	10
25	5	7	13
30	5	10	15


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Total Internal Assessment Marks (Practicum)	Class Participation	Seminar/Demonstration/Viva-Voce/Lab record, etc.	Mid-Term Exam
5		5	NA
10		10	NA
15	5	10	NA
30	5	10	15


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Session: 2025-26

Part A–Introduction

Subject	Mathematics		
Semester	I		
Name of the Course	Introductory Mathematics		
Course Code	B25-MAT-104		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC		
Level of the course	100-199		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLOs):	After completing this course, the learner will be able to: 1. Gain the knowledge of set theory, types of sets and operations on sets. Understand various concepts of matrices and determinants, and acquire the cognitive skills to apply different operations on matrices and determinants. 2. To acquire skills to solve linear inequalities and quadratic equations. 3. Gain the knowledge of the concepts of Arithmetic progression and Geometric progression, find A.M., and G.M. of given numbers. 4. Have the conceptual knowledge of straight lines. Find out the slope of a line, angle between two lines, and know about various forms of a straight line. 5. Attain the skills to make use of the learnt concepts of Introductory Mathematics in multidisciplinary learning contexts and to know their applications.		
CLO 5 is related to the practical components of the course.			
	Theory	Practical	Total
Credits	2	1	3
Contact Hours	2	2	4
Internal Assessment Marks	15	5	20
End Term Examination Marks	35	20	55
Examination Time	3 Hrs	3Hrs	
Max. Marks:75			

Part B-Contents of the Course

Instructions for Paper- Setter

Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topics	Contact Hours
I	Sets and their representations, Empty set, Finite and infinite sets, Subsets, Equal sets, Power sets, Universal set, Union and intersection of sets, Difference of two sets, Complement of a set, Venn diagram, De-Morgan's laws and their applications. An introduction to matrices and their types, Operations on matrices, Symmetric and skew-symmetric matrices, Minors, Co-factors. Determinant of a square matrix.	8
II	Linear inequalities, Algebraic solutions of linear inequalities in two variables and their graphical representation. Quadratic equations, Solution of quadratic equations.	8
III	Arithmetic progression, Geometric progression, Arithmetic mean (A.M.), Geometric mean (G.M.), Relation between A.M. and G.M.	8
IV	Straight lines: Slope of a line and angle between two lines, Different forms of equation of a line: Parallel to co-ordinate axes, Point-slope form, Slope-intercept form, Two-point form, General form; Distance of a point from a straight line.	8
Practical		
	The examiner will set 4 questions at the time of practical examination by taking course learning outcomes (CLOs) into consideration. The examinee will be required to solve 2 questions. The evaluation will be done on the basis of practical record, viva-voce and written examination. Problem Solving-Questions related to the practical problems based on following topics will be worked out and record of those will be maintained in the Practical Note Book: 1. Problems related to union, intersection, difference and complement of sets.	30

2. Problems based on De Morgan's Laws. 3. Problems related to Venn diagrams. 4. Problems to find determinant of a square matrix of order 3. 5. Problems to find nth term of A.P. and G.P. 6. Problems to find sum of n terms of A.P. and G.P. 7. Problems to find A.M. and G.M. of given numbers. 8. Problems involving formulation and solution of quadratic equations in one variable. 9. Problems to represent solutions of linear inequalities graphically. 10. Problems based on angle between two lines. 11. Problems involving straight lines and their slope.	

Suggested Evaluation Methods

Internal Assessment: ➤ Theory 15 • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➤ Practicum 5 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam:	End Term Examination: ➤ Theory 35 Written Examination ➤ Practicum 20 Lab record, viva-voce, written examination.

Part C-Learning Resources

Recommended Books:

1. C. Y. Young (2021). *Algebra and Trigonometry*. Wiley.
2. S.L. Loney (2016). *The Elements of Coordinate Geometry (Cartesian Coordinates)* (2nd Edition). G.K. Publication Private Limited.
3. Seymour Lipschutz and Marc Lars Lipson (2013). *Linear Algebra*. (4th Edition) Schaum's Outline Series, McGraw-Hill.
4. C.C.Pinter (2014). *A Book of Set Theory*. Dover Publications.
5. J. V. Dyke, J. Rogers and H. Adams (2011). *Fundamentals of Mathematics* (10th Edition), Brooks/Cole.
6. A.Tussy, R. Gustafson and D. Koenig (2010). *Basic Mathematics for College Students* (4th Edition). Brooks Cole.

Session: 2025-26

Part A–Introduction

Subject	Mathematics
Semester	II
Name of the Course	Mathematics for Commerce and Social Sciences
Course Code	B25-MAT-204
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC
Level of the course	100-199
Pre-requisite for the course (if any)	NA
Course Learning Outcomes(CLOs): CLO 5 is related to practical components of the course.	After completing this course, the learner will be able to: 1. Understand and have the procedural knowledge of the concepts of matrices and determinants to solve simultaneous linear equations. 2. Gain the knowledge to find derivatives of simple functions related to commerce and social sciences. Acquire skills to make use of derivatives in realistic problems of the discipline. 3. Have the conceptual knowledge of compound interest, annuity, loan, debenture and sinking funds and attain skills to use these concepts in problem solving. 4. Gain the knowledge and understanding of the concepts of Linear programming and develop skills of formulating and solving linear programming problems based on real world problems. 5. Attain the cognitive and technical skills required for accomplishing assigned tasks relating to the chosen fields of learning in the context of broad multidisciplinary contexts to solve commercial and social real world problems using Mathematics.

	Theory	Practical	Total
Credits	2	1	3
Contact Hours	2	2	4
Internal Assessment Marks	15	5	20
End Term Examination Marks	35	20	55
Examination Time	3Hrs	3Hrs	

Max. Marks: 75

Part B-Contents of the Course

Instructions for Paper- Setter

Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topics	Contact Hours
I	Matrices and Determinants: Definition of a matrix, Order, Equality, Types of matrices, Operations on matrices: addition, multiplication and multiplication with a scalar and their simple properties. Minors, Co-factors, Determinant, Properties of determinants and applications of determinants in finding the area of a triangle, Adjoint and inverse of a square matrix, Solutions of simultaneous linear equations.	8
II	Differentiation, Derivatives of simple functions and other functions having applications in business and social studies, Maxima and minima of a function and their applications to Revenue, Cost, Demand, Production, Profit functions and other functions related to commercial and social Problems.	8
III	Simple interest and compound interest. Annuities: Types of annuities, Present value and amount of an annuity (including the case of continuous compounding), Valuation of simple loans and debentures, Problems related to sinking funds.	8
IV	Linear Programming: Formulation of linear programming problems (LPP) and their solution by graphical and Simplex methods. Applications of linear programming in solving social science and business problems.	8

Practical		
	The examiner will set 4 questions at the time of practical examination by taking course learning outcomes (CLOs) into consideration. The examinee will be required to solve 2 questions. The evaluation will be done on the basis of practical record, viva-voce and written examination. Problem Solving-Questions related to the practical applications based on following problems will be worked out and record of those will be maintained in the Practical Note Book: 1. Problems to find sum of matrices. 2. Problems to find product of matrices. 3. Problems to find determinant of a matrix. 4. Problems to find inverse of a matrix. 5. Problems to find solution of system of linear equations. 6. Problems to find derivatives of simple functions related to commerce and social sciences. 7. Problems to find maxima of profit function, production, demand function and minima of cost function. 8. Problems to find simple and compound interest. 9. Problems based on annuity. 10. Formulation of real life commercial and social science problems (LPP) related to maximizing profits, minimizing costs, minimal usage of resources etc. and their solutions using graphical method. 11. Problems to solve LPP using simplex method.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory 15 • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➤ Practicum 5 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam:		End Term Examination: ➤ Theory 35 Written Examination ➤ Practicum 20 Lab record, viva-voce, written examination.
Part C-Learning Resources		
Recommended Books: 1. E.T. Dowling (2020). <i>Schaum outlines of Calculus for Business, Economics and the Social Sciences</i>. McGraw Hill. 2. S.C. Gupta and V.K. Kapoor (2014). <i>Fundamentals of Mathematical Statistics</i>. S. Chand & Sons, Delhi. 3. Seymour Lipschutz and Marc Lars Lipson (2013). <i>Linear Algebra</i>. (4th Edition) Schaum's Outline Series, McGraw-Hill. 4. D.C. Sancheti and V.K. Kapoor (2011). <i>Business Mathematics</i>. Sultan Chand and Sons. 5. Holden (2010). <i>Introductory Mathematics for Business and Economics</i>. Ane/pal Exclusive.		

6. E.T. Dowling (2009). *Schaum outlines of Mathematical methods for Business and Economics*. McGraw Hill.
7. E. Don and J. Lerner (2009). *Schaum's outline of Basic Business Mathematics* (2nd Edition). McGraw Hill.
8. L.N.Paul (2002). *Linear Programming: an introductory analysis*. Tata Mcgraw Hill. New Delhi.

MDC-3

Session: 2025-26			
Part A – Introduction			
Subject	Mathematics		
Semester	III		
Name of the Course	Applicable Mathematics		
Course Code	B25-MAT-303		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC		
Level of the course	200-299		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLOs):	After completing this course, the learner will be able to: 1. Gain knowledge about quadratic and cubic equations and methods to solve quadratic and cubic equations. Learn the methods to solve simultaneous linear equations in two and three variables. 2. Understand the concepts of probability, conditional probability and Binomial distribution. 3. Acquire cognitive and technical knowledge about a variety of methods of representation of statistical data and methods of measure of central tendency. Analyze the problem and apply the best measure of central tendency to draw inferences from the available data. 4. Understand the concept of correlation, correlation methods and conclude about the type of correlation for the available data. Comprehend the skills of curve fitting. 5. Attain a range of cognitive and technical skills related to various concepts of probability. Have technical and practical skills required for selecting and using suitable methods for data representation and measure of central tendency.		
CLO 5 is related to practical components of the course.			
	Theory	Practical	Total
Credits	2	1	3
Contact Hours	2	2	4
Internal Assessment Marks	15	5	20
End Term Examination Marks	35	20	55
Examination Time	3Hrs	3Hrs	
Max. Marks:75			

Part B-Contents of the Course		
<u>Instructions for Paper- Setter</u>		
Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 7 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.		
Unit	Topics	Contact Hours
I	Solution of simple quadratic and cubic equations, Solution of simultaneous linear equations upto three variables. Binomial Theorem for positive index and its simple applications.	8
II	Probability, Events, Exhaustive Events, Mutually Exclusive Events, Conditional Probability, Multiplication Theorem on Probability, Independent Events, Theorems of Total Probability, Binomial Distribution for positive index.	8
III	Presentation of data: Frequency distribution and cumulative frequency distribution, Diagrammatic and graphical presentation of data, Construction of bar, Pie diagrams, Histograms, Frequency polygon, Frequency curve and Ogives. Measures of central tendency: Arithmetic mean, Median, Mode, Geometric mean and Harmonic mean for ungrouped and grouped data. Measures of dispersion: Concept of dispersion, Mean deviation and its coefficient, Range, Variance and its coefficient, Standard deviation.	8
IV	Correlation: Concept and types of correlation, Methods of finding correlation: Scatter diagram, Karl Pearson's coefficients of correlation, Rank correlation. Linear regression: Principle of least square, Fitting of straight line, Two lines of regression, Regression coefficients.	8

Practical		
	The examiner will set 4 questions at the time of practical examination by taking course learning outcomes (CLOs) into consideration. The examinee will be required to solve 2 questions. The evaluation will be done on the basis of practical record, viva-voce and written examination. Problem Solving- Questions related to the practical applications based on following problems will be worked out and record of those will be maintained in the Practical Note Book: 1. Real life problems leading to quadratic equations. 2. Problem involving solution of simple cubic equations. 3. Formulation and solution of realistic problems to solve system of linear equations. 4. Problems based on Binomial theorem for positive index. 5. Problems based on conditional probability. 6. Problems based on theorems of total probability. 7. Problems based on Binomial distribution for positive index. 8. Problems to compute measures of central tendency. 9. Problems to calculate measures of dispersion. 10. Problem to calculate Karl Pearson's coefficient of correlation. 11. Problem to fit the straight line for the given data. 12. Problem to find lines of regression.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory 15 • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.: 4 • Mid-Term Exam: 7 ➤ Practicum 5 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam:		End Term Examination: ➤ Theory 35 Written Examination ➤ Practicum 20 Lab record, viva-voce, written examination.

Part C-Learning Resources

Recommended Books:

1. S.C. Gupta and V.K. Kapoor (2014). *Fundamentals of Mathematical Statistics*, S. Chand & Sons, Delhi.
2. R.V. Hogg, J. W. McKean and A. T. Craig (2013). *Introduction to Mathematical Statistics* (7th edition), Pearson Education.
3. J. V. Dyke, J. Rogers and H. Adams (2011). *Fundamentals of Mathematics*, Cengage Learning.
4. A.S. Tussy, R. D. Gustafson and D. Koenig (2010). *Basic Mathematics for College Students*. Brooks Cole.
5. G. Klambauer (1986). *Aspects of calculus*. Springer-Verlag.

Session: 2025-26	
Part A–Introduction	
Subject	Mathematics
Semester	III
Name of the Course	Differential Equations
Course Code	B25-MAT-304
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M
Level of the course	200-299
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class XII)
Course Learning Outcomes (CLOs):	After completing this course, the learner will be able to: 1. Gain knowledge of the basic concepts of ordinary differential equations and learn various techniques of finding exact solutions of certain solvable first order differential equations. 2. Have procedural knowledge and cognitive and technical skills of solving homogeneous and non-homogeneous second order linear ordinary differential equations with constant coefficients and with variable coefficients. 3. Gain knowledge of basic concepts of partial differential equations. To learn methods and techniques for solving linear PDEs of first order and to acquire technical skills for accomplishing assigned tasks relating to formulation and solution of PDEs in broad multi disciplinary contexts. 4. To understand compatible systems and to learn cognitive and technical skills required for selecting and using relevant Charpit method and Jacobi method. 5. To attain cognitive and technical skills required for selecting and using relevant methods and techniques to assess the appropriateness of approaches to solving problems associated with the differential equations. To attain technical skill of solving differential equations by using built in functions of MAXIMA software.
CLO 5 is related to the practical component.	

	Theory	Practical	Total
Credits	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Examination Marks	50	20	70
Examination Time	3 Hours	3 Hours	

Max. Marks:100

Part B-Contents of the Course

Instructions for Paper- Setter

Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topics	Contact Hours
I	Basic concepts and genesis of ordinary differential equations, Order and degree of a differential equation, Solutions of differential equations of first order and first degree, Exact differential equations, Integrating factor, First order higher degree equations solvable for x , y and p , Lagrange's equations, Clairaut's form and singular solutions.	12
II	Orthogonal trajectories of one-parameter families of curves in a plane. Solutions of linear ordinary differential equations with constant coefficients, linear non-homogeneous differential equations.	12
III	Linear differential equation of second order with variable coefficients. Method of reduction of order, method of undetermined coefficients, method of variation of parameters. Cauchy-Euler equation. Solution of simultaneous differential equations.	12
IV	Genesis of Partial differential equations (PDE), Concept of linear and non-linear PDEs. Complete solution, general solution and singular solution of a PDE. Linear PDE of first order. Lagrange's method for PDEs of the form: $P(x, y, z) p + Q(x, y, z) q = R(x, y, z)$, where $p = \partial z / \partial x$ and $q = \partial z / \partial y$. Compatible systems of first order equations. Charpit's method, Special types of first order PDEs, Jacobi's method.	12

Practical

The practical component of the course has two parts, Problem Solving and Practical's using MAXIMA software. The examiner will set 4 questions at the time of practical examination asking two questions from the part (A) and two questions from the part (B) by taking course learning outcomes (COs) into consideration. The examinee will be required to solve one problem from the part (A) and to execute one problem successfully from the part (B). Equal weightage will be given to both the parts. The evaluation will be done on the basis of practical record, viva-voce, write up and execution of the program.

(A) Problem Solving- Questions related to the following problems will be solved and record of those will be maintained in the Practical Notebook:

1. Problems solving for differential equations which are reducible to homogeneous.
2. Problems solving for differential equations which are Exact differential equations.
3. Problems solving for linear differential equations with constant coefficient.
4. Problems solving for linear differential equations with variable coefficient.
5. Problems solving for differential equations by method of variation of parameters.
6. Problems solving for differential equations by method of undetermined coefficients.
7. Problems solving for simultaneous differential equations.
8. Problems solving for different PDEs using Lagrange's method.
9. Problems solving for PDEs with Charpit's method and Jacobi's method.

(B) The following practicals will be done using MAXIMA software and record of those will be maintained in the practical note book:

1. Solutions of first and second order differential equations.
2. Plotting of family of solutions of differential equations of first, second and third order.
3. Solution of differential equations using method of variation of parameters.
4. Solution of differential equations with constant coefficients using MAXIMA.
5. Solution of differential equations with variable coefficients using MAXIMA.
6. Solution of partial differential equations using MAXIMA.
7. To find the solutions Linear differential equations of second order using built in functions of MAXIMA software.

	8. To find numerical solution of a first order ODE using plotdf built in function of MAXIMA. 9. To find exact solutions of first and second order ODEs using ode2 and ic1/ic2 built in functions of MAXIMA. 10. To find exact solutions of first and second order ODEs using desolve and atvalue built in functions of MAXIMA.	
➤ Suggested Evaluation Methods		
Internal Assessment: ➤ Theory 20 • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum 10 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam:	End Term Examination: ➤ Theory 50 Written Examination ➤ Practicum 20 Lab record, viva-voce, write up and execution of the program	
Part C-Learning Resources		
Recommended Books: 1. Erwin Kreyszig (2011). <i>Advanced Engineering Mathematics</i> (10th edition). J. Wiley & Sons. 2. B. Rai& D. P. Choudhury(2006). <i>Ordinary Differential Equations - An Introduction</i>. Narosa Publishing House Pvt. Ltd. New Delhi. 3. Shepley L. Ross (2014). <i>Differential Equations</i> (3rd edition). Wiley India Pvt. Ltd. 4. George F. Simmons (2017). <i>Differential Equations with Applications and Historical Notes</i> (3rd edition). CRC Press. Taylor & Francis. 5. Ian N. Sneddon (2006). <i>Elements of Partial Differential Equations</i>. Dover Publications		

Session: 2025-26	
Part A – Introduction	
Subject	Mathematics
Semester	VI
Name of the Course	Numerical Methods
Course Code	B25-MAT-607
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M
Level of the course	300-399
Pre-requisite for the course (if any)	Mathematics as a subject at level 4.5
Course Learning Outcomes (CLOs):	After completing this course, the learner will be able to: 1. Understand the different types of errors, learn techniques to obtain numerical solutions of algebraic and transcendental equations. 2. Have the knowledge and attain numerical skills to find solutions of system of linear equations by different methods. 3. Gain the knowledge to understand the concept of interpolation and extrapolation. Learn various numerical methods to find the value of function and their derivatives using interpolation concept. 4. Have the procedural knowledge and acquire the skills to apply numerical methods for evaluating definite integrals. Learn single step and multi-step methods to solve first order ordinary differential equations. 5. Attain cognitive and technical skills required to solve scientific problems by applying numerical techniques. Learn to write and execute program of numerical methods based on C language.
CLO 5 is related to the practical component of the course.	

	Theory	Practical	Total
Credits	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	20	10	30
End Term Examination Marks	50	20	70
Examination Time	3 Hours	3 Hours	

Max. Marks: 100

Part B- Contents of the Course

Instructions for Paper- Setter

Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topics	Contact Hours
I	Round-off error, Local and global truncation errors, convergence. Numerical methods for solving algebraic and transcendental equations: Bisection method, False position method, Fixed point iteration method, Newton-Raphson method and Secant method. Newton's iterative method for finding nth root of a number.	12
II	Numerical methods for solving simultaneous linear equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method), Crout's method, Iterative methods: Jacobi's method, Gauss-Seidal method.	12
III	Finite Differences operators and their relations. Interpolation with equal intervals: Gregory–Newton forward and backward difference interpolations. Interpolation with unequal intervals: Newton's divided difference formulae, Lagrange's Interpolation formulae. Central Differences: Gauss forward and Gauss backward interpolation formulae, Sterling formula, Bessel's formula. Piecewise linear interpolation, Cubic spline interpolation. Numerical Differentiation: First and second derivative of a function using interpolation formulae.	12

IV	Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one-third and three-eighth rule. Numerical solution of ordinary differential equations: Single step methods-Picard's method, Taylor's series method, Euler's method, Runge-Kutta Method. Multiple step methods: Predictor-corrector method, Modified Euler's method.	12
Practical		
	This course has programs, based on Programming in C, related to Numerical methods to solve mathematical problems. The examiner will set 4 programs at the time of practical examination by taking course learning outcomes (CLOs) into consideration. The examinee will be required to execute two programs. The evaluation will be done on the basis of practical record, viva-voce, write-up and execution of the program. Practicals: The following practicals will be done using the programming language C and record of those will be maintained in the practical Note Book: 1. To find roots of algebraic and transcendental equations using Bisection method. 2. To find roots of algebraic and transcendental equations using Newton Raphson method. 3. To find roots of algebraic and transcendental equations using RegulaFalsi method. 4. To find solution of system of equations using Gauss Elimination method. 5. To find solution of system of equations using Gauss Seidal method. 6. To find approximate value of a function by Newton Forward Interpolation formula. 7. To find approximate value of a function by Newton Backward Interpolation formula. 8. To find approximate value of a function using Lagrange's Interpolation formula. 9. To find first and second order derivatives using interpolation formulas.	30

	10. To evaluate a definite integral using Trapezoidal Rule. 11. To evaluate a definite integral using Simpson 1/3 rule. 12. To evaluate a definite integral using Simpson 3/8 rule. 13. To solve an ordinary differential equation using Euler's method. 14. To find solution of an ordinary differential equation using modified Euler's method. 15. To solve an ordinary differential equation using Runge-Kutta second order and fourth order methods.	

Suggested Evaluation Methods

Internal Assessment: ➤ Theory 20 • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum 10 • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam:	End Term Examination: ➤ Theory 50 Written Examination ➤ Practicum 20 Lab record, viva-voce, write-up and execution of programs

Part C-Learning Resources

Recommended Books:

1. S.D. Conte and C. de Boor (2018). *Elementary Numerical Analysis: An algorithmic Approach*. SIAM.
2. A. Gupta and S.C. Bose (2012). *Introduction to Numerical Analysis* (3rd Edition). Academic Publishers.
3. M.K. Jain, S. R. K. Iyengar and R. K. Jain (2012). *Numerical Methods for Scientific and Engineering Computation* (6th Edition). New Age International Publishers.
4. B. Bradie (2007). *A Friendly Introduction to Numerical Analysis*. Pearson India.
5. C. F. Gerald and P. O. Wheatley (2007). *Applied Numerical Analysis* (7th Edition). Pearson Education India.
6. F.B. Hildebrand (2003). *Introduction to Numerical Analysis* (2nd edition). Dover Publication Inc.
7. R. J. Schilling and S. L. Harris (1999). *Applied Numerical Methods for Engineers using MATLAB and C*. S. Chand (G/L) & Company Ltd.

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

("A++" Grade, NAAC Accredited)



Syllabus for

Post Graduate Programme

M.Sc. Computer Science (Software)

as per NEP-2020

Curriculum and Credit Framework for Postgraduate Programme

CBCS-LOCF

(3rd and 4th Semesters)

With effect from the session 2025-26

**DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
FACULTY OF SCIENCES**

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119

Part A - Introduction

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	3 rd		
Name of the Course	Mobile Applications Development		
Course Code	M24-CSE-301		
Course Type	CC-9		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The course aims to provide a comprehensive understanding of mobile application development, focusing on the Android platform. It will cover fundamental concepts, user interface design, data persistence, and advanced features like location-based services and graphics, equipping students with the skills to build robust and interactive mobile applications.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will gain a foundational understanding of mobile application concepts and the Android ecosystem, including its architecture and development environment. CLO 2: Students will learn to design and implement interactive user interfaces using various UI components and handle user events effectively, along with understanding how to use Intents for inter-component communication and deploy applications. CLO 3: Students will be able to implement modular and multi-screen user interfaces using Fragments and integrate location-based services and multimedia functionalities into their applications. CLO 4: Students will be able to incorporate graphics and manage data persistence using file storage and SQLite databases, including interacting with Content Providers.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction: Mobile Applications, Characteristics and Benefits, Application Models, Mobile devices Profiles. Basics of Android, Importance and scope, Android Versions, Features of Android, Android Architecture, Android Stack, Android Applications Structure, Android Emulator, Android SDK, Overview of Android Studio, Android and File Structure, Android Virtual Device Manager, DDMS, LogCat, Understanding Activities. Android User Interface: Measurements – Device and pixel density independent measuring units. Layouts – Linear, Relative, Grid and Table Layouts.	15

II	User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers, List View, Spinner View. Event Handling – Handling clicks or changes of various UI components. Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Services- Callbacks and Override in application, Application Signing, API keys for Google Maps, Publishing application to the Android Market.	15
III	Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities Location and Mapping: location based services, Mapping, Google Maps activity, Working with MapView and MapActivity; Playing and Recording of Audio and Video in application; Sensors and Near Field Communication; Native libraries and headers, Building client server applications.	15
IV	Using Graphics: Canvas Drawing, Shadows, and Gradients. Persisting Data to files: Saving to Internal Storage, Saving to External Storage Introduction to SQLite database: creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books		
1) Zigurd Mednieks, Laird Dornin, G,Blake Meike and Masumi Nakamura “Programming Android”, O’Reilly Publications.		
2) Wei-Meng Lee, “Beginning Android Application Development”, Wiley India Ltd.		
3) James C.S. “Android Application development for Java Programmer”, CENGAGE Learning.		
4) Pradeep Kothari, “Android Application Development: Black Book”, Wiley India Ltd.		
5) Gargenta M., Nakamura M., “Learning Android”, O’Reilly Publications.		

Part A - Introduction

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	3 rd		
Name of the Course	Machine Learning using Python		
Course Code	M24-CSE-302		
Course Type	CC-10		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The course aims to equip students with a strong foundation in Python programming, covering core data structures, file handling, and error management. It will then delve into essential Python libraries for data manipulation, analysis, and visualization, culminating in an introduction to various machine learning algorithms and their theoretical underpinnings.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Students will master fundamental Python data structures like strings, lists, tuples, and dictionaries, along with file operations and exception handling. CLO-2: Students will gain proficiency in using key Python libraries (Pandas, NumPy, Scikit-learn, Matplotlib) for data manipulation, analysis, visualization, and implementing various machine learning algorithms. CLO-3: Students will develop an understanding of core machine learning concepts, including problem definition, system design, and algorithms like Concept Learning and Decision Trees. CLO-4: Students will comprehend advanced machine learning topics such as Bayesian learning, computational learning theory, and instance-based learning algorithms.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Python Programming: Strings - String slices, immutability, string functions and methods, string module; Lists, Tuples, Dictionaries: Lists - Lists as arrays Traversing a List, list operations, list slices, list methods, Map, Filter and Reduce, list loop, mutability, aliasing, cloning lists, list parameters; Dictionaries - operations and methods; advanced list processing - list comprehension; Tuples - tuple assignment, tuple as return value. Files and Modules: Files and exception - text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules.	15

II	Packages in Python: PANDAS, NUMPY, SCIKIT-LEARN, MATPLOTLIB. NumPy - Introduction, Narray Object ,Data types, Array Attributes, Array Creation Routines, Indexing & Slicing, Advanced Indexing, Broadcasting, Iterating Over Array, Array Manipulation, Binary Operators, String Functions, Mathematical Functions, Mathematical Functions, Arithmetic Operations, Statistical Functions, Linear Algebra, Matplotlib(Used for data visualization), Histogram Using Matplotlib. Pandas: Performing data cleaning and analysis, Loading data with Pandas (data manipulation and analysis), Working with and Saving data with Pandas. Using Scikit-Learn for Linear Regression, Logistic Regression, Decision Tree, Naive Bayes, KNN, SVN, k Mean Clustering, Random Forest.	15
III	Introduction to Machine Learning – Well defined learning problems, Designing a Learning System, Issues in Machine Learning. The Concept Learning Task - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias Decision Tree Learning - Decision tree learning algorithm-Inductive bias- Issues in Decision tree learning.	15
IV	Bayesian Learning: Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. Computational Learning Theory: Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning. Instance-Based Learning – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books		
1) Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited.		
2) Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press.		
3) John V Guttag, Introduction to Computation and Programming Using Python, MIT Press.		
4) Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Interdisciplinary Approach, Pearson India Education Services Pvt. Ltd.		
5) Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press.		
6) Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Updated for Python 3 Shroff/O.,Reilly Publishers.		
7) Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press.		
8) Python Machine Learning, Sebastian Raschka.		

Part A - Introduction

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	3 rd		
Name of the Course	Data Mining and Analytics using R		
Course Code	M24-CSE-303		
Course Type	DEC-1		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The course aims to provide a comprehensive understanding of data warehousing and data mining concepts, techniques, and their practical application. It will cover data preprocessing, various data mining algorithms, and data analytics methodologies, concluding with an introduction to R programming for data analysis and mining.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Students will gain a foundational understanding of data warehousing concepts, architecture, and the knowledge discovery process, including various data preprocessing techniques and data visualization. CLO-2: Students will learn about key data mining techniques such as clustering, decision trees, and association rule mining, along with their underlying principles and performance considerations. CLO-3: Students will develop an understanding of data analytics methodologies, including qualitative and quantitative data analysis, data strategies, and exploratory data analysis techniques, as well as working with external data sources. CLO-4: Students will acquire practical skills in R programming for data manipulation, exploration, and the application of data mining algorithms like decision trees and clustering.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Data Warehouse: A Brief History, Characteristics, Architecture for a Data Warehouse. Fact and Dimension Tables, Data Mining: Introduction, Motivation, Importance, Knowledge Discovery Process, Data Mining Functionalities, Interesting Patterns, Classification of Data Mining Systems, Major issues, Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization, Data Visualization, Outliers.	15
II	Data Mining Techniques: Statistical Perspective on Data Mining, Similarity Measures, Clustering- Requirement for Cluster Analysis, Clustering Methods, Decision Tree- Decision Tree Induction, Attribute Selection Measures, Tree Pruning. Association Rule Mining: Frequent Item-set Mining using Apriori Algorithm, Nearest Neighbour Classification: Performance of Nearest Neighbour Classifiers.	15
III	Data Analytics: Ways of Thinking About Data, Qualitative and Quantitative Data, And Data Strategies, Conceptualizing Data Analysis as a Process, Managing Data Analysis Process, Exploratory Data Analysis: Exploring a New Dataset, Summarizing Numeric Data, Anomalies in Numeric Data, Visualizing Relations between Variables. Working with External Data: Manual Data Entry, CSV Files, Other Files, Merging Data from Different Sources.	15

IV	R Programming: Advantages of R over other Programming Languages, Working with Directories and Data Types in R, Control Statements, Loops, Data Manipulation and integration in R, Exploring Data in R: Data Frames, R Functions for Data in Data Frame, Loading Data Frames, Decision Tree packages in R, Issues in Decision Tree Learning, Hierarchical and K-means Clustering functions in R, Mining Algorithm interfaces in R.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books		
1) J Hanes, M. Kamber, Data Mining Concepts and Techniques, Elsevier India.		
2) Ronald K. Pearson, Exploratory Data Analysis Using R, CRC Press.		
3) S. Acharya, Data Analytics Using R, McGraw Hill Education (India) Private Limited.		
4) G.S. Linoff, M.J.A. Berry, Data Mining Techniques, Wiley India Pvt. Ltd.		
5) Berson, S.J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw-Hill.		
6) J.Horbulyk, Data Integration Best Practices, elastic.io		
7) Jared P. Lander, R For Everyone, Perason India Education Services Pvt. Ltd.		

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	3 rd		
Name of the Course	Linux Administration		
Course Code	M24-CSE-304		
Course Type	DEC-1		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The course aims to provide a fundamental understanding of the Linux operating system, covering its architecture, file system, and essential command-line operations. It will then delve into managing users, groups, and permissions, followed by comprehensive coverage of process and package management. Finally, the course will equip students with knowledge of Linux networking, security configurations, and backup strategies.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Students will grasp the core architecture and file system hierarchy of Linux, enabling them to effectively navigate and manipulate files and directories using basic shell commands, and manage disk partitions and file systems. CLO-4: Students will be able to competently manage users and groups, understand and apply file permissions and ownership, including special permissions, and configure user environments while utilizing disk quotas and log file management. CLO-4: Students will master the concepts of process and job scheduling, manage system services, and effectively utilize various package management tools for software installation and maintenance, along with employing system monitoring utilities. CLO-4: Students will acquire the skills to configure Linux networking interfaces, implement firewall rules for security, set up and use SSH for secure remote access and file transfer, and understand basic backup strategies.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Linux and File System: Linux architecture and kernel overview; Boot process and run levels; Basic shell commands (ls, cp, mv, rm, cat, more, less, etc.); File system hierarchy (/ , /home, /etc, /var, /tmp, etc.); File types and permissions; Creating and managing files and directories; Disk partitions; File systems (ext3, ext4, xfs); Mounting and unmounting file systems	15
II	User and Group Management, Permissions: Managing users and groups (useradd, usermod, passwd, groupadd, etc.); Understanding /etc/passwd, /etc/shadow, /etc/group; File permissions and ownership (chmod, chown, chgrp); Special permissions (SUID, SGID, Sticky Bit); User environment configuration files; Switching users (su, sudo); Disk quotas; Log files and log management (/var/log/)	15

III	Process and Package Management: Understanding processes (ps, top, nice, renice, kill, killall); Scheduling jobs (cron, at, anacron); System services (systemd, service, chkconfig); Package management using apt and dpkg (Debian-based systems); Package management using yum, dnf and rpm (Red Hat-based systems); Compiling and installing software from source; System monitoring tools (htop, iotop, vmstat, netstat, ss)	15
IV	Networking, Security and Backup: Linux networking basics (IP, ifconfig/ip, ping, netstat, ss); Configuring network interfaces and hostnames; Network configuration files; Firewall configuration using iptables and firewalld; SSH server and client configuration; File transfer using scp, rsync, sftp;	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory		30
• Class Participation:		5
• Seminar/presentation/assignment/quiz/class test etc.:		10
• Mid-Term Exam:		15
Written Examination		
Part C-Learning Resources		
Reference Books		
1) UNIX and Linux System Administration Handbook by Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley Dan Mackin – Pearson Education		
2) Linux Administration: A Beginner’s Guide by Wale Soyinka – McGraw-Hill Education		
3) Linux Command Line and Shell Scripting Bible by Richard Blum and Christine Bresnahan – Wiley		
4) Red Hat RHCSA/RHCE 8 Cert Guide: Red Hat Enterprise Linux 8 (EX200 and EX294) by Sander van Vugt – Pearson IT Certification		
5) How Linux Works: What Every Superuser Should Know by Brian Ward – No Starch Press		

Part A - Introduction

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	3 rd		
Name of the Course	Theory of Computation		
Course Code	M24-CSE-306		
Course Type	DEC-2		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The course aims to provide a rigorous theoretical foundation in the principles of computation, starting with finite automata and formal languages, progressing through pushdown automata and Turing machines, and culminating in an exploration of decidability, computability, and computational complexity.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Students will gain a deep understanding of finite state machines, including their design, equivalence, and the properties of regular languages and grammars, along with their limitations. CLO-2: Students will learn about formal grammars, specifically context-free grammars, their construction, properties, and simplification, alongside the introduction and design of Pushdown Automata and their relationship to CFGs. CLO-3: Students will comprehend the concept of Turing Machines as a general model of computation, exploring their capabilities as language acceptors and function computers, and understanding the nature of recursive and recursively-enumerable languages. CLO-4: Students will delve into advanced topics such as the Halting Problem, decidability of language properties, and the fundamentals of computable functions and computational complexity, including tractable and intractable problems.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Finite State Machines: Finite Automata, Designing of DFA and NFA, NFA with E-Transitions, Equivalence of DFA and NFA with proof, Regular Expressions and Regular languages, Laws of Regular Expressions, Kleene's Theorem 1 and 2, Properties and Limitations of FSM FSM with Output: Moore and Mealy Machines, Arden's Theorem with proof, Closure Properties of Regular Sets, Pumping Lemma for Regular Grammars, Minimization of FA.	15
II	Formal Grammars: Definition, Construction of Regular & Context Free Grammar, Derivation, Parse Trees, Ambiguity, Removal of Ambiguity, Simplification of Context Free Grammar, CNF and GNF, Closure properties of CFL, Pumping Lemma for CFL. Pushdown Automaton: Introduction, Types of PDA, Designing of PDA's, Conversion from PDA to CFG and vice-versa.	15

III	Linear Bounded Automata (LBA), Turing Machines (TM), General Model of Computation, TM as Language Acceptors, TM as Computing Partial Functions, Combining TM, Multi-Tape TM, Restricted and Universal TM; TM and Computers. Recursive and recursively-enumerable languages and Properties, More General Grammars	15
IV	Reductions and the Halting Problem, Post's correspondence problem, Rice's theorem, Cook's Theorem, decidability of membership, emptiness and equivalence problems of languages, Decidable languages and problems, Diagonalization method. Computable Functions: Primitive recursive functions, Godel Numbering, Tractable and Intractable problems, Computable Complexity.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books		
1) John C. Martin, Introduction to Languages and the Theory of Computation, McGraw Hill.		
2) Peter Linz, An introduction to formal language & automata, Jones & Bartlett publications.		
3) Hopcroft J. E. & Ullman J. D, Formal languages and their relation to Automata, Pearson Education.		
4) Lewis, H.R. & Papadimitriou, C. H., Elements of the theory of computation, PHI Learning.		
5) Michael Sipser, Introduction to the Theory of Computation, Cengage Learning.		

Part A - Introduction

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	3 rd		
Name of the Course	Principles of programming Languages		
Course Code	M24-CSE-307		
Course Type	DEC-2		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The course aims to provide a comprehensive understanding of programming language design and implementation. It will cover fundamental concepts such as language syntax and semantics, formal language theory, data types, object-oriented principles, control flow mechanisms, and various advanced topics including concurrency and distributed processing.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Students will gain a foundational understanding of programming language history, design principles, translation processes, and formal syntax description using BNF grammars and parsing techniques. CLO-2: Students will learn about formal languages and automata theory, including the Chomsky hierarchy, and delve into language semantics through attribute grammars and denotational semantics, alongside a detailed study of data objects and types. CLO-3: Students will acquire a deep understanding of object-oriented programming concepts such as inheritance, polymorphism, and abstract data types, and explore various sequence control mechanisms within programs and subprograms. CLO-4: Students will be introduced to advanced and miscellaneous topics in programming languages, including parameter passing, scoping rules, storage management, exception handling, and an overview of parallel, network, and scripting paradigms.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Preliminaries: History, Impact of Programming Paradigms, Role of Programming Languages, Good Language, Effects of Programming Environment, Translators and virtual architectures, Binding and Binding time, Language Syntax, Analysis of Program, Synthesis of Object program, Formal translation models: BNF Grammars, General parsing, Language translation, Recursive descent parsing.	15
II	Formal languages and automata: The Chomsky hierarchy of formal languages, regular grammars, Regular expressions, Finite State Automata, Context-free grammars, Pushdown automata, Ambiguous grammars. Language Semantics: Attribute grammars, Denotational semantics, Program verification and validation, Data objects, variables, constants, data types, declaration, type checking, type casting, type promotion, Enumerators, Composite data types.	15

III	Object Orientated concepts: Structured data types, Abstract data types, Information hiding, Subprogram concepts, Good program design, Type definitions, Type equivalence, Inheritance, Derived classes, Abstract classes, Polymorphism, Inheritance and software reuse. Sequence control: Implicit and explicit sequence control, Sequence control within arithmetic expressions, sequence control between statements, sequencing with non-arithmetic expressions, Subprogram Sequence control.	15
IV	Miscellaneous topics: Parameter passing techniques, Static & Dynamic Scoping, Storage of variables, Static storage, Heap Storage management, Distributed Processing, Exceptions and Exception handlers, Co-routines, Scheduled subprograms, Parallel programming, Processor design, Hardware and Software architectures, Network Programming, Evolution of scripting languages, Applets, XML.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books		
1) Pratt T.W., Zelkowitz M.V., Gopal T.V., Programming Languages Design and Implementation, Pearson Education.		
2) Sebesta W. Robert, Concepts of Programming Languages, Pearson Education.		
3) Appleby Doris & Vande Kopple J. Julius, Programming Languages-Paradigm and practice”, Tata McGraw Hill.		
4) Sethi Ravi, Programming Languages: Concepts & Constructs, Pearson Education		
5) Scott M., Programming Language Pragmatics, Elsevier India.		

PC-5 PRACTICAL-5

With effect from Session: 2024-25

Part A - Introduction

With effect from Session: 2024-25			
Part A - Introduction			
Name of the Programme	M. Sc. Computer Science (Software)		
Semester	3 rd		
Name of the Course	Practical-5		
Course Code	M24-CSE-309		
Course Type	PC-5		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course objectives	This practical course aims to provide students with hands-on experience in developing Android applications. Students will learn to set up their development environment, design various user interfaces using different layout managers and UI components, handle user interactions, and implement inter-component communication using Intents. Furthermore, they will gain practical skills in incorporating advanced features such as background services, fragments, Google Maps integration, multimedia playback, and data persistence using file I/O and SQLite databases, including interaction with Content Providers. This course aims to equip students with practical skills in both Linux system administration and data analytics using R. Students will learn to navigate and manage Linux file systems using essential shell commands, administer users and groups, configure file and directory permissions, manage processes, and schedule tasks using tools such as cron and at.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Design and implement user interfaces in Android using various layout managers to create interactive components such as login forms, calculators, radio buttons, and dropdowns. CLO-2: Demonstrate the ability to handle user interaction, activity transitions, fragment management, and basic data storage and retrieval using event listeners, intents, fragments, and SQLite in Android applications. CLO-3: Apply data warehousing and preprocessing techniques in R, including schema design, handling missing values, normalization, discretization, and data integration, to prepare structured datasets for analysis. CLO-4: Use R packages and functions to implement and interpret data mining and analysis techniques such as decision trees, clustering, K-NN classification, association rule mining, and exploratory data visualization. OR CLO-3: Operate essential Linux commands to navigate the file system, manage files and directories, and explore system configuration, boot status, and kernel-level information. CLO-4: Administer users, groups, permissions, and scheduled tasks while effectively managing system processes, access control mechanisms, and system monitoring in a Linux environment.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours	
Part B- Contents of the Course			
Practicals			Contact Hours
Practical course will consist of two components Part-A and Part-B. The examiner will set 5 questions at the time of practical examination asking 2 questions from the Part-A and 3 questions from the Part-B by taking course learning outcomes (CLO) into consideration. The examinee will be required to solve one problem from the Part-A and to write and execute 2 programs from the Part-B.			120

Part-A

- 1) Design a simple login screen using `LinearLayout`. Include `EditText` for username and password, and two `Buttons` for "Login" and "Cancel." Experiment with `android:orientation` (vertical/horizontal) and `android:layout_weight` to distribute space.
- 2) Design a basic calculator interface using `GridLayout`. Include `Buttons` for numbers (0-9) and basic operations (+, -, *, /). Focus on layout arrangement, not functionality.
- 3) Create an application with a `Button`. When the button is clicked, change the text of a `TextView` to "Button Clicked!". Implement both an `OnClickListener` and a method in the XML layout for handling the click.
- 4) Design a layout with a `RadioGroup` containing three `RadioButtons` representing different programming languages (e.g., Java, Kotlin, Python). Display a `Toast` message indicating the selected language when a radio button is chosen.
- 5) Implement a `Spinner` (dropdown list) with a list of countries. When a country is selected, display the selected country in a `TextView`.
- 6) Create two activities. From the main activity, use an explicit `Intent` to launch the second activity when a button is clicked. Pass a simple string message from the first to the second activity.
- 7) Create an activity that hosts two `Fragments`. Initially display one fragment. Add a button that, when clicked, replaces the currently displayed fragment with the other fragment using `FragmentManager`.
- 8) Create an Android application with a `Button` to insert a record into an SQLite database. Add another button to retrieve and display all records from the database in a `TextView` or `ListView`.

30

Part-B

- 1) Design and document a star schema, then simulate fact and dimension tables in R using `data.frame()`.
- 2) Perform data preprocessing in R: handle missing values, normalize data, and discretize using `cut()` or `scale()`.
- 3) Use the `arules` package to apply the Apriori algorithm on transaction data and generate association rules.
- 4) Build a decision tree using the `rpart` package, visualize it with `rpart.plot`, and interpret the model.
- 5) Apply K-means and hierarchical clustering using `kmeans()` and `hclust()` on a multivariate dataset, and plot the results.
- 6) Perform EDA using `summary()`, `str()`, `hist()`, and `ggplot2` to explore patterns and outliers.
- 7) Manipulate data frames using `dplyr` functions like `filter()`, `select()`, `mutate()`, and `arrange()`.
- 8) Implement K-NN classification using the `class` package and evaluate performance with a confusion matrix.
- 9) Read and merge datasets from CSV/Excel using `read.csv()` or `readxl`, then merge using `merge()` or `dplyr::left_join()`.
- 10) Detect and visualize outliers with `boxplot()`, `ggplot2`, and statistical functions like `scale()` or `IQR()`.

OR

- 1) Use `ls`, `cd`, `pwd`, `cat`, `cp`, `mv`, `rm`, `mkdir`, and `rmdir` to navigate and manipulate files across directories like `/home`, `/etc`, and `/tmp`.
- 2) Run commands like `uname -a`, `dmesg`, `runlevel`, and `systemctl` to explore the Linux kernel, boot process, and current run level.
- 3) Create a directory structure, assign read/write/execute permissions using `chmod`, and change ownership using `chown` and `chgrp`.
- 4) Add users with `useradd`, modify them using `usermod`, create groups with `groupadd`, and verify entries in `/etc/passwd`, `/etc/shadow`, and `/etc/group`.
- 5) Apply and test SUID, SGID, and Sticky Bit on executable files and shared directories to control access behavior.
- 6) Use `ps`, `top`, `htop`, `kill`, `nice`, and `renice` to monitor system processes, adjust priorities, and terminate specific jobs.
- 7) Schedule recurring tasks using `crontab -e` and one-time tasks using `at` and `anacron`; verify execution logs in `/var/log`.

90
(Lab hours include instructions for writing programs and demonstration by a teacher and for running the programs on computer by students.)

Suggested Evaluation Methods

Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the programs	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Examination:	15		

Part C-Learning Resources

Recommended Books:

- 1) Zigurd Mednieks, Laird Dornin, G,Blake Meike and Masumi Nakamura “Programming Android”, O’Reilly Publications.
- 2) Wei-Meng Lee, “Beginning Android Application Development”, Wiley India Ltd.
- 3) James C.S. “Android Application development for Java Programmer”, CENGAGE Learning.
- 4) Pradeep Kothari, “Android Application Development: Black Book”, Wiley India Ltd.
- 5) Gargenta M., Nakamura M., “Learning Android”, O’Reilly Publications.

PC-6 PRACTICAL-6

With effect from Session: 2024-25

Part A - Introduction

With effect from Session: 2024-25			
Part A - Introduction			
Name of the Programme	M. Sc. Computer Science (Software)		
Semester	3 rd		
Name of the Course	Practical-6		
Course Code	M24-CSE-310		
Course Type	PC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course objectives	This practical course aims to provide students with hands-on proficiency in core Python programming concepts, including string manipulation, list and dictionary operations, file handling, and exception management. Students will gain practical experience in leveraging powerful Python libraries such as NumPy for numerical computing, Pandas for data manipulation and analysis, and Matplotlib for data visualization. Furthermore, the course will equip students with the ability to implement and evaluate various machine learning algorithms using Scikit-Learn for tasks including regression, classification, and clustering.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Students will be able to perform advanced string manipulations, effectively utilize lists, tuples, and dictionaries for data organization and processing, and manage file input/output with robust exception handling. CLO-2: Students will be proficient in writing Python scripts that interact with command-line arguments, create and utilize custom modules, and perform efficient numerical operations, array manipulations, and statistical computations using NumPy. CLO-3: Students will be able to load, clean, analyze, and save data using Pandas DataFrames, and create informative data visualizations including line plots, histograms, and scatter plots using Matplotlib. CLO-4: Students will gain practical experience in implementing and evaluating a range of supervised and unsupervised machine learning algorithms, including linear and logistic regression, decision trees, KNN, Naïve Bayes, SVM, K-Means clustering, and Random Forest, using the Scikit-learn library.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours	
Part B- Contents of the Course			
Practicals			Contact Hours
Practical course will consist of two components Part-A and Part-B. The examiner will set 5 questions at the time of practical examination asking 2 questions from the Part-A and 3 questions from the Part-B by taking course learning outcomes (CLO) into consideration. The examinee will be required to solve one problem from the Part-A and to write and execute 2 programs from the Part-B.			120
Part-A			
1) Write a Python program to extract substrings, reverse strings, and demonstrate string immutability using slicing and string methods. 2) Use Python’s <code>string</code> module to perform operations like removing punctuation, checking character types, and converting case formats. 3) Create a list of integers, perform operations like append, insert, delete, slice, and use list comprehensions to generate a list of squares and even numbers. 4) Implement basic array-like operations using lists and demonstrate the difference between aliasing and cloning lists.			

5) Use <code>map()</code> , <code>filter()</code> , and <code>reduce()</code> to process a list of numbers (e.g., square, filter primes, calculate product of all elements).	30																
6) Write a program that uses dictionaries to count character frequencies in a string and update values dynamically.																	
7) Demonstrate tuple assignment, packing and unpacking, and use a tuple as a return value from a function.																	
8) Write a program to read a text file, count word occurrences, and write the output to a new file using the <code>with</code> statement.																	
Part-B 9) Create a Python script that takes input from command line arguments and prints formatted results using <code>%</code> and <code>format()</code> methods.	90 (Lab hours include instructions for writing programs and demonstration by a teacher and for running the programs on computer by students.)																
10) Create a calculator program that gracefully handles exceptions such as division by zero and invalid input types using <code>try-except</code> blocks.																	
11) Create a custom module with mathematical functions and import it into another Python file for computation.																	
12) Create a NumPy ndarray and perform slicing, reshaping, broadcasting, and mathematical operations.																	
13) Use NumPy to compute mean, median, standard deviation, and solve a system of linear equations.																	
14) Generate line plots, histograms, and bar charts using <code>matplotlib.pyplot</code> for a given dataset.																	
15) Load a CSV dataset into a Pandas DataFrame, perform missing data handling, filtering, sorting, and summary statistics.																	
16) Modify and analyze data from a CSV file and save the cleaned and processed dataset into a new file.																	
17) Use Scikit-Learn to implement linear regression on a dataset and logistic regression on a binary classification dataset.																	
18) Implement Decision Tree, KNN, Naïve Bayes, and SVM classifiers using Scikit-Learn on a suitable dataset and evaluate performance using accuracy, precision, and recall.																	
19) Apply K-Means clustering on a synthetic dataset and visualize the clusters using <code>matplotlib</code> .																	
Suggested Evaluation Methods																	
<table><tr><td colspan="2">Internal Assessment: 30</td><td colspan="2">End Term Examination: 70</td></tr><tr><td>➤ Practicum</td><td>30</td><td>➤ Practicum</td><td>70</td></tr><tr><td>• Class Participation:</td><td>5</td><td colspan="2" rowspan="3">Lab record, Viva-Voce, write-up and execution of the programs</td></tr><tr><td>• Seminar/Demonstration/Viva-voce/Lab records etc.:</td><td>10</td></tr><tr><td>• Mid-Term Examination:</td><td>15</td></tr></table>		Internal Assessment: 30		End Term Examination: 70		➤ Practicum	30	➤ Practicum	70	• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the programs		• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	• Mid-Term Examination:	15
Internal Assessment: 30		End Term Examination: 70															
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• Seminar/Demonstration/Viva-voce/Lab records etc.:	10																
• Mid-Term Examination:	15																
Part C-Learning Resources																	
Recommended Books:																	
1) Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited.																	
2) Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press.																	
3) John V Guttag, Introduction to Computation and Programming Using Python, MIT Press.																	
4) Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd.																	
5) Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press.																	
6) Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Updated for Python 3, Shroff/O.,Reilly Publishers.																	
7) Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press.																	
8) Raschka, S., & Mirjalili, V. (2017). Python Machine Learning (2nd ed.). Packt Publishing.																	

Part A - Introduction

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	3 rd		
Name of the Course	Python Programming		
Course Code	M24-OEC-307		
Course Type	OEC		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course introduces the core concepts of Python programming to help students develop logical problem-solving skills using an easy-to-learn high-level language. Students will learn Python syntax, control structures, data types, functions, modular programming, and error handling. The course prepares students to write well-structured programs suitable for automation, academic research, and general-purpose computing tasks.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-I: Students will be able to construct Python programs using variables, expressions, and control flow structures. CLO-II: Students will be able to manipulate and process data using Python's built-in data structures such as strings, lists, tuples, and dictionaries. CLO-III: Students will be able to design modular Python programs using functions and implement recursive solutions CLO-IV: Students will be able to reuse code through modules and handle runtime exceptions effectively.		
Credits	Theory	Tutorial	Total
	2		2
Teaching Hours per week	2		2
Internal Assessment Marks	15		15
End Term Exam Marks	35		35
Max. Marks	50		50
Examination Time	3		3

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Python Programming: History and features of Python; Installing Python and working with IDEs; Python syntax and indentation; Variables and data types; Type conversion; Input and output functions; Arithmetic, relational, logical and assignment operators; Conditional statements – if, if-else, if-elif-else; Looping structures – for loop, while loop; Loop control statements – break, continue, pass	15
II	Strings and Lists: String creation and indexing; String operations and built-in methods; String slicing and formatting; List creation, indexing, updating and deletion; List operations and methods; Nested lists; Iterating through strings and lists; List comprehensions	15
III	Tuples, Sets and Dictionaries: Tuples – creation, indexing and immutability; Tuple operations; Set creation and operations; Set methods and membership testing; Dictionary creation and access; Dictionary methods – update, pop, keys, values, items; Iterating through tuples, sets and dictionaries	15
IV	Functions: Defining and calling functions; Function arguments – positional, keyword, default, variable-length; Return values and scope of variables; Recursive functions; Lambda functions.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 15		End Term Examination: 35
➤ Theory	15	➤ Theory: 35
➤ Class Participation:	4	Written Examination

➤ Seminar/presentation/assignment/quiz/class test etc.:	4
➤ Mid-Term Exam:	7
Part C-Learning Resources	
Reference Books	
1) Learning Python by Mark Lutz – O'Reilly Media 2) Python Programming: An Introduction to Computer Science by John Zelle – Franklin, Beedle & Associates 3) Python Crash Course by Eric Matthes – No Starch Press 4) Think Python: How to Think Like a Computer Scientist by Allen B. Downey – O'Reilly Media 5) Automate the Boring Stuff with Python by Al Sweigart – No Starch Press	

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Object Oriented Analysis and Design using UML		
Course Code	M24-CSE-401		
Course Type	DEC-3		
Level of the course (As per Annexure-I	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The course aims to provide a comprehensive understanding of the Unified Modeling Language (UML) and its application in software engineering. It will cover various UML diagrams for structural and behavioral modeling, as well as essential concepts in requirement engineering and system design.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1 Understands basics of modelling and UML and applying usecase modeling for requirements elicitation CLO-2 Understand and apply concepts of class modeling and advanced structural modeling through UML diagrams. CLO-3 Understand and apply behavioural modeling through state diagram, sequence diagram, activity diagram to represent software systems. CLO-4 Have a working ability and grasping attitude to analyse and design software systems based on object-oriented thinking using UML.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to UML: Principles of Modeling, Conceptual Model of UML - Things, Relationships, Diagrams; Mechanisms in The UML – Specifications, Adornments, Common Divisions, Extensibility Mechanisms. Usecase Modeling: Identifying Use Cases & Actors, Relationships - between Actors, between Use Cases and between Actor and Use Case, Elements of Use Case Diagram, Constructing Use Case Diagram. Requirement Engineering: Gathering and Documenting Requirements, Functional Vs. Non-Functional Requirements, Requirement Validation and Verification.	15
II	Structural Modeling with UML: Class Modeling - Generalization & Inheritance, Association, Multiplicity, Sets, Bags & Sequences, Role Names, Qualified Association, Aggregation, Composition, Association Attributes, Association Classes, Abstract Class, Metadata, Reification, Elements of Class Diagrams, Constructing Class Diagrams. Advanced Structural Modeling with UML: Object Diagrams - Instances and Links; Package Diagrams - Organizing Classes, Components Diagram, Deployment Diagram.	15

III	Behavioral Modeling with UML: State Modeling - Events, States, Transitions & Conditions, Activity Effects, Do-Activities, Entry & Exit Activities, Completion Transitions, Elements of State Diagrams, Nested State Diagrams, Concurrency, Constructing State Diagrams. Sequence Diagram: Lifelines, Messages, and Activations, Constructing Sequence Diagram and Communication Diagram Activity Diagram: Actions, Control Flows, and Object Flows, Swim Lanes, Constructing Activity Diagram	15
IV	System Design: Estimating Performance, Make A Reuse Plan, Organize The System into Subsystem, Identifying Concurrency, Allocating Subsystems to Processors and Tasks, Management of Data Stores, Handling Global Resources, Choosing Software Control Strategies, Handling Boundary Conditions, Setting Trade-Off Priorities, Selecting an Architect Style. Class Design: bridging gap, realize use cases with operations, designing algorithms, design optimization, adjustment of inheritance.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
➤ Class Participation:	5	Written Examination
➤ Seminar/presentation/assignment/quiz/class test etc.:	10	
➤ Mid-Term Exam:	15	
Part C-Learning Resources		
Textbook		
1) Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Pearson education.		
2) M. Blaha, J. Rumbaugh, Object-Oriented Modeling and Design with UML, Pearson Education.		
Reference Books		
1) Brend Bruegge, Allen H. Dutoit, Object-Oriented Software Engineering, Using UML, Patterns and Java, Pearson Education.		
2) J. Rumbaugh, M. Blaha, W. Premerlani, F. Eddy, W. Lorensen, Object-Oriented Modeling and Design, Prentice Hall of India.		
3) Satzinger, Jackson, Burd, Object-Oriented Analysis & Design with the Unified Process, Thomson.		
4) Grady Booch, Object Oriented Analysis & Design, Pearson Education.		
5) Craig Larman , Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Prentice Hall		

Part A - Introduction

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Computer Graphics and Animation		
Course Code	M24-CSE-402		
Course Type	DEC-3		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The objective of this course is to provide students with a solid foundation in the principles, techniques, and applications of computer graphics. The course covers both 2D and 3D graphics, focusing on fundamental concepts such as raster and random scan systems, graphics hardware, drawing algorithms, transformations, and curve generation. Students learn how to create and manipulate graphical primitives, perform geometric and viewing transformations, and apply clipping algorithms. Advanced topics include 3D modeling, projections, visible surface detection, lighting, shading, and animation techniques. Through this course, students will develop the skills needed to build interactive visual applications and understand the role of graphics in modern computing fields such as augmented reality, computer vision, and animation.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Students will understand the basic components, functions, and devices of computer graphics and explore its practical applications. CLO-2: Students will implement scan conversion algorithms for lines, circles, and ellipses and use curve and area-filling techniques to create graphic primitives. CLO-3: Students will apply 2D geometric transformations, clipping techniques, and coordinate system manipulations for effective 2D rendering. CLO-4: Students will explore 3D modeling, transformations, surface rendering, and animation techniques to simulate realism and motion in computer graphics.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Computer Graphics and its Components: Overview of Computer Graphics, its functions & elements; Introduction to GUI, Computer Vision, Augmented Reality and other Applications of Graphics; Popular Graphics Software; Components and Working of Interactive Graphics; Raster Scan and Random Scan systems and Display Processors; Look-up table; Loading the Frame Buffer; Coordinate Systems. Graphics Devices: Display Technologies: Resolution, Aspect Ratio, Refresh CRT, Color CRT, Flat Panel Displays; Interactive Input Devices for Graphics, Image and Video Input Devices.	15

II	Scan Conversion: Drawing Geometry; Output Primitives; Lines and Pixel Graphics; AntiAliasing; Scan Converting Lines: DDA line drawing algorithms, Bresenham’s line Algorithm; Scan Converting Circles: Polynomial method for circle drawing, circle drawing using polar coordinates, Bresenham’s circle drawing; Algorithms for Generation of ellipse; Line Styles; Generation of Bar Charts, Pie-Charts. Curve Representation: Parametric Curves, Parametric Representation of a Circle, Parametric representation of cubic curves, drawing Bezier curves. Filled-Area Primitives: Basic Stack based fill algorithms: Flood fill algorithm, Boundary fill algorithm; Scan-line polygon fill algorithm and its computational structures.	15
III	Two-Dimensional Transformations: Coordinate and Geometric Transformations; Translation, Rotation, Scaling; Matrix representations and Homogeneous coordinates, Composite transformations, General Pivot Point rotation, General Fixed Point Scaling, Shearing; Reflection ; Reflection about an arbitrary line. 2-D Viewing: Viewing pipeline; Window, Viewport, Window-to-Viewport transformation; Zooming, Panning; Pointing and Positioning techniques; Rubber band technique; Dragging. Clipping operations: Point and Line clipping, Cohen-Sutherland line clipping, Mid-Point Subdivision line clipping, Liang-Barsky line clipping, Sutherland-Hodgman polygon clipping; Weiler-Atherton polygon clipping.	15
IV	3-D Graphics & Modeling: Visualization techniques for Realism; 3D Object Representation; Solid Model Representation Schemes; Euclidean Geometry methods: Regularized Boolean Set Operations, Primitive Instancing, Boundary Representations, Curved lines and surfaces, Sweep Representations, Spatial-Partitioning Representations - Octree representation, Constructive Solid Geometry; Procedural Methods: Fractals, Shape Grammars, Particle systems, Physically Based modeling, Visualization techniques; 3D transformations. Three-Dimensional Viewing: Viewing Pipeline; Parallel Projection: Orthographic and Oblique Projection; Perspective Projection. Visible-Surface Determination: Z-buffer, Depth-Sorting, Area Subdivision, BSP-Tree method; Ray casting. Introduction to Animation: Designing of Animation Sequences; Key-Frame Systems; Animation Techniques: Tweening, Morphing.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books		
1) Donald Hearn, M. Pauline Baker, Computer Graphics, Pearson Education.		
2) J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Pearson Education.		
3) Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill.		
4) Rogers, David F., Procedural Elements of Computer Graphics, McGraw Hill.		
5) Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.		

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Big Data Analytics		
Course Code	M24-CSE-403		
Course Type	DEC-3		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course aims to provide students with a comprehensive understanding of the foundational concepts of big data, its characteristics, and the challenges it presents. Students will learn various technologies and analytical techniques for processing, storing, and analyzing large datasets, including distributed computing frameworks and advanced analytical methods, enabling them to derive actionable insights from complex data.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-I: Students will be able to articulate the fundamental concepts of big data, differentiate it from traditional data processing methods, and understand the Hadoop ecosystem and its components. CLO-II: Students will gain proficiency in distributed data processing using MapReduce and will be able to design and work with various types of NoSQL databases, including Cassandra. CLO-III: Students will learn to use Hive and Pig for data analysis and ETL processing, and will be introduced to the Apache Spark framework for efficient big data processing. CLO-IV: Students will be able to apply advanced analytical techniques, including clustering, association rule mining, regression, and classification, and will understand the applications of big data analytics in real-world scenarios.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Big Data; Characteristics of Big Data (Volume, Velocity, Variety, Veracity, Value); Evolution of Big Data; Big Data vs. Traditional Business Intelligence; Key roles in the Big Data ecosystem; Examples of Big Data Analytics; Data Analytics Lifecycle; Big Data Myths; Challenges with Big Data; Understanding Big Data Storage; Overview of High-Performance Architecture; Introduction to Hadoop; Why Hadoop? Limitations of RDBMS; RDBMS vs. Hadoop; History of Hadoop; Hadoop overview; Use cases of Hadoop; Hadoop Distributed File System (HDFS); Processing data with Hadoop; Managing resources and applications with Hadoop YARN (Yet Another Resource Negotiator).	15

II	MapReduce Programming Model: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression, Real-time applications using MapReduce, Data serialization and working with common serialization formats; Introduction to NoSQL Databases; Types of NoSQL Databases (Key-Value, Document, Column-Family, Graph); Advantages and disadvantages of NoSQL; NewSQL; SQL vs. NoSQL vs. NewSQL; Cassandra: Introduction, Features, Data types, CQLSH, Keyspaces, CRUD operations, Collections, Counter, TTL, Alter commands, Import and Export, Querying System tables.	15
III	Hive: Introduction to Hive, Hive architecture, Hive data types, Hive file format, Hive Query Language (HQL), User-Defined Functions (UDF) in Hive; Pig: The anatomy of Pig, Pig on Hadoop, Pig philosophy, Use case for Pig, ETL processing with Pig, Pig Latin overview, Data types in Pig, Running Pig, Execution modes of Pig, HDFS commands, Relational operators, Eval Functions, Complex data types, Piggy Bank, Word count example using Pig; Introduction to Apache Spark; Spark's advantages over MapReduce; Spark architecture; Resilient Distributed Datasets (RDDs); Spark Core, Spark SQL, Spark Streaming, MLlib, GraphX; Hands-on with PySpark/Scala for basic data processing.	15
IV	Analytical Theory and Methods: Clustering and associated algorithms, Association Rules, Apriori Algorithm, Candidate Rules, Applications of Association Rules, Validation and Testing, Diagnostics; Regression: Linear Regression, Logistic Regression, Additional Regression Models; Classification: Decision Trees, Naïve Bayes, Diagnostics of Classifiers, Additional Classification Methods; Time Series Analysis: Box-Jenkins methodology, ARIMA Model, Additional methods; Text Analysis: Steps, Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency-Inverse Document Frequency (TF-IDF); Introduction to machine learning for Big Data; Real-world case studies and applications of Big Data Analytics in various domains (e.g., healthcare, finance, social media, e-commerce).	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books		
1) "Big Data Analytics: A Practitioner's Approach" by V. Bhuvaneswari and T. Devi.		
2) "Mining of Massive Datasets" by Jure Leskovec, Anand Rajaraman, and Jeffrey D. Ullman.		
3) "Big Data and Analytics" by Seema Acharya and Subhashini Chellappan.		
4) "Hadoop: The Definitive Guide" by Tom White.		
5) "Spark: The Definitive Guide: Big Data Processing Made Simple" by Bill Chambers and Matei Zaharia.		
6) "Data Science from Scratch" by Joel Grus.		
7) "Designing Data-Intensive Applications" by Martin Kleppmann.		

With effect from the Session: 2024-25

Part A - Introduction

Name of the Programme	M. Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Compiler Design		
Course Code	M24-CSE-405		
Course Type	DEC-4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course objectives	The objective of this course is to provide students with a comprehensive understanding of the design and implementation of compilers, emphasizing the translation of high-level programming languages into machine code. The course covers all key phases of a compiler including lexical analysis, parsing, syntax-directed translation, intermediate code generation, symbol table management, error handling, and code optimization. Students will learn various parsing techniques, attribute grammars, and optimization strategies, equipping them with the theoretical foundation and practical skills necessary for compiler construction and language processing tools.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1 Acquire knowledge of different phases and passes of the compiler. CLO-2 Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table. CLO-3 Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes. CLO-4 Understand the target machine’s run time environment, its instruction set for code generation and techniques used for code optimization		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Overview of the Translation Process: Introduction to translation, Difference between interpreter, assembler and compiler, Types of Compilers, Analysis of the Source Program, Phases of a Compiler. Lexical Analysis: Role of Lexical Analyzer, Tokens, Patterns, Lexemes, Lexical Errors, Input Buffering, Specifications of Tokens, Recognition of Tokens, Parsing: Parsing, role of parser, context free grammar, derivations, parse trees, ambiguity, elimination of left recursion, left factoring.	15
II	Parsing Techniques: Top-down parsing - backtracking, recursive descent parsing, predictive parsers, LL (1) grammars. Bottom-Up Parsing: Definition of bottom-up parsing, handles, handle pruning, stack implementation of shift-reduce parsing, conflicts during shift-reduce parsing, Operator Precedence Parsing, LR grammars, LR parsers-simple LR, canonical LR(CLR) and Look Ahead LR (LALR) parsers, error recovery in parsing.	15
III	Syntax Directed Translation: Syntax directed definitions (SDD), Inherited and Synthesized attributes, Evaluation orders for SDD, Applications of syntax directed translation. Intermediate Code Generation: DAG for expressions, three address codes - quadruples and triples, types and declarations, translation of expressions, array references, type checking and conversions, translation of Boolean expressions and control flow statements.	15

IV	Symbol Table: Structure and features of symbol tables, symbol attributes and scopes.		15
	Error Detection and Recovery: Errors, Lexical-Phase Errors, Syntactic Phase Errors, Semantic Errors		
	Code Optimization: Potential cases of Code Optimization, Optimization of basic blocks, Local and Global optimizations, Common optimization techniques: Folding, Copy propagation, Common Sub expression eliminations, Code motion, Frequency reduction, Strength reduction		
	Total Contact Hours		
			60
Suggested Evaluation Methods			
Internal Assessment: 30			End Term Examination: 70
➤ Theory		30	➤ Theory
➤ Class Participation:		5	Written Examination
➤ Seminar/presentation/assignment/quiz/class test etc.:		10	
➤ Mid-Term Exam:		15	
Part C-Learning Resources			
Text Books:			
1) Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman (2007), Compilers Principles, Techniques and Tools, 2nd edition Pearson Education, New Delhi, India.			
Reference Books:			
1) Alfred V. Aho, Jeffrey D. Ullman (2001), Principles of compiler design, Indian student edition, Pearson Education, New Delhi, India.			
2) Kenneth C. Loudon (1997), Compiler Construction– Principles and Practice, 1st edition, PWS Publishing.			
3) D.M.Dhamdhere, “Compiler Construction – Principles & Practice”, Macmillan India			
4) Andrew W. Appel (2004), Modern Compiler Implementation C, Cambridge University Press, UK.			

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	M. Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Biometric Security		
Course Code	M24-CSE-406		
Course Type	DEC-4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Objectives	The objective of this course is to introduce students to the principles, technologies, and applications of biometric systems. It provides a detailed understanding of various biometric traits, including both physiological and behavioral characteristics, and the processes of enrollment, identification, and verification. The course covers performance evaluation, error analysis, and the design of unimodal and multimodal biometric systems along with sensor technologies. It also addresses biometric system security, ethical considerations, and real-world applications in government and commercial domains, preparing students to assess and implement secure biometric solutions.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand the basics of biometric and its functionalities CLO-2 Understand and analyze biometric systems with different traits. CLO-3 Analyze the performance of biometrics by combining multiple traits and biometric sensors. CLO-4 Understand various Biometric security issues & Applications		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Biometric; Biometric technologies, Biometric Enrollment, Identification & Verification process, Biometric advantages, Different Biometric traits, characteristics of ideal biometric, Comparison of different biometrics, Accuracy in biometric systems; Error rates, Biometric deformations.	15
II	Physiological and Behavioral Biometric; Different Physiological and Behavioral Biometrics, Fingerprint, Face, Iris Introduction, Recognition, Feature extraction and matching, IRIS segmentation- normalization, Gait feature extraction, Hand geometry; Behavioral Biometrics: Introduction, Features, classification and properties of behavioral biometrics; Signature, Keystroke dynamics, Voice etc., merits and their demerits, soft biometrics.	15
III	Multimodal Biometrics and Biometric Sensors; Multimodal and Multi-biometric systems, Biometric Integration strategies, Architecture, Level of fusion, Training and adaptability, examples of multimodal biometric systems, Performance evaluation. Different types of Biometric sensors and their use; Biometric sensor interoperability.	15
IV	Biometrics Security and Applications; Biometrics Security; Biometric system challenges, Attack on biometric system, Liveness detection, Cancelable biometrics. Biometric standards, Applications of biometrics; Government sector, Commercial sector, Privacy in biometrics, Biometric Ethics and Technology usage, DNA Biometrics.	15
Total Contact Hours		60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Reference Books:			
1) Anil K. Jain, Arun Ross, and Karthik Nandakumar, “Introduction to Biometrics”, Springer.			
2) Anil K Jain, Patrick Flynn and Arun A Ross, “Handbook of Biometrics”, Springer.			
3) James Wayman, Anil Jain, Davide Maltoni, Dario Maio, “Biometric Systems, Technology Design and Performance Evaluation”,Springer.			
4) S.Y. Kung, S.H. Lin, M.W.Mak, “Biometric Authentication: A Machine Learning Approach” Prentice Hall.			

Part A - Introduction

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Cloud Computing and IoT		
Course Code	M24-CSE-407		
Course Type	DEC-4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The objective of this course is to equip students with foundational and advanced knowledge of cloud computing and the Internet of Things (IoT). It covers cloud architecture, deployment and service models, virtualization, and key cloud services, along with their applications and security considerations. The course also introduces the concepts, architecture, and networking technologies of IoT, followed by in-depth study of IoT communication protocols, constrained environments, and device-level implementations using platforms like Arduino and Raspberry Pi, with a focus on associated security challenges.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1 Understand core issues of cloud computing and enabling technologies. CLO-2 Learn services provided on cloud computing platforms & security challenges. CLO-3 Understand concepts, architecture, applications & networking technologies of IoT. CLO-4 Learn IoT-oriented communication protocols and security concerns.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Cloud Computing: Definition and Characteristics of Cloud Computing, Evolution and Enabling Technologies, Benefits & Challenges, NIST Reference Architecture of Cloud Computing; Deployment Models, Service Models, Service Oriented Architecture (SOA). Virtualization: Virtualization and Its Role in Cloud Computing; Benefits & Drawbacks of Virtualization, Types of Virtualization, Server Virtualization, Hypervisor-Based Approaches, Virtualization Of - Operating System, Platform, CPU, Network, Application, Memory and I/O Devices.	15
II	Cloud Computing Services & Applications: Cloud Computing Platforms; Compute Services, Storage Services, Database Services, Applications Services, Queuing Services, E-Mail Services, Notification Services, Media Services, Content Delivery Services, Analytics Services, Deployment & Management Services, Identity & Access Management Services and their Case Studies. Cloud Security and Compliance: Security Challenges in The Cloud, Data Protection and Privacy, Compliance and Regulatory Issues.	15

III	Internet of Thing (IoT): Definition and Characteristics of IoT, Key Components of IoT (Sensors, Actuators, Devices). IoT Ecosystems and Architecture, Conceptual Framework, Common Applications of IoT. Modified OSI Model for IoT/M2M Systems, M2M Vs IoT. IoT Networking Technologies: NFC, RFID, Bluetooth BR/EDR and Bluetooth Low Energy, Zigbee, WiFi.	15
IV	IoT Communication Technologies & Security Issues: Constrained Nodes, Constrained Networks, Types of Constrained Devices, Low Power and Lossy Networks. Security Issues and Challenges in IoT. IoT Protocols – 6LoWPAN, QUIC Protocol; Data Protocols - MQTT, MQTT-SN, CoAP, AMQP. Introduction to Arduino and Raspberry Pi Boards.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
➤ Class Participation:	5	Written Examination
➤ Seminar/presentation/assignment/quiz/class test etc.:	10	
➤ Mid-Term Exam:	15	
Part C-Learning Resources		
Textbook		
1) Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing – Principles and Paradigms, Wiley India Pvt. Ltd.		
2) Sudip Misra, Anandarup Mukherjee, Arijit Roy, Introduction to IOT, Cambridge		
3) Arshdeep Bahga, Vijay Madisetti, Cloud Computing – A Hands-on Approach, University Press.		
4) Raj Kamal, Internet of Things - Architecture and Design Principles, McGraw Hills		
Reference Books		
1) Mayur Ramgir, Internet of Things – Architecture, Implementation and Security, Pearson		
2) Kai Hwang, Geoffrey C.Fox, and Jack J. Dongarra, Distributed and Cloud Computing, Elsevier India Private Limited		
3) Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud computing: A practical Approach, McGraw Hill		
4) Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on Approach), VPT		

Part A - Introduction

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Security in Computing		
Course Code	M24-CSE-409		
Course Type	DEC-5		
Level of the course (As per Annexure-I	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The objective of this course is to provide students with a comprehensive understanding of computer security principles, challenges, and techniques used to protect systems, data, and networks. It introduces key concepts such as threats, attacks, cryptography, and secure programming, along with practical knowledge of securing databases, networks, internet communication, operating systems, and physical environments. The course also covers legal, ethical, and policy aspects of cybersecurity to prepare students for addressing real-world security issues.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will understand the fundamental concepts of computer security, cryptography, and common program threats along with methods to mitigate them. CLO 2:: Students will gain knowledge of database and network security mechanisms including access control, encryption, firewalls, and intrusion detection systems. CLO 3: Students will be able to evaluate and apply internet security protocols and secure various operating systems such as Linux and Windows. CLO 4: Students will analyze physical security risks, perform risk assessments, and understand ethical and legal considerations in cybersecurity.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Computer Security Concepts, Threats, Attacks and Assets, Security Functional Requirements, Security Architecture and Scope of Computer Security, Computer Security Trends and Strategies. Cryptography: Terminology and Background, Substitution Ciphers, Transpositions, Cryptanalysis, Program Security: Secure Program, Non-malicious Program Error, Viruses and other Malicious Code, Targeted Malicious Code, Control against Program Threats.	15
II	Database Security: Database Management System, Relational Databases, Database Access Control, Inference, Security Requirements, Reliability and Integrity, Sensitive Data, Database Encryption. Network Security: Threats in Network, Network Security Controls, and Firewall- Need for firewall, Characteristics, Types of firewall, Firewall Basing, Intrusion Detection System- Types, Goals of IDS, IDS strengths and Limitations.	15

III	Internet Security Protocols and Standards: Secure Socket Layer (SSL) and Transport Layer Security (TLS), IPv4 and IPv6 Security, Kerberos 672, X.509, Public Key Infrastructure. Linux Security Model, File System Security, Linux Vulnerability, Linux System Hardening, Application Security. Window Security Architecture, Windows Vulnerability, Windows Security Defense, Browser Defenses.	15
IV	Physical Security Threats, Physical Security Prevention and Mitigation Measures, Recovery form Physical Security Breaches, Security Auditing Architecture, Security Audit Trail, Security Risk assessment, Security Controls or Safeguard, IT Security Plan, Implementation of Controls, Cybercrime and Computer Crime, Intellectual Property, Privacy, Ethical Issues.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books:		
1) Charles. P. Pfleeger & Shari Lawrence Pfleeger, Security in Computing, Pearson Education.		
2) William Stalling, Lawrie Brown, Computer Security Principles and Practice, Pearson Education.		
3) Atul Kahate, Cryptography and Network Security, Tata McGraw-Hill Education		

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	M. Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Software Testing		
Course Code	M24- CSE -410		
Course Type	DEC-5		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course provides a foundational understanding of software testing principles, methodologies, and life cycles. It covers test design, execution, and automation using tools like Selenium and JUnit, along with quality assurance standards and performance testing techniques. Students also explore advanced testing approaches and emerging trends such as Agile, DevOps, and AI in testing to ensure effective and reliable software development.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Explain the fundamentals of digital image and its processing CLO-2. Perform image enhancement techniques in spatial domain. CLO-3. Elucidate the mathematical modelling of image restoration and compression CLO-4. Apply the concept of image segmentation and morphological Image Processing.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Fundamentals of Software Testing: Software testing principles, objectives, and types; Verification and validation; Software development life cycle (SDLC) vs. software testing life cycle (STLC); Testing methodologies: Black-box testing, White-box testing, Grey-box testing; Static testing techniques: Reviews, Walkthroughs, and Inspections; Dynamic testing techniques: Functional and Non-functional testing; Levels of testing: Unit testing, Integration testing, System testing, Acceptance testing.	15
II	Test Design and Execution: Test planning, Test strategies, and Test documentation; Test case design techniques: Equivalence partitioning, Boundary value analysis, Decision table-based testing, State transition testing, Use case-based testing, Error guessing; Test execution process; Test result analysis; Test automation concepts and tools; Introduction to Selenium, JUnit, TestNG, and other testing frameworks.	15
III	Software Quality and Performance Testing: Software quality assurance (SQA); ISO and CMMI standards for quality; Metrics for software testing; Defect life cycle and defect tracking tools; Performance testing: Load testing, Stress testing, Scalability testing, and Volume testing; Tools for performance testing: JMeter, LoadRunner; Security testing concepts and techniques; Usability testing and its importance.	15
IV	Advanced Testing Techniques and Emerging Trends: Mutation testing, Regression testing, Configuration testing, Compatibility testing, Recovery testing; Testing in Agile and DevOps environments; Continuous Integration and Continuous Testing; Cloud-based testing; AI and machine learning in software testing;	15

			Total Contact Hours	60
Suggested Evaluation Methods				
Internal Assessment: 30			End Term Examination: 70	
➤ Theory	30	➤ Theory	70	
➤ Class Participation:	5	Written Examination		
➤ Seminar/presentation/assignment/quiz/class test etc.:	10			
➤ Mid-Term Exam:	15			
Part C-Learning Resources				
Reference Books:				
1) Glenford J. Myers, Corey Sandler, Tom Badgett – The Art of Software Testing, Wiley.				
2) Paul C. Jorgensen – Software Testing: A Craftsman’s Approach, CRC Press.				
3) Srinivasan Desikan, Gopalaswamy Ramesh – Software Testing: Principles and Practices, Pearson.				
4) William Perry – Effective Methods for Software Testing, Wiley.				
5) Aditya P. Mathur – Foundations of Software Testing, Pearson.				
6) Ron Patton – Software Testing. Sams Publishing.				

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	M. Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Digital Image Processing		
Course Code	M24- CSE -411		
Course Type	DEC-5		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course aims to introduce students to the fundamental concepts and techniques of digital image processing. It covers key topics such as image formation, sampling, quantization, and pixel relationships. Students will learn methods for enhancing images in the spatial domain, restoring degraded images, and applying Fourier transform techniques. The course also explores color image processing, compression methods, morphological operations, and image segmentation techniques, preparing students to apply image processing in real-world applications.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Explain the fundamentals of digital image and its processing CLO-2. Perform image enhancement techniques in spatial domain. CLO-3. Elucidate the mathematical modelling of image restoration and compression CLO-4. Apply the concept of image segmentation and morphological Image Processing.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction: Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels. Image enhancement in the spatial domain: Basic gray-level transformation, histogram processing, arithmetic and logic operators, basic spatial filtering, smoothing, and sharpening spatial filters.	15
II	Image restoration: A model of the image degradation/restoration process, noise models, and restoration in the presence of noise—only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms; Introduction to the Fourier transform and the frequency domain, estimating the degradation function.	15
III	Color Image Processing: Color fundamentals, color models, pseudo color image processing, basics of full-color image processing, color transforms, smoothing and sharpening, Image Compression: Fundamentals, image compression models, error-free compression, lossy predictive coding, some basic compression methods	15
IV	Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, basic morphologic algorithms, The Hit-or-Miss Transformation Image Segmentation: Detection of discontinuous, edge linking and boundary detection, thresholding, Hough Transform Line Detection and Linking, region-based segmentation.	15
Total Contact Hours		60
Suggested Evaluation Methods		

Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory	70
➤ Class Participation:	5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	10		
➤ Mid-Term Exam:	15		

Part C-Learning Resources

Text Books:

- 1) Digital Image Processing, RafealC.Gonzalez, Richard E.Woods, Second Edition, Pearson Education/PHI.

Reference Books

- 1) Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Second Edition, Thomson Learning.
- 2) Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
- 3) Computer Vision and Image Processing, Adrian Low, Second Edition, B.S.Publications
- 4) Digital Image Processing using Matlab, RafealC.Gonzalez, Richard E.Woods, Steven L. Eddins, Pearson Education.

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	M.Sc. Computer Science (Software)		
Semester	4 th		
Name of the Course	Research Ethics		
Course Code	M24-CSE-413		
Course Type	EEC		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The objective of this course is to instill a deep understanding of ethical principles and practices in scientific research, particularly in computer science. It aims to familiarize students with the moral dimensions of research conduct, including integrity, plagiarism, authorship, peer review, data management, and ethical issues in computer science such as privacy, intellectual property, and responsible innovation. The course prepares students to identify ethical dilemmas in research environments and to respond thoughtfully and responsibly in accordance with professional and institutional ethical standards.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Students will be able to understand the meaning, scope, and importance of research ethics in scientific and technological advancement. CLO-2: Students will be able to identify and evaluate ethical issues related to research misconduct, authorship, and peer review. CLO-3: Students will be able to apply ethical practices in data management, privacy, and intellectual property within the context of computer science research. CLO-4: Students will be able to analyze case studies and institutional frameworks to uphold research integrity and compliance.		
Credits	Theory	Tutorial	Total
	2		2
Teaching Hours per week	2		2
Internal Assessment Marks	15		15
End Term Exam Marks	35		35
Max. Marks	50		50
Examination Time	3		3

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Research Ethics: Definition, need and importance of ethics in research; Scope and objectives of ethical research; Research and society; Scientific temper and research culture; Core values – honesty, trust, fairness, accountability; Professionalism and responsibility in research	15
II	Misconduct in Research and Ethical Publishing: Research misconduct – fabrication, falsification, plagiarism; Ethical guidelines for authorship and publication; Responsibilities of authors, reviewers, and editors; Conflict of interest; Retraction and correction of published work; Case studies on research misconduct	15
III	Ethical Issues in Computer Science Research: Data privacy and confidentiality; Cybersecurity ethics; Ethical use of AI and machine learning systems; Responsible innovation; Open-source ethics; Software piracy and licensing; Intellectual property rights – copyrights, patents, trademarks in research	15
IV	Institutional Frameworks and Case Studies: Institutional ethics committees and review boards; National and international guidelines – IEEE, ACM, UGC, DST, and CSIR ethics codes; Ethical clearance procedures; Whistleblowing and protection; Case studies of ethical dilemmas and best practices in research ethics	15

			Total Contact Hours	60
Suggested Evaluation Methods				
Internal Assessment: 15			End Term Examination: 35	
➤ Theory	15	➤ Theory:	35	
➤ Class Participation:	4	Written Examination		
➤ Seminar/presentation/assignment/quiz/class test etc.:	4			
➤ Mid-Term Exam:	7			
Part C-Learning Resources				
Reference Books				
1) Resnik, D. B. (2011). Ethics of Science: An Introduction. Routledge				
2) Shamoo, A. E., & Resnik, D. B. (2015). Responsible Conduct of Research (3rd ed.). Oxford University Press				
3) Beauchamp, T. L., & Childress, J. F. (2019). Principles of Biomedical Ethics (8th ed.). Oxford University Press				
4) Steneck, N. H. (2007). ORI Introduction to the Responsible Conduct of Research. U.S. Government Printing Office				
5) Bhatia, R. (2018). Research Methodology and Scientific Writing. Springer				

With effect from the Session: 2024-25

Name of Programme	M.Sc. Computer Science (Software)
Semester	4 th
Name of the Course	Dissertation / Project
Course Code	M24-CSE-414
Course Type	Dissertation / Project
Level of the course	500-599
Pre-requisite for the course (if any)	
Course Objectives	The objective of the Dissertation/Project course is to provide the students with an opportunity to undertake an in-depth investigation of a contemporary research problem or to apply their knowledge and skills in a real-world industrial setting. The course is designed to develop independent research aptitude, analytical and problem-solving skills, and the ability to design and implement effective computational solutions. Students may choose to work on a research-oriented topic leading to a dissertation report, or on an industry-based project culminating in a project report. The emphasis is on fostering innovation, critical thinking, technical competence, and professional reporting and presentation skills, thereby preparing students for higher research, entrepreneurial ventures, or responsible professional roles in the IT industry.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Demonstrate the ability to identify, formulate, and analyze a research problem or industrial requirement in the domain of computer applications. CLO2: Apply advanced concepts, tools, and methodologies to design and implement effective computational solutions. CLO3: Develop independent research, project management, and technical documentation skills with professional standards. CLO4: Present findings and outcomes effectively through a well-structured dissertation/project report and oral defense before experts.
Credits	12
Max. Marks	300

Guidelines for Examiners for Dissertation:

1. Relevance of Topic – Assess whether the chosen problem/project is significant, original, and relevant to the field of Computer Applications.
2. Literature Review & Problem Formulation – Evaluate the depth of background study, clarity in objectives, and problem definition.
3. Methodology & Technical Content – Examine the appropriateness of research methods, tools, algorithms, and technologies employed.
4. Implementation & Results – Assess the quality of system design, implementation, experiments conducted, and accuracy/reliability of results.
5. Report Quality – Assess organization, clarity, formatting, referencing, and overall technical writing of the dissertation/project report.
6. Originality & Innovation – Look for independent thinking, novelty of the solution, and avoidance of plagiarism.
7. Viva-Voce / Presentation – Evaluate student's understanding, ability to defend work, and clarity in oral communication.

Guidelines for Examiners (Industrial Project Evaluation)

1. Problem Identification & Industry Relevance: Assess whether the project addresses a real-world industrial problem and its relevance to current practices/technologies.
2. Project Objectives & Scope: Evaluate clarity of objectives, scope definition, and alignment with industry requirements.
3. System Design & Methodology: Examine the design models, architecture, frameworks, and tools used for problem-solving.
4. Assess quality of coding, integration, testing, and overall execution of the project.
5. Assess clarity, completeness, and professionalism of the project report, including industry-specific standards followed.
6. Viva-Voce / Presentation: Evaluate student's ability to present the project, explain technical decisions, and respond to queries confidently.

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act-XII of 1956)
("A++" Grade, NAAC Accredited)



**Syllabus
for**

Post Graduate Programme

**Master of Computer Applications
as per NEP-2020**

Curriculum and Credit Framework for Postgraduate Programme

**CBCS-LOCF
(3rd and 4th Semesters)
With effect from the session 2025-26**

**DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
FACULTY OF SCIENCES**

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119

With effect from the Session: 2024-25

Part A - Introduction			
Name of the Programme	MCA		
Semester	3 rd		
Name of the Course	Design and Analysis of Algorithms		
Course Code	M24-CAP-301		
Course Type	CC-9		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course aims to provide students with a deep understanding of algorithm design, analysis, and complexity, equipping them with the skills to develop efficient solutions to computational problems. It introduces foundational concepts such as asymptotic notation and algorithmic paradigms like divide-and-conquer, greedy methods, and dynamic programming. Students will explore advanced data structures, graph and string algorithms, and will also gain exposure to probabilistic analysis and randomized algorithms. The course further delves into computational geometry and the theoretical aspects of computational complexity, including NP-completeness and intractable problems, preparing students for both practical algorithm development and theoretical analysis.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Students will be able to analyze and compare algorithm performance using asymptotic notations and apply divide-and-conquer strategies with recurrence-solving techniques. CLO-2: Students will develop efficient algorithmic solutions using dynamic programming and greedy methods for problems like matrix chain multiplication, Huffman coding, and optimal binary search trees. CLO-3: Students will understand and implement key graph and string algorithms, including shortest path algorithms, maximum flow techniques, and pattern matching methods. CLO-4: Students will comprehend geometric algorithmic techniques and critically evaluate problem complexity using concepts from computational complexity theory, including NP-completeness and reducibility.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Introduction: Algorithms, Role of algorithms in computing, Analyzing algorithms, Designing algorithms, Asymptotic notations. Divide and Conquer: Solving recurrence equations: Back substitution method, Recursion tree method, Masters theorem. Probabilistic Analysis and Randomized Algorithms: The hiring problem, Indicator random variables, Randomized algorithms, Probabilistic analysis and further uses of indicator random variables	15	

II	Trees: Red-black trees and Splay trees. Dynamic Programming (DP): Elements of DP, Matrix chain multiplication, Longest common subsequence, optimal binary search trees. Greedy Techniques (GT): Elements of GT, Activity selection problem, Huffman codes, Knapsack Problem.	15
III	Graph Algorithms: Topological sort, Strongly connected components, Single source shortest path: Analysis of Dijkstra’s Algorithm, Limitations of Dijkstra’s Algorithm, Negative weight cycle, Bellman-Ford algorithm. All Pairs Shortest Path: Relation of Shortest path and matrix multiplication, Analysis of Floyd Warshall algorithm. Maximum Flow: Flow network, Ford-Fulkerson method. Strings: Storage of strings, Naive string-matching algorithm, Rabin-Karp algorithm, String matching with finite automata, Knuth-Morris-Pratt algorithm	15
IV	Computational Geometry: Line-segment properties, Convex hull, Closest pair of points. Computational complexity: Notion of Polynomial time algorithms, Complexity classes: P, NP, NP-Hard and NP-Complete, Polynomial time verification, Reducibility, NP-Completeness, Examples of NP-Complete and NP-Hard problems: Traveling Salesman Problem, Knapsack, Bin Packing, Satisfiability, Vertex Cover, Clique, Independent Set.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books:		
1) 1. Cormen, Leiserson, Rivest, Introduction to Algorithms, PHI India.		
2) Neapolitan R., Foundations of Algorithms, Jones and Bartlett Learning.		
3) Cooper A., Computability Theory, Chapman and Hall/ CRC Press.		
4) A.V.Aho, J.E.Hopcroft, and J.D.Ullman, The Design and Analysis of Computer Algorithms, Pearson Education India		
5) AnanyLevitin, Introduction to the Design and Analysis of Algorithms, Pearson Education.		
6) R.C.T Lee, S.S.Tseng, R.C.Chang, Y.T.Tsai, Introduction to Design and Analysis of Algorithms: A Strategic Approach, Tata McGraw Hill		
7) Steven Skiena, The Algorithm Design Manual, Springer India.		

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	MCA		
Semester	3 rd		
Name of the Course	Machine Learning in Python		
Course Code	M24-CAP-302		
Course Type	CC-10		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The course Machine Learning in Python is designed to provide students with a comprehensive understanding of machine learning concepts and their practical implementation using Python. It introduces learners to the fundamentals of supervised and unsupervised learning, covering a range of algorithms including decision trees, naive Bayes, logistic regression, clustering methods, and regression models. The course also emphasizes hands-on experience through Python libraries like <code>scikit-learn</code> , <code>scipy</code> , and others to implement, train, and evaluate machine learning models. Furthermore, students will explore advanced topics such as dimensionality reduction, anomaly detection, recommender systems, support vector machines, and reinforcement learning, equipping them with both theoretical insight and practical tools to solve real-world problems using machine learning techniques.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO I: Students will be able to explain fundamental machine learning concepts and implement classification tasks using decision tree algorithms in Python. CLO II: Students will demonstrate the ability to apply Bayesian methods and regression techniques using Python to model and predict data-driven outcomes. CLO III: Students will implement and analyze logistic regression and clustering algorithms to extract patterns and perform classification in unlabelled datasets using Python libraries. CLO IV: Students will apply dimensionality reduction and anomaly detection techniques and gain exposure to advanced machine learning topics such as SVM, recommender systems, and reinforcement learning using Python tools.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Machine Learning in Python: Concepts and definitions, Overview of Machine Learning, Key terminology, types of learning tasks, and real-world applications. Supervised Learning with Python: Classification tasks, Representation of Decision Trees, identifying suitable problems for decision learning, Decision Tree algorithms (e.g., ID3, CART), and implementation using Python libraries such as <code>scikit-learn</code> . Exploration of hyperspace search in decision tree models.	15
II	Naive Bayes in Python: Bayes Theorem, applying Bayes Decision Theory, Conditional	15

	Probability, and implementation of Bayesian classifiers. Introduction to Bayesian Belief Networks and their applications using Python libraries. Regression Models with Python: Linear Regression for numerical prediction, methods for finding the best fit line, implementation using <code>scikit-learn</code> . Introduction to Regression Trees and performing regression using CART in Python.	
III	Logistic Regression with Python: Binary classification using the sigmoid function, model interpretation, and implementation using Python. Clustering Techniques in Python: Unsupervised learning concepts, implementation of K-Means Clustering, Expectation-Maximization (EM) algorithm, and Hierarchical Clustering using <code>scipy</code> and <code>scikit-learn</code> . Introduction to semi-supervised learning and supervised learning post-clustering.	15
IV	Dimensionality Reduction and Anomaly Detection in Python: Overview of dimensionality reduction techniques, implementation of Principal Component Analysis (PCA), detecting outliers using statistical and model-based approaches. Advanced Topics: Introduction to Recommender Systems using collaborative filtering, Support Vector Machines (SVM) for classification, and basics of Reinforcement Learning with an overview of relevant Python tools like OpenAI Gym.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books:		
1) Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited.		
2) Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press.		
3) Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press.		
4) Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press.		
5) Peter Harrington, Machine Learning in Action, Manning Publications.		
6) Shai Shalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press.		
7) Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (2nd or 3rd Edition), O'Reilly Media.		

With effect from the Session: 2024-25

Part A - Introduction

Name of the Programme	MCA		
Semester	3 rd		
Name of the Course	Ethical Hacking		
Course Code	M24-CAP-303		
Course Type	DEC-1		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Objectives	The objective of this course is to provide students with an in-depth understanding of the ethical aspects of hacking and cybersecurity practices. It aims to develop skills in identifying security vulnerabilities in computer systems and networks through ethical means. The course introduces tools and techniques used by ethical hackers to conduct penetration testing, vulnerability assessments, and security audits. It also emphasizes the legal and ethical boundaries of hacking and trains students to defend against cyber threats while complying with industry standards and regulations.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to explain the basic concepts of ethical hacking and perform information gathering through footprinting and scanning techniques within legal boundaries. CLO 2: Students will analyze system vulnerabilities and demonstrate the ability to detect and mitigate various forms of malware and unauthorized system access. CLO 3: Students will assess and exploit weaknesses in networks and web applications while understanding the use of tools and methods used by ethical hackers. CLO 4: Students will perform penetration testing using industry-standard tools, interpret vulnerability reports, and communicate findings through professional documentation.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Ethical Hacking: Definition and types of hackers, phases of hacking, footprinting and reconnaissance, scanning networks and enumeration, understanding vulnerabilities, legal and ethical issues in ethical hacking, cyber laws in India and internationally.	15
II	System Hacking and Malware Threats: Password cracking techniques, privilege escalation, steganography and hiding data, malware types and analysis (viruses, worms, trojans), sniffing and spoofing, keyloggers and spyware, identifying and mitigating malware threats.	15
III	Network and Web Application Hacking: Understanding firewalls and intrusion detection systems (IDS), hacking wired and wireless networks, SQL injection, cross-site scripting (XSS), session hijacking, denial-of-service (DoS) attacks, web server vulnerabilities, exploiting web application weaknesses using tools such as Burp Suite.	15
IV	Penetration Testing and Security Tools: Phases of penetration testing, vulnerability assessment tools (Nmap, Nessus), exploiting systems using Metasploit Framework, writing and customizing scripts for ethical hacking, report writing and documentation, recent trends in ethical hacking.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70

➤ Theory	30	➤ Theory	70
➤ Class Participation:	5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	10		
➤ Mid-Term Exam:	15		
Part C-Learning Resources			
Reference Books			
1) William Stallings, Network Security Essentials: Applications and Standards, Pearson Education.			
2) William Easttom, Computer Security Fundamentals, Pearson Education.			
3) Patrick Engebretson, The Basics of Hacking and Penetration Testing, Syngress.			
4) Michael T. Simpson, Kent Backman, and James Corley, Hands-On Ethical Hacking and Network Defense, Cengage Learning.			
5) EC-Council, Certified Ethical Hacker (CEH) Official Study Guide, Wiley.			

Part A - Introduction

Name of the Programme	MCA		
Semester	3 rd		
Name of the Course	Computer Architecture		
Course Code	M24-CAP-304		
Course Type	DEC-1		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	Student must have the knowledge of Computer Organization & Design		
Course Objectives	This course aims to introduce students to the foundational models and architectures of parallel computation, emphasizing how hardware and software interact in parallel processing environments. It explores various types and levels of parallelism, including instruction-level parallelism (ILP) and the architecture of superscalar processors. Students learn about code scheduling, branch prediction strategies, and memory models in MIMD systems. The course also delves into interconnection networks and cache coherence protocols, equipping learners with the conceptual and practical knowledge needed to understand, analyze, and optimize modern parallel computing systems.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1 Learn the concepts of computational models & parallel architectures and exploitation of parallelism at instruction level. CLO-2 Understand architectural features of multi-issue ILP processors and branch handling. CLO-3 Learn MIMD architectures and interconnection networks used in them and evaluate their comparative performances. CLO-4 Analyze causes of cache coherence problem and learn protocols for its solution.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Computational Model: Computational models, computer architecture, Classification of parallel architectures, Relationships between programming languages and parallel architectures. Parallel Processing: Types and levels of parallelism, Instruction Level Parallel (ILP) processors, dependencies between instructions, principle and general structure of pipelines, performance measures of pipeline, pipelined processing instructions. Code Scheduling for ILP- Processors: Basic block scheduling, loop scheduling, global scheduling.	15
II	Superscalar Processors: Emergence of superscalar processors, Tasks of superscalar processing – parallel decoding, superscalar instruction issue, shelling, register renaming, parallel execution, preserving sequential consistency of instruction execution and exception processing, comparison of VLIW & superscalar processors. Branch Handling: Branch problem, Approaches to branch handling – delayed branching, branch detection and prediction schemes, branch penalties and schemes to reduce them, multiway branches.	15
III	MIMD Architectures: Concepts of distributed and shared memory MIMD architectures, UMA, NUMA, CC-NUMA & COMA models of multiprocessors. Direct Interconnection Networks: Metrics for performance measures; Interconnection topologies: Linear Array, Ring, Chordal Rings, Star, Tree, 2D Mesh, Barrel Shifter, Hypercube.	15
IV	Dynamic interconnection networks: single shared buses, comparison of bandwidths of locked, pended & split transaction buses, arbiter logics, crossbar, multistage networks – omega. Cache Coherence Protocols: Cache Coherence Problem, Causes, Hardware Based Protocols – Snoopy	15

Cache Protocol, Directory Schemes – Full-Map Directory, Limited Directory, Chained Directory.				
			Total Contact Hours	60
Suggested Evaluation Methods				
Internal Assessment: 30			End Term Examination: 70	
➤ Theory		30	➤ Theory	70
➤ Class Participation:		5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:		10		
➤ Mid-Term Exam:		15		
Part C-Learning Resources				
Textbook				
1) Sima, Fountain, Kacsuk, Advanced Computer Architecture, Pearson Education.				
2) D. A. Patterson and J. L. Hennessey, Computer Architecture – A Quantitative Approach, Elsevier India.				
Reference Books				
1) Kai Hwang, Advanced Computer Architecture, McGraw Hill.				
2) Nicholas Carter, Computer Architecture, McGraw Hill.				
3) Harry F. Jordan, Gita Alaghband, Fundamentals of Parallel Processing, Pearson Education.				

With effect from the Session: 2024-25

Part A - Introduction

Name of the Programme	MCA		
Semester	3 rd		
Name of the Course	Computer Graphics		
Course Code	M24-CAP-306		
Course Type	DEC-2		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Objectives	The objective of this course is to introduce students to the fundamental concepts and techniques of computer graphics, including both two-dimensional and three-dimensional modeling and rendering. The course aims to develop an understanding of the components, devices, and software involved in computer graphics systems, and to explore the mathematical foundations of graphical transformations and geometric representations. Students will learn how to implement various algorithms for scan conversion, clipping, filling, and rendering of objects, along with basic animation techniques. The course also covers advanced topics such as 3D viewing, visible-surface determination, shading models, and procedural modeling methods to give students insight into realistic visualizations and modern applications of computer graphics such as GUI design, computer vision, and augmented reality.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to describe the components and working principles of interactive computer graphics systems and distinguish between raster and random scan display mechanisms. CLO 2: Students will demonstrate the ability to implement and analyze scan conversion algorithms for drawing basic geometric shapes and understand curve representation techniques using parametric equations and Bézier curves. CLO 3: Students will apply two-dimensional geometric transformations and viewing techniques, implement clipping algorithms, and effectively perform operations such as zooming, panning, and window-to-viewport transformations. CLO 4: Students will gain proficiency in 3D object modeling, transformations, projections, surface visibility determination techniques, and will understand the fundamentals of illumination, shading, and animation sequence design.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Computer Graphics and its Components: Overview of Computer Graphics, its functions & elements; Introduction to GUI, Computer Vision, Augmented Reality and other Applications of Graphics; Popular Graphics Software; Components and Working of Interactive Graphics; Raster Scan and Random Scan systems and Display Processors; Look-up table; Loading the Frame Buffer; Coordinate Systems. Graphics Devices: Display Technologies: Resolution, Aspect Ratio, Refresh CRT, Color CRT, Flat Panel Displays; Interactive Input Devices for Graphics, Image and Video Input Devices.	15
II	Scan Conversion: Drawing Geometry; Output Primitives; Lines and Pixel Graphics; AntiAliasing; Scan Converting Lines: DDA line drawing algorithms, Bresenham's line Algorithm; Scan Converting Circles: Polynomial method for circle drawing, circle drawing using polar coordinates, Bresenham's circle drawing; Algorithms for Generation of ellipse; Line Styles; Generation of Bar Charts, Pie-Charts. Curve Representation: Parametric Curves, Parametric Representation of a Circle, Parametric representation of cubic curves, drawing Bezier curves.	15

	Filled-Area Primitives: Basic Stack based fill algorithms: Flood fill algorithm, Boundary fill algorithm; Scan-line polygon fill algorithm and its computational structures.	
III	Two-Dimensional Transformations: Coordinate and Geometric Transformations; Translation, Rotation, Scaling; Matrix representations and Homogeneous coordinates, Composite transformations, General Pivot Point rotation, General Fixed Point Scaling, Shearing; Reflection ; Reflection about an arbitrary line. 2-D Viewing: Viewing pipeline; Window, Viewport, Window-to-Viewport transformation; Zooming, Panning; Pointing and Positioning techniques; Rubber band technique; Dragging. Clipping operations: Point and Line clipping, Cohen-Sutherland line clipping, Mid-Point Subdivision line clipping, Liang-Barsky line clipping, Sutherland-Hodgman polygon clipping; Weiler-Atherton polygon clipping.	15
IV	3-D Graphics & Modeling: Visualization techniques for Realism; 3D Object Representation; Solid Model Representation Schemes; Euclidean Geometry methods: Regularized Boolean Set Operations, Primitive Instancing, Boundary Representations, Curved lines and surfaces, Sweep Representations, Spatial-Partitioning Representations - Octree representation, Constructive Solid Geometry; Procedural Methods: Fractals, Shape Grammars, Particle systems, Physically Based modeling, Visualization techniques; 3D transformations. Visible-Surface Determination: Z-buffer, Depth-Sorting, Area Subdivision, BSP-Tree method; Ray casting. Illumination and Shading: Modeling Light Intensities; Basic Illumination Models; Gouraud Shading; Phong Shading.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
➤ Class Participation:	5	Written Examination
➤ Seminar/presentation/assignment/quiz/class test etc.:	10	
➤ Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books		
1) Donald Hearn, M. Pauline Baker, Computer Graphics, Pearson Education.		
2) J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Pearson Education.		
3) Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill.		
4) Rogers, David F., Procedural Elements of Computer Graphics, McGraw Hill.		
5) Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.		
6) Malay K. Pakhira, Computer Graphics, Multimedia and Animation, PHI		
7) Steven Harrington, Computer Graphics, A Programming Approach, McGraw Hill.		

Part A - Introduction

Name of the Programme	MCA		
Semester	3 rd		
Name of the Course	Big Data & Pattern Recognition		
Course Code	M24-CAP-307		
Course Type	DEC-2		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Objectives	The objective of this course is to provide students with a comprehensive understanding of the core concepts, technologies, and analytical methods used in the domain of big data and pattern recognition. The course introduces the foundational principles of big data, including its characteristics, sources, business motivations, and the lifecycle of big data analytics. Students will learn about various enterprise technologies and data governance strategies necessary for managing and analyzing large-scale datasets effectively. The course further explores the tools and techniques used for data processing, such as Hadoop ecosystem components, and offers insight into the theoretical and practical aspects of pattern recognition, including feature extraction, classification, and neural networks. It concludes with an overview of NoSQL databases, highlighting their architectures, types, and applications in big data management, enabling students to distinguish between traditional and modern data handling approaches.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to explain the fundamental characteristics of big data and identify its business drivers, architectures, and real-world applications across various industries. CLO 2: Students will demonstrate the ability to apply big data governance principles and utilize core Hadoop ecosystem tools such as HDFS, MapReduce, Hive, and Pig for analyzing large-scale datasets. CLO 3: Students will apply pattern recognition techniques, including feature extraction and nearest neighbor classifiers, and model simple logical operations using neural networks. CLO 4: Students will analyze the characteristics and types of NoSQL databases and evaluate their suitability for different big data storage and retrieval scenarios compared to traditional RDBMS.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Understanding Big Data: Concepts and Terminology, Big Data Characteristics, Different Types of Data, Identifying Data Characteristics, Business Motivations and Drivers for Big Data Adoption: Business Architecture, Business Process Management, Information and Communication Technology, Big Data Analytics Lifecycle, Enterprise Technologies and Big Data Business Intelligence, Industry examples of big data.	15
II	Data Governance for Big Data Analytics: Evolution of Data Governance, Big Data and Data Governance, Big Datasets, Big Data Oversight, Big Data Tools and Techniques: HDFS, Map Reduce, YARN, Zookeeper, HBase, HIVE, Pig, Mahout, Developing Big Data Applications, Stepwise Approach to Big Data Analysis, Big Data Failure: Failure is common, Failed Standards, Legalities.	15
III	Data Analysis and Pattern Recognition: Quantitative and Qualitative Analysis, Pattern Recognition	15

	Systems, Fundamental Problems in Pattern Recognition, Feature Extraction and Reduction, Paradigms, Pattern Recognition Approaches, Importance and Applications. Data Domain for Pattern Recognition. Pattern Recognition using Nearest Neighbour Classifier and Modeling an AND Gate Neural Nets.		
IV	An Overview of NoSQL, Characteristics of NoSQL, NoSQL Storage Types, Introduction of NoSQL Products, NoSQL Data Management for Big Data: Schema Less Models, Key-Value Stores, Document Stores, Tabular Stores, Object Data Stores, Graph databases, NoSQL Misconceptions, NoSQL over RDBMS.		15
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory	70
➤ Class Participation:	5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	10		
➤ Mid-Term Exam:	15		
Part C-Learning Resources			
Reference Books			
1) Thomas Erl, Wajid Khattak and Paul Buhler, Big Data Fundamentals Concepts, Drivers & Techniques Prentice Hall.			
2) David Loshin, Big Data Analytics from Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph Morgan Kaufmann.			
3) Jules J. Berman, Principles of Big Data Preparing, Sharing and Analyzing Complex Information, Morgan Kaufmann.			
4) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing.			
5) Rajjan Shinghal, Pattern Recognition Techniques and Applications, Oxford Higher Education.			
6) Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer.			
7) Jay Liebowitz, Big Data and Business Analytics, Auerbach Publications, CRC press.			
8) Pete Warden, Big Data Glossary, O'Reily.			
9) Michael Mineli, Michele Chambers, AmbigaDhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications.			

With effect from Session: 2024-25**Part A - Introduction**

Name of the Programme	MCA		
Semester	3 rd		
Name of the Course	Practical-7		
Course Code	M24-CAP-309		
Course Type	PC-5		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course objectives	This course aims to equip students with hands-on experience in implementing and analyzing fundamental and advanced algorithms. Students will develop the ability to measure and compare the empirical time complexity of sorting algorithms, trace recursion trees, and understand the behavior of divide-and-conquer strategies. They will gain practical skills in implementing dynamic programming solutions for problems such as Matrix Chain Multiplication and Longest Common Subsequence, and in applying advanced data structures like Red-Black Trees. The course also emphasizes solving real-world problems using greedy, graph-based, and optimization algorithms such as Huffman Coding, 0/1 Knapsack, Bellman-Ford, and Floyd-Warshall. By the end of the course, students will be proficient in algorithmic problem-solving and performance analysis, preparing them for software development, competitive programming, and research.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Implement and empirically evaluate the performance of classical algorithms such as Bubble Sort, Merge Sort, and Quick Sort, and analyze their execution times across different input cases. CLO-2: Apply and trace advanced algorithmic techniques, including recursion trees in divide-and-conquer approaches and dynamic programming tables in optimization problems like Matrix Chain Multiplication and LCS. CLO-3: Design and implement efficient data structures and graph algorithms, such as Red-Black Trees, Huffman Coding, Topological Sort, and algorithms for shortest paths and strongly connected components. CLO-4: Compare and contrast greedy and dynamic programming approaches for problems like the 0/1 Knapsack and understand their suitability through programmatic implementations and results analysis.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours	
Part B- Contents of the Course			
Practicals			Contact Hours
Practical course will consist of two components Part-A and Part-B. The examiner will set 5 questions at the time of practical examination asking 3 questions from the Part-A and 2 questions from the Part-B by taking course learning outcomes (CLO) into consideration. The examinee will be required to solve one problem from the Part-A and one from the Part-B.			120
Part-A			60
1) Write a program to compare the execution time of different sorting algorithms (Bubble Sort, Merge Sort, Quick Sort) and analyze their empirical time complexity.			
2) Implement the Merge Sort. Trace the recursion tree and compare the number of recursive calls for different inputs.			
3) Implement the Quick Sort algorithms. Trace the recursion tree and compare the number of recursive calls for different inputs.			
4) Apply Strassen’s Matrix Multiplication and compare with the naive matrix multiplication algorithm.			

5) Implement Red-Black Tree with insertion and deletion. Validate the tree's properties at each step.			
6) Solve the Matrix Chain Multiplication problem using dynamic programming.			
7) Write a program to find the Longest Common Subsequence of two strings and trace the DP table.			
Part-B		60	
8) Construct Huffman Codes for a given set of characters and frequencies; also display the encoded and decoded message.		(Lab hours include instructions for writing programs and demonstration by a teacher and for running the programs on computer by students.)	
9) Solve the 0/1 Knapsack Problem using Greedy approach.			
10) Solve the 0/1 Knapsack Problem using DP approaches.			
11) Implement Topological Sort using DFS algorithm.			
12) Implement Kosaraju's algorithm to find strongly connected components in a directed graph.			
13) Implement Bellman-Ford algorithm to find shortest paths and detect negative weight cycles.			
14) Implement the Floyd-Warshall algorithm for all-pairs shortest paths.			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the programs	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Examination:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1) Cormen, Leiserson, Rivest, Introduction to Algorithms, PHI India.			
2) Neapolitan R., Foundations of Algorithms, Jones and Bartlett Learning.			
3) Cooper A., Computability Theory, Chapman and Hall/ CRC Press.			
4) A.V.Aho, J.E.Hopcroft, and J.D.Ullman, The Design and Analysis of Computer Algorithms, Pearson Education India			
5) AnanyLevitin, Introduction to the Design and Analysis of Algorithms, Pearson Education.			
6) R.C.T Lee, S.S.Tseng, R.C.Chang, Y.T.Tsai, Introduction to Design and Analysis of Algorithms: A Strategic Approach, Tata McGraw Hill			
7) Steven Skiena, The Algorithm Design Manual, Springer India.			

With effect from Session: 2024-25

Part A - Introduction			
Name of the Programme	MCA		
Semester	3 rd		
Name of the Course	Practical-8		
Course Code	M24-CAP-310		
Course Type	PC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course objectives	This course aims to equip students with practical experience in implementing foundational machine learning algorithms using Python. It covers key supervised learning techniques such as decision trees, naive Bayes, linear and logistic regression, and introduces students to unsupervised learning techniques like clustering and dimensionality reduction. Through hands-on projects, students will explore model evaluation metrics, visualize model behaviors, and analyze datasets using libraries like <code>scikit-learn</code> , <code>matplotlib</code> , and <code>pandas</code> . The course also integrates basic anomaly detection approaches, enabling students to identify unusual patterns in data. Overall, the course bridges theoretical concepts with applied programming, preparing students to solve real-world problems using machine learning tools.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Apply supervised learning techniques such as decision trees, naive Bayes, and linear/logistic regression to solve classification and prediction problems using Python. CLO-2: Perform model evaluation using metrics like R ² score, mean squared error, and visualize model behavior through regression lines and decision boundaries. CLO-3: Implement unsupervised learning techniques, including K-Means clustering and Principal Component Analysis (PCA), and interpret results through appropriate visualizations. CLO-4: Detect anomalies in datasets using statistical and model-based methods like Z-score, Isolation Forest, and One-Class SVM for applications such as fraud detection and system monitoring.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours	
Part B- Contents of the Course			
Practicals			Contact Hours
Practical course will consist of two components Part-A and Part-B. The examiner will set 5 questions at the time of practical examination asking 3 questions from the Part-A and 2 questions from the Part-B by taking course learning outcomes (CLO) into consideration. The examinee will be required to solve one problem from the Part-A and one from the Part-B.			120
Part-A 1) Implement a Decision Tree Classifier on the Iris dataset using <code>scikit-learn</code> and visualize the decision tree. 2) Implement a Gaussian Naive Bayes Classifier on the Wine dataset using <code>scikit-learn</code> . 3) Implement Simple Linear Regression using <code>scikit-learn</code> to predict house prices. 4) Implement Multiple Linear Regression and evaluate R ² score, MSE, and other metrics on a real-world dataset. 5) Write a program to plot the regression line along with the data points using <code>matplotlib</code> .			60

6) Perform regression using CART (Decision Tree Regressor) and compare performance with linear regression.			
Part-B 7) Apply Logistic Regression for binary classification on a heart disease dataset using <code>scikit-learn</code> . 8) Visualize the sigmoid function and decision boundary of logistic regression on a binary classification dataset. 9) Implement K-Means Clustering on a synthetic dataset and visualize the clusters. 10) Apply K-Means on customer segmentation data, and determine the optimal number of clusters using the Elbow Method. 11) Implement PCA on a high-dimensional dataset and visualize the first two principal components. 12) Create a program for outlier detection using the Z-score method on a numeric dataset. 13) Use Isolation Forest or One-Class SVM to detect anomalies in network traffic or financial transactions.		60 (Lab hours include instructions for writing programs and demonstration by a teacher and for running the programs on computer by students.)	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the programs	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Examination:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1) Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited. 2) Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press. 3) Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press. 4) Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press. 5) Peter Harrington, Machine Learning in Action, Manning Publications. 6) Shai Shalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press. 7) Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (2nd or 3rd Edition), O'Reilly Media.			

With effect from the Session: 2024-25**Part A - Introduction**

Name of Programme	MCA		
Semester	3 rd		
Name of the Course	Data Analytics using Excel		
Course Code	M24-OEC-308		
Course Type	OEC		
Level of the course	500-599		
Pre-requisite for the course (if an)			
Course Objectives	The objective of this course is to equip students with practical knowledge and hands-on skills in performing data analysis using Microsoft Excel. The course introduces the fundamentals of data analytics, focusing on the importance of structured data processing and interpretation for decision-making. Students will learn to work with Excel functions, data formatting, and visualization tools to perform descriptive analytics. The course also covers advanced Excel features such as PivotTables, What-if analysis, data models, and statistical functions for predictive analysis. By the end of the course, students will be capable of cleaning, analyzing, visualizing, and interpreting datasets using Excel, supporting business and research-oriented data-driven decisions.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to understand core concepts of data analytics and effectively use Excel to organize, format, and visualize raw data. CLO 2: Students will demonstrate the ability to perform descriptive statistical analysis and apply data-cleaning techniques using Excel's built-in features. CLO 3: Students will be able to apply advanced Excel tools like PivotTables and What-if analysis to derive insights and perform basic forecasting. CLO 4: Students will conduct statistical and predictive analysis using Excel's built-in tools and interpret the results through dynamic dashboards and visual reports.		
Credits	Theory	Tutorial	Total
	2		2
Teaching Hours per week	2		2
Internal Assessment Marks	15		15
End Term Exam Marks	35		35
Max. Marks	50		50
Examination Time	3		3

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Data Analytics: Definition, types of analytics (descriptive, predictive, prescriptive), data types and sources, role of Excel in analytics. Excel basics: interface, cell references, formulas, functions, sorting and filtering data, data formatting, basic charts and graphs, importing data from different sources.	8
II	Descriptive Statistics using Excel: Calculating mean, median, mode, standard deviation, variance, percentiles, quartiles, and correlation. Using Excel functions for data summarization and exploration. Creating frequency distributions and histograms. Data cleaning and transformation using Text-to-Columns, Flash Fill, and Conditional Formatting.	7
III	Data Analysis Tools in Excel: Using PivotTables and PivotCharts for summarization and trend analysis. Introduction to data models and Power Pivot. Performing What-if Analysis using Goal Seek, Scenario Manager, and Data Tables. Introduction to forecasting using Excel functions like TREND and	8

	LINEST.		
IV	Statistical and Predictive Analysis: Performing regression analysis in Excel. Using correlation, ANOVA, and t-tests. Introduction to the Data Analysis Toolpak for hypothesis testing. Creating dashboards with interactive elements such as slicers and form controls. Case studies involving real-world datasets to interpret and communicate analytical results effectively.		7
Total Contact Hour			30
Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
➤ Theory	15	➤ Theory:	35
➤ Class Participation:	4	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	4		
➤ Mid-Term Exam:	7		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1) Wayne Winston, Microsoft Excel Data Analysis and Business Modeling, Microsoft Press.			
2) Paul McFedries, Excel Data Analysis for Dummies, Wiley.			
3) Danielle Stein Fairhurst, Using Excel for Business Analysis, Wiley.			
4) Conrad Carlberg, Statistical Analysis: Microsoft Excel 2016, Que Publishing.			
5) M. Balasubramanian, Data Analysis Using Excel, McGraw Hill Education.			

With effect from the Session: 2024-25

Part A - Introduction

Name of the Programme	MCA		
Semester	4 th		
Name of the Course	Object Oriented Design and UmL		
Course Code	M24-CAP-401		
Course Type	DEC-3		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course provides a comprehensive understanding of Unified Modeling Language (UML) and object-oriented design principles for effective software development. It introduces the conceptual model of UML, including its various elements like use cases, class diagrams, state diagrams, and interaction diagrams. Students learn to gather and analyze software requirements, model system structure and behavior, and use UML diagrams to design scalable and maintainable systems. The course emphasizes both high-level architectural planning and detailed class and object modeling, equipping students with the skills needed to transition from requirements to implementation effectively.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1 Understands basics of modelling and UML and applying usecase modeling for requirements elicitation CLO-2 Understand and apply concepts of class modeling and advanced structural modeling through UML diagrams. CLO-3 Understand and apply behavioural modeling through state diagram, sequence diagram, activity diagram to represent software systems. CLO-4 Have a working ability and grasping attitude to analyse and design software systems based on object-oriented thinking using UML.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to UML: Principles of Modeling, Conceptual Model of UML - Things, Relationships, Diagrams; Mechanisms in The UML – Specifications, Adornments, Common Divisions, Extensibility Mechanisms. Usecase Modeling: Identifying Use Cases & Actors, Relationships - between Actors, between Use Cases and between Actor and Use Case, Elements of Use Case Diagram, Constructing Use Case Diagram. Requirement Engineering: Gathering and Documenting Requirements, Functional Vs. Non-Functional Requirements, Requirement Validation and Verification.	15
II	Structural Modeling with UML: Class Modeling - Generalization & Inheritance, Association, Multiplicity, Sets, Bags & Sequences, Role Names, Qualified Association, Aggregation, Composition, Association Attributes, Association Classes, Abstract Class, Metadata, Reification, Elements of Class Diagrams, Constructing Class Diagrams. Advanced Structural Modeling with UML: Object Diagrams - Instances and Links; Package Diagrams - Organizing Classes, Components Diagram, Deployment Diagram.	15
III	Behavioral Modeling with UML: State Modeling - Events, States, Transitions & Conditions, Activity Effects, Do-Activities, Entry & Exit Activities, Completion Transitions, Elements of State Diagrams, Nested State Diagrams, Concurrency, Constructing State Diagrams. Sequence Diagram: Lifelines, Messages, and Activations, Constructing Sequence Diagram and Communication Diagram	15

	Activity Diagram: Actions, Control Flows, and Object Flows, Swim Lanes, Constructing Activity Diagram		
IV	System Design: Estimating Performance, Make A Reuse Plan, Organize The System into Subsystem, Identifying Concurrency, Allocating Subsystems to Processors and Tasks, Management of Data Stores, Handling Global Resources, Choosing Software Control Strategies, Handling Boundary Conditions, Setting Trade-Off Priorities, Selecting an Architect Style. Class Design: bridging gap, realize use cases with operations, designing algorithms, design optimization, adjustment of inheritance.		15
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory	70
➤ Class Participation:	5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	10		
➤ Mid-Term Exam:	15		
Part C-Learning Resources			
Textbook			
1) Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Pearson education.			
2) M. Blaha, J. Rumbaugh, Object-Oriented Modeling and Design with UML, Pearson Education.			
Reference Books			
1) Brend Bruegge, Allen H. Dutoit, Object-Oriented Software Engineering, Using UML, Patterns and Java, Pearson Education.			
2) J. Rumbaugh, M. Blaha, W. Premerlani, F. Eddy, W. Lorensen, Object-Oriented Modeling and Design, Prentice Hall of India.			
3) Satzinger, Jackson, Burd, Object-Oriented Analysis & Design with the Unified Process, Thomson.			
4) Grady Booch, Object Oriented Analysis & Design, Pearson Education.			
5) Craig Larman , Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Prentice Hall			

With effect from the Session: 2024-25

Part A - Introduction

Name of the Programme	MCA		
Semester	4 th		
Name of the Course	Data Science		
Course Code	M24-CAP-402		
Course Type	DEC-3		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The objective of this course is to introduce students to the foundational concepts and practical techniques used in data science. It aims to equip learners with the skills to collect, clean, analyze, and visualize data to generate meaningful insights. The course covers the end-to-end data science lifecycle, starting from data acquisition and preprocessing to exploratory data analysis, statistical modeling, and machine learning. Students will explore real-world data applications, understand the use of Python-based tools, and learn how to effectively communicate findings through visualization and storytelling. The course also emphasizes ethical considerations and best practices in handling data responsibly in decision-making contexts.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to explain the data science lifecycle and identify the roles and tools involved in solving real-world data problems. CLO 2: Students will demonstrate the ability to preprocess, clean, and explore datasets using Python-based libraries for meaningful data interpretation. CLO 3: Students will apply basic statistical and machine learning techniques to build and evaluate predictive models on structured data. CLO 4: Students will create effective data visualizations, interpret model outputs, and understand ethical responsibilities in data-driven decision-making.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Data Science: Definition and components of data science, data science vs. data analytics vs. machine learning, applications of data science in various domains. Data science lifecycle: data collection, data wrangling, analysis, interpretation, and communication. Overview of tools: Python, Jupyter, NumPy, pandas, and Matplotlib. Introduction to types of data and sources.	15
II	Data Preprocessing and Exploration: Handling missing values, data cleaning and transformation, outlier detection and treatment, encoding categorical variables, data normalization and standardization. Exploratory data analysis (EDA): using pandas and visualization libraries for summarizing and exploring datasets, correlation analysis, feature engineering.	15
III	Statistical Foundations and Machine Learning: Descriptive and inferential statistics, probability distributions, hypothesis testing, regression analysis. Introduction to supervised learning: linear regression, logistic regression, decision trees. Basics of unsupervised learning: clustering and dimensionality reduction. Model evaluation metrics: accuracy, precision, recall, F1-score, confusion matrix, cross-validation.	15
IV	Data Visualization and Communication: Principles of effective data visualization, tools for visualization in Python: Matplotlib, Seaborn, and Plotly. Dashboards and storytelling with data. Introduction to real-world case studies and capstone mini-projects. Ethical concerns in data science: data privacy, algorithmic bias, and responsible AI.	15
Total Contact Hours		60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory	70
➤ Class Participation:	5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	10		
➤ Mid-Term Exam:	15		
Part C-Learning Resources			
Reference Books			
1) Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly Media.			
2) Cathy O’Neil and Rachel Schutt, Doing Data Science, O'Reilly Media.			
3) Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media.			
4) Wes McKinney, Python for Data Analysis, O'Reilly Media.			
5) Hadley Wickham and Garrett Grolemund, R for Data Science, O'Reilly Media (for supplementary reading and comparative learning).			

With effect from the Session: 2024-25

Part A - Introduction

Name of the Programme	MCA		
Semester	4 th		
Name of the Course	Theory of Computation		
Course Code	M24-CAP-403		
Course Type	DEC-3		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course introduces the foundational concepts of computation through the study of formal languages and automata theory. It covers finite automata (DFA, NFA, ϵ -NFA), regular expressions, and regular grammars, along with their equivalence and minimization techniques. Students learn about context-free grammars (CFG), derivation trees, grammar simplification, and pushdown automata (PDA) for recognizing CFLs. The course also explores finite automata with output (Moore and Mealy machines), Turing machines as general models of computation, and undecidable problems. By the end, learners will gain a solid understanding of the theoretical models that underpin programming languages and compiler design.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1 Design deterministic and non-deterministic finite state machines and understand their capabilities and limits CLO-2 Define and discuss the concept of formal grammar, formal language, regular expression, and automata machine. CLO-3 Design finite automata and push down automata machines for given formal languages or computational real-world problem statements. CLO-4 Understand basic properties of Turing machines and computing with Turing machines.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Fundamentals: Alphabets, Strings, Languages, Problems, Graphs, Trees, Finite State Systems, Definitions, Finite Automaton Model, Acceptance of Strings, And Languages. Types of FA: Deterministic Finite Automaton and Nondeterministic Finite Automaton, Transition Diagrams, Transition Tables, Equivalence of DFA and NFA. Finite Automata with $\square$ -Moves, Significance, Acceptance of Languages, $\square$ -Closure, Equivalence of NFA With and Without $\square$ -Moves, Minimization of Finite Automata, Myhill-Nerode Theorem.	15
II	Finite Automata with Output: Moore and Mealy Machines, Equivalence of Moore, and Mealy machines. Regular Languages: Regular Sets, Regular Expressions, Identity Rules, Constructing Finite Automata for A Given Regular Expressions, Conversion of Finite Automata to Regular Expressions. Arden Theorem, Pumping Lemma for Regular Languages, Closure Properties of Regular Sets, Regular Grammars–Right Linear and Left Linear Grammars.	15
III	Context Free Grammar: Context Free Grammar, Derivation Trees, Sentential Forms, Right Most and Leftmost derivation of Strings, Ambiguity in Grammar, Inherent ambiguity. Simplification of Context Free Grammars, Chomsky Normal Form, Greibach Normal Form, Pumping Lemma for Context Free Languages and Its Applications, Closure properties of CFL, Membership Algorithm (CYK Algorithm) for Context Free Grammars.	15
IV	Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA,	15

Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, two stack PDA. Turing machines (TM): Linear Bounded Automata (LBA), Turing Machines (TM), General Model of Computation, Combining TM, Multi-Tape TM, Restricted and Universal TM, Recursive and recursively-enumerable languages and Properties, Reductions and the Halting Problem, Post's correspondence problem.			
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory	70
➤ Class Participation:	5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	10		
➤ Mid-Term Exam:	15		
Part C-Learning Resources			
Textbook			
1) J. E. Hopcroft, Rajeev Motwani and J. D. Ullman, “Introduction to Automata Theory, Languages, and Computation” 3rd Edition, Pearson Publisher, 2008, ISBN: 978-8131720479.			
Reference Books			
1) John C. Martin, “Introduction to Languages and the Theory of Computation”, 4th Edition, McGraw Hill Education 2010, ISBN: 978-0073191461.			
2) K. L. P. Mishra and N. Chandrasekaran, “Theory of Computer Science: Automata, languages and Computation”, 3rd Edition, 2006, Prentice Hall of India, ISBN: 978-8120329683.			
3) Peter Linz, “An Introduction to Formal Languages and Automata”, 6th Edition, Jones & Bartlett Publisher, 2016 ISBN: 978-9384323219.			
4) Zvi Kohav, Niraj K. Jha, “Switching and Finite Automata Theory”, 3rd Edition, Cambridge University Press, 2009 ISBN: 978-0521857482..			

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	MCA		
Semester	4 th		
Name of the Course	Blockchain Technology		
Course Code	M24-CAP-405		
Course Type	DEC-4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The objective of this course is to provide students with a comprehensive understanding of blockchain technology, its architecture, core components, and potential applications in various domains. The course aims to introduce the theoretical foundations and the underlying cryptographic principles of blockchain while equipping students with hands-on knowledge of how decentralized systems work. Students will explore consensus mechanisms, smart contracts, and distributed ledger technologies. The course also emphasizes real-world use cases such as cryptocurrencies, supply chain management, identity verification, and decentralized finance. Through this course, learners will develop the necessary skills to analyze, design, and implement blockchain-based solutions securely and efficiently.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to explain the fundamental concepts and architecture of blockchain technology and compare it with traditional centralized systems. CLO 2: Students will understand the cryptographic techniques and consensus algorithms that ensure the security and integrity of blockchain networks. CLO 3: Students will demonstrate the ability to develop basic smart contracts using Solidity and understand the differences between blockchain platforms such as Ethereum and Hyperledger. CLO 4: Students will analyze the practical applications of blockchain technology, evaluate associated security challenges, and discuss emerging trends and future directions.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Blockchain: History and evolution of blockchain, features and benefits, architecture of blockchain, types of blockchain (public, private, consortium), distributed ledger technology, blockchain versus traditional databases, overview of blockchain applications across industries.	15
II	Cryptographic Foundations and Consensus Mechanisms: Hash functions, digital signatures, public-key cryptography, Merkle trees, proof-of-work (PoW), proof-of-stake (PoS), delegated proof-of-stake (DPoS), Byzantine fault tolerance, mining and validation processes, block structure, and block propagation.	15
III	Smart Contracts and Platforms: Concept of smart contracts, Ethereum blockchain and Ethereum Virtual Machine (EVM), Solidity programming basics, gas usage, writing and deploying simple smart contracts, introduction to Hyperledger Fabric and its components, comparison between Ethereum and Hyperledger.	15
IV	Blockchain Use Cases, Security, and Challenges: Blockchain in cryptocurrency (Bitcoin), finance, supply chain, healthcare, identity management, voting, and IoT. Security issues in blockchain including 51% attacks, double spending, Sybil attacks, scalability and interoperability challenges. Overview of recent advancements and future trends in blockchain.	15
Total Contact Hours		60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory	70
➤ Class Participation:	5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	10		
➤ Mid-Term Exam:	15		
Part C-Learning Resources			
Reference Books			
1) Imran Bashir, Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, Packt Publishing.			
2) Andreas M. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, O'Reilly Media.			
3) Melanie Swan, Blockchain: Blueprint for a New Economy, O'Reilly Media.			
4) Arshdeep Bahga and Vijay Madisetti, Blockchain Applications: A Hands-On Approach, VPT.			
5) Joseph J. Bambara and Paul R. Allen, Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, McGraw-Hill Education.			

DEC-4 Biometric Security

With effect from the Session: 2024-25

Part A - Introduction

Part A – Introduction			
Name of the Programme	MCA		
Semester	4 th		
Name of the Course	Biometric Security		
Course Code	M24-CAP-406		
Course Type	DEC-4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Objectives	This course introduces the fundamentals and practical applications of biometric technologies for secure identification and authentication. It covers key biometric modalities (physiological and behavioral), system processes (enrollment, verification, identification), and performance metrics. Students will explore multimodal systems, biometric security challenges (e.g., spoofing, liveness detection), and integration strategies. The course also addresses ethical, privacy, and interoperability issues, with real-world applications and an introduction to soft and DNA biometrics.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1. Understand the basics of biometric and its functionalities CLO-2 Understand and analyze biometric systems with different traits. CLO-3 Analyze the performance of biometrics by combining multiple traits and biometric sensors. CLO-4 Understand various Biometric security issues & Applications		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Biometric; Biometric technologies, Biometric Enrollment, Identification & Verification process, Biometric advantages, Different Biometric traits, characteristics of ideal biometric, Comparison of different biometrics, Accuracy in biometric systems; Error rates, Biometric deformations.	15
II	Physiological and Behavioral Biometric; Different Physiological and Behavioral Biometrics, Fingerprint, Face, Iris Introduction, Recognition, Feature extraction and matching, IRIS segmentation- normalization, Gait feature extraction, Hand geometry; Behavioral Biometrics: Introduction, Features, classification and properties of behavioral biometrics; Signature, Keystroke dynamics, Voice etc., merits and their demerits, soft biometrics.	15
III	Multimodal Biometrics and Biometric Sensors; Multimodal and Multi-biometric systems, Biometric Integration strategies, Architecture, Level of fusion, Training and adaptability, examples of multimodal biometric systems, Performance evaluation. Different types of Biometric sensors and their use; Biometric sensor interoperability.	15
IV	Biometrics Security and Applications; Biometrics Security; Biometric system challenges, Attack on biometric system, Liveness detection, Cancelable biometrics. Biometric standards, Applications of biometrics; Government sector, Commercial sector, Privacy in biometrics, Biometric Ethics and Technology usage, DNA Biometrics.	15
Total Contact Hours		60

Suggested Evaluation Methods

Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory	70
➤ Class Participation:	5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	10		

Part C-Learning Resources**Reference Books:**

1. Anil K. Jain, Arun Ross, and Karthik Nandakumar, "Introduction to Biometrics", Springer.
2. Anil K Jain, Patrick Flynn and Arun A Ross, "Handbook of Biometrics", Springer.
3. James Wayman, Anil Jain, Davide Maltoni, Dario Maio, "Biometric Systems, Technology Design and Performance Evaluation", Springer.
4. S.Y. Kung, S.H. Lin, M.W.Mak, "Biometric Authentication: A Machine Learning Approach" Prentice Hall.

With effect from the Session: 2024-25

Part A - Introduction

Name of the Programme	MCA		
Semester	4 th		
Name of the Course	Soft Computing		
Course Code	M24-CAP-407		
Course Type	DEC-4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course provides a comprehensive introduction to soft computing techniques, including fuzzy logic, neural networks, and evolutionary algorithms. It covers metaheuristic optimization methods such as PSO, ACO, and other bio-inspired algorithms. Students will learn fuzzy set theory, inference systems, and design of fuzzy controllers. The course also explores various neural network models and genetic algorithms for solving real-world optimization and classification problems. Emphasis is placed on applications, limitations, and emerging trends in soft computing.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Soft Computing and Optimization: Students will understand soft computing techniques and apply metaheuristic optimization methods to solve complex problems. CLO-2: Fuzzy Systems: Students will analyze fuzzy logic principles and implement fuzzy inference systems for decision-making. CLO-3: Neural Networks: Students will develop and apply neural network models for pattern recognition and machine learning. CLO-4: Genetic Algorithms: Students will design genetic algorithms and utilize evolutionary principles for optimization.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Soft Computing: Conventional AI to Computational Intelligence; Soft Computing Constituents and Applications. Introduction to Non-traditional Metaheuristic Optimization Techniques: Random Optimization, Simulated Annealing, Tabu Search, Ant Colony Optimization, Particle Swarm Optimization, Harmony Search, Memetic Algorithms, Other Evolutionary Algorithms such as Firefly Algorithm, Bee Algorithm, Shuffled Frog Leap algorithm, Bat algorithm etc.	15
II	Fuzzy Set theory: Fuzzy Sets & Classical Sets; Operations on Fuzzy Sets, Fuzzy Relations, Linguistic Variables. Membership Functions: Introduction, Features & Fuzzification, Methods of Membership Value Assignment; Defuzzification. Fuzzy Systems: Crisp Logic, Predicate Logic, Fuzzy Logic; Fuzzy Rule Base and Approximate Reasoning, Fuzzy Quantifiers; Fuzzy Inference Systems, Fuzzy Decision Making, Fuzzy Logic Control System; Fuzzy Expert Systems.	15
III	Neural Networks: Fundamental Concepts, Basic Models and Architecture; Machine Learning Using Neural Networks; Associative Memory Networks and their Applications. Supervised Learning Neural Networks: Perceptron Networks, Radial Basis Function Networks; Back Propagation Neural Network: Architecture, Learning, Applications, & Research Directions; The Boltzmann Machine. Unsupervised Learning Networks: Competitive Learning networks; Kohonen Self-Organizing Net-	15

	works; Hebbian learning; The Hopfield Network; Counter propagation Networks; Adaptive Resonance Theory: Introduction, Architecture, & Applications; Feed forward Networks; Reinforcement Learning.	
IV	Genetic Algorithms: Introduction to Genetic Algorithms and their Terminology; Traditional Optimization and Search Techniques vs Genetic Algorithm; Operators in Genetic Algorithms: selection, crossover, mutation; Problem Solving using Genetic Algorithm; Classification of Genetic Algorithms; Holland's Schemata theorem; Advantages and Limitations of Genetic Algorithm; Applications of Genetic Algorithm.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
➤ Class Participation:	5	Written Examination
➤ Seminar/presentation/assignment/quiz/class test etc.:	10	
➤ Mid-Term Exam:	15	
Part C-Learning Resources		
1) S. N. Sivanandam& S. N. Deepa, Principles of Soft Computing, Wiley - India. 2) Jyh Shing Roger Jang, Chuen Tsai Sun, Eiji Mizutani, Neuro Fuzzy and Soft Computing, Prentice Hall 3) S.Rajasekaran and G.A.VijayalakshmiPai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, Prentice-Hall of India Pvt. Ltd. 4) George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall. 5) George J. Klir, Ute St. Clair, Bo Yuan, Fuzzy Set Theory: Foundations and Applications Prentice Hall. 6) Simon O. Haykin, Neural networks: a comprehensive foundation, Pearson Education. 7) Mitchell Melanie, An Introduction to Genetic Algorithm, Prentice Hall 8) Goldberg D. E., Genetic Algorithms in Search, Optimization, and Machine Learning, Pearson Education. 9) Ahmad Lotfi, Jonathan Garibaldi, Applications and Science in Soft Computing, Springer. 10) Rajkumar Roy, Mario Koppen, Soft Computing and Industry: Recent Applications, Springer. 11) James A. Freeman, David M. Skapura, Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India. 12) Du, Ke-Lin, Swamy, M. N. S., Search and Optimization by Metaheuristics: Techniques and Algorithms, Springer 13) OmidBozorg-Haddad, Mohammad Solgi, Hugo A. Loaiciga, Meta-heuristic and Evolutionary Algorithms for Engineering Optimization, Wiley		

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	MCA		
Semester	4 th		
Name of the Course	Mobile Computing		
Course Code	M24- CAP -409		
Course Type	DEC-5		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	The objective of this course is to provide students with a solid foundation in the concepts, architecture, and technologies that drive mobile computing systems. The course explores the evolution of mobile communication, wireless networks, and mobile devices, highlighting the design and implementation of mobile applications in a distributed and heterogeneous environment. Students will gain insights into mobile operating systems, wireless transmission principles, cellular technologies, and security challenges associated with mobile environments. The course also addresses current trends in mobile platforms and development frameworks, enabling students to analyze, design, and build efficient and secure mobile computing solutions suited to modern business and societal needs.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Demonstrate an understanding of the fundamental concepts, architectures, and communication models of mobile computing, including various mobile and wireless communication technologies such as GSM, GPRS, 3G/4G, LTE, and mobile IP. CLO 2: Describe the Android platform architecture, development tools (SDK, AVD, DDMS), and the Android application lifecycle, and set up a basic Android development environment using Android Studio. CLO 3: Design and implement user interfaces for Android applications using various layout managers and UI components, and utilize intents for inter-component communication and interaction within applications. CLO 4: Develop Android applications that utilize services, fragments, location-based features, persistent storage mechanisms (internal, external, SQLite), and integrate third-party services such as Google Maps.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Mobile Computing: Concepts and scope, Features and applications of mobile computing, Mobile and wireless devices: smartphones, tablets, PDAs, Limitations and challenges of mobile environments, Wireless communication basics: signal propagation, multiplexing, modulation, Overview of mobile communication systems: GSM, GPRS, 3G/4G, LTE, Mobile computing architecture: Internet-based and satellite-based models, Wireless LAN architecture and mobile IP.	15
II	Introduction: Mobile Applications, Characteristics and Benefits, Application Models, Basics of Android, Importance and scope, Android Versions, Features of Android, Android Architecture, Android Stack, Android Applications Structure, Android Emulator, Android SDK, Overview of Android Studio, Android and File Structure, Android Virtual Device Manager, DDMS, LogCat, Understanding Activities (Activity Life Cycle).	15
III	Android User Interface: Measurements –Device and pixel density independent measuring units. Layouts –Linear, Relative, Grid and Table Layouts. User Interface (UI) Components –Editable and non-editable Text Views, Buttons, Radio and Toggle	15

	Buttons, Checkboxes, Spinners, Dialog and pickers, List View, Spinner View. Intents and Broadcasts: Intent –Using intents to launch Activities, Types of Intent, Passing data to Intents, using Intent to dial a number or to send SMS.	
IV	Services- Callbacks and Override in application, Application Signing, API keys for Google Maps, Publishing application to the Android Market. Fragments –Creating fragments, Lifecycle of fragments, adding, removing and replacing fragments with fragment transactions Location and Mapping: location based services, Google Maps activity Persisting Data to files: Saving to Internal Storage, Saving to External Storage Introduction to SQLite database: creating and opening a database, creating tables, content provider	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory 70
➤ Class Participation:	5	Written Examination
➤ Seminar/presentation/assignment/quiz/class test etc.:	10	
➤ Mid-Term Exam:	15	
Part C-Learning Resources		
Reference Books		
1) Raj Kamal, Mobile Computing, Oxford University Press.		
2) Asoke K. Talukder, Hasan Ahmed, and Roopa R. Yavagal, Mobile Computing: Technology, Applications and Service Creation, McGraw-Hill Education.		
3) Jochen Schiller, Mobile Communications, Pearson Education.		
4) Reto Meier and Ian Lake, Professional Android, Wrox.		
5) Wei-Meng Lee, Beginning Android Programming with Android Studio, Wiley.		

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	MCA		
Semester	4 th		
Name of the Course	Cloud Computing and IoT		
Course Code	M24- CAP -410		
Course Type	DEC-5		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course introduces the fundamentals of cloud computing and IoT, covering architectures, service models, virtualization, and enabling technologies. Students will explore cloud services, security, and compliance, as well as IoT components, communication protocols, and ecosystem design. Hands-on experience with platforms like Arduino and Raspberry Pi prepares students to build and manage cloud-integrated IoT systems for real-world applications.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1 Understand core issues of cloud computing and enabling technologies. CLO-2 Learn services provided on cloud computing platforms & security challenges. CLO-3 Understand concepts, architecture, applications & networking technologies of IoT. CLO-4 Learn IoT-oriented communication protocols and security concerns.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Cloud Computing: Definition and Characteristics of Cloud Computing, Evolution and Enabling Technologies, Benefits & Challenges, NIST Reference Architecture of Cloud Computing; Deployment Models, Service Models, Service Oriented Architecture (SOA). Virtualization: Virtualization and Its Role in Cloud Computing; Benefits & Drawbacks of Virtualization, Types of Virtualization, Server Virtualization, Hypervisor-Based Approaches, Virtualization Of - Operating System, Platform, CPU, Network, Application, Memory and I/O Devices.	15
II	Cloud Computing Services & Applications: Cloud Computing Platforms; Compute Services, Storage Services, Database Services, Applications Services, Queuing Services, E-Mail Services, Notification Services, Media Services, Content Delivery Services, Analytics Services, Deployment & Management Services, Identity & Access Management Services and their Case Studies. Cloud Security and Compliance: Security Challenges in The Cloud, Data Protection and Privacy, Compliance and Regulatory Issues.	15
III	Internet of Thing (IoT): Definition and Characteristics of IoT, Key Components of IoT (Sensors, Actuators, Devices). IoT Ecosystems and Architecture, Conceptual Framework, Common Applications of IoT. Modified OSI Model for IoT/M2M Systems, M2M Vs IoT. IoT Networking Technologies: NFC, RFID, Bluetooth BR/EDR and Bluetooth Low Energy, Zigbee, Wi-Fi.	15
IV	IoT Communication Technologies & Security Issues: Constrained Nodes, Constrained Networks, Types of Constrained Devices, Low Power and Lossy Networks. Security Issues and Challenges in IoT. IoT Protocols – 6LoWPAN, QUIC Protocol; Data Protocols - MQTT, MQTT-SN, CoAP, AMQP. Introduction to Arduino and Raspberry Pi Boards.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70

➤ Theory	30	➤ Theory	70
➤ Class Participation:	5	Written Examination	
➤ Seminar/presentation/assignment/quiz/class test etc.:	10		
➤ Mid-Term Exam:	15		

Part C-Learning Resources

Textbook

- 1) Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing – Principles and Paradigms, Wiley India Pvt. Ltd.
- 2) Sudip Misra, Anandarup Mukherjee, Arijit Roy, Introduction to IOT, Cambridge
- 3) Arshdeep Bahga, Vijay Madisetti, Cloud Computing – A Hands-on Approach, University Press.
- 4) Raj Kamal, Internet of Things - Architecture and Design Principles, McGraw Hills

Reference Books

- 1) Mayur Ramgir, Internet of Things – Architecture, Implementation and Security, Pearson
- 2) Kai Hwang, Geoffrey C.Fox, and Jack J. Dongarra, Distributed and Cloud Computing, Elsevier India Private Limited
- 3) Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud computing: A practical Approach, McGraw Hill
- 4) Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on Approach), VPT

With effect from the Session: 2024-25**Part A - Introduction**

With effect from the Session: 2024-25			
Part A - Introduction			
Name of the Programme	MCA		
Semester	4 th		
Name of the Course	Principles of Programming Languages		
Course Code	M24-CAP-411		
Course Type	DEC-5		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	-		
Course Objectives	This course offers a foundational understanding of programming languages, covering their evolution, paradigms, and core components. Topics include formal language theory, parsing, language semantics, type systems, and program verification. Students will explore object-oriented concepts, control structures, memory management, and advanced features like parallel programming and scripting languages, gaining both theoretical and practical insights.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO I: Students will be able to analyze the structure and translation of programming languages using formal methods such as BNF grammars and recursive descent parsing, and understand the role of translators and binding times in language implementation. CLO II: Students will understand the theoretical foundations of programming languages through the Chomsky hierarchy, and be able to design and interpret finite state automata and context-free grammars while applying semantic models like attribute grammars and denotational semantics. CLO III: Students will be able to implement and compare object-oriented concepts such as abstract data types, inheritance, and polymorphism, and evaluate various sequence control mechanisms used in modern programming languages. CLO IV: Students will understand and apply different parameter passing techniques, memory management strategies, and scoping rules, and explore advanced programming topics such as parallelism, exception handling, scripting languages, and distributed processing.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Preliminaries: History, Impact of Programming Paradigms, Role of Programming Languages, Good Language, Effects of Programming Environment, Translators and virtual architectures, Binding and Binding time, Language Syntax, Analysis of Program, Synthesis of Object program, Formal translation models: BNF Grammars, General parsing, Language translation, Recursive descent parsing.	15
II	Formal languages and automata: The Chomsky hierarchy of formal languages, regular grammars, Regular expressions, Finite State Automata, Context-free grammars, Pushdown automata, Ambiguous grammars. Language Semantics: Attribute grammars, Denotational semantics, Program verification and validation, Data objects, variables, constants, data types, declaration, type checking, type casting, type promotion, Enumerators, Composite data types.	15
III	Object Orientated concepts: Structured data types, Abstract data types, Information hiding, Subprogram concepts, Good program design, Type definitions, Type equivalence, Inheritance, Derived classes, Abstract classes, Polymorphism, Inheritance and software reuse. Sequence control: Implicit and explicit sequence control, Sequence control within arithmetic expressions, sequence control between statements, sequencing with non-arithmetic expressions, Subprogram Sequence	15

	control.	
IV	Miscellaneous topics: Parameter passing techniques, Static & Dynamic Scoping, Storage of variables, Static storage, Heap Storage management, Distributed Processing, Exceptions and Exception handlers, Co-routines, Scheduled subprograms, Parallel programming, Processor design, Hardware and Software architectures, Network Programming, Evolution of scripting languages, Applets, XML.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory70
➤ Class Participation:	5	Written Examination
➤ Seminar/presentation/assignment/quiz/class test etc.:	10	
➤ Mid-Term Exam:	15	
Part C-Learning Resources		
1) Pratt T.W., Zelkowitz M.V., Gopal T.V., Programming Languages Design and Implementation, Pearson Education. 2) Sebesta W. Robert, Concepts of Programming Languages, Pearson Education. 3) Appleby Doris & VandeKopple J. Julius, Programming Languages-Paradigm and practice, Tata McGraw Hill. 4) Sethi Ravi, Programming Languages: Concepts & Constructs, Pearson Education 5) Scott M., Programming Language Pragmatics, Elsevier India.		

Part A - Introduction

Name of Programme	MCA		
Semester	4 th		
Name of the Course	Cyber Security Fundamentals		
Course Code	M24-CAP-413		
Course Type	EEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	None		
Course Objectives	The objective of this course is to introduce students to the fundamental concepts, principles, and practices of cyber security. It aims to develop a foundational understanding of cyber threats, vulnerabilities, attack types, and security mechanisms. The course covers a broad spectrum of topics including system and network security, cryptographic techniques, risk management, cyber laws, and ethical practices. Students will learn about current trends in cyber attacks and the defensive techniques used to secure data, applications, and infrastructure in both individual and organizational contexts. The course emphasizes a practical understanding of security tools and techniques, fostering the skills necessary to protect information systems and ensure confidentiality, integrity, and availability of digital assets.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to explain the key concepts of cyber security, identify common types of cyber threats, and understand the foundational principles of securing digital systems. CLO 2: Students will demonstrate knowledge of cryptographic techniques and security mechanisms used to ensure data confidentiality, integrity, and secure communication. CLO 3: Students will analyze system and network security vulnerabilities and apply basic security measures to protect digital infrastructure. CLO 4: Students will understand the legal and ethical aspects of cyber security and recognize current trends and professional opportunities in the field.		
Credits	Theory	Tutorial	Total
	2		2
Teaching Hours per week	2		2
Internal Assessment Marks	15		15
End Term Exam Marks	35		35
Max. Marks	50		50
Examination Time	3		3

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Cyber Security: Importance of cyber security in the digital era, objectives and scope, fundamental concepts such as assets, threats, vulnerabilities, risk, attack vectors, and security controls. Types of cyber attacks: malware, phishing, social engineering, denial of service, ransomware, man-in-the-middle attacks. Principles of cyber defense and the CIA triad (confidentiality, integrity, availability).	8
II	Security Mechanisms and Cryptography: Authentication methods, password policies, access control models, firewalls, intrusion detection and prevention systems (IDPS), virtual private networks (VPNs), antivirus tools. Basics of cryptography: symmetric and asymmetric encryption, digital signatures, hashing algorithms, key management, public key infrastructure (PKI), and applications of cryptography in securing data.	7

III	Network and System Security: Security issues in operating systems and applications, endpoint security, patch management, secure configuration, wireless network security, securing web applications, browser security, and email security. Network security architecture, IP security, and secure communication protocols such as SSL/TLS and HTTPS.	8
IV	Cyber Laws, Ethics, and Emerging Trends: Overview of cyber laws in India and global regulations (IT Act, GDPR), ethical hacking, digital forensics, data privacy and governance. Introduction to security frameworks and standards (ISO 27001, NIST, OWASP). Emerging cyber threats in IoT, cloud computing, AI, and social media.	7
Total Contact Hour		30
Suggested Evaluation Methods		
Internal Assessment: 15		End Term Examination: 35
➤ Theory	15	➤ Theory: 35
➤ Class Participation:	4	Written Examination
➤ Seminar/presentation/assignment/quiz/class test etc.:	4	
➤ Mid-Term Exam:	7	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1) William Stallings, Network Security Essentials: Applications and Standards, Pearson Education.		
2) Nina Godbole and Sunit Belpure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India.		
3) Chuck Easttom, Computer Security Fundamentals, Pearson Education.		
4) Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill Education.		
5) Rao B. Ramesh and Govindarajulu, Cyber Security Fundamentals, Wiley.		

With effect from the Session: 2024-25

Name of Programme	MCA
Semester	4 th
Name of the Course	Dissertation / Project
Course Code	M24-CAP-414
Course Type	Dissertation / Project
Level of the course	500-599
Pre-requisite for the course (if any)	
Course Objectives	The objective of the Dissertation/Project course is to provide the students with an opportunity to undertake an in-depth investigation of a contemporary research problem or to apply their knowledge and skills in a real-world industrial setting. The course is designed to develop independent research aptitude, analytical and problem-solving skills, and the ability to design and implement effective computational solutions. Students may choose to work on a research-oriented topic leading to a dissertation report, or on an industry-based project culminating in a project report. The emphasis is on fostering innovation, critical thinking, technical competence, and professional reporting and presentation skills, thereby preparing students for higher research, entrepreneurial ventures, or responsible professional roles in the IT industry.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Demonstrate the ability to identify, formulate, and analyze a research problem or industrial requirement in the domain of computer applications. CLO2: Apply advanced concepts, tools, and methodologies to design and implement effective computational solutions. CLO3: Develop independent research, project management, and technical documentation skills with professional standards. CLO4: Present findings and outcomes effectively through a well-structured dissertation/project report and oral defense before experts.
Credits	12
Max. Marks	300

Guidelines for Examiners for Dissertation:

1. Relevance of Topic – Assess whether the chosen problem/project is significant, original, and relevant to the field of Computer Applications.
2. Literature Review & Problem Formulation – Evaluate the depth of background study, clarity in objectives, and problem definition.
3. Methodology & Technical Content – Examine the appropriateness of research methods, tools, algorithms, and technologies employed.
4. Implementation & Results – Assess the quality of system design, implementation, experiments conducted, and accuracy/reliability of results.
5. Report Quality – Assess organization, clarity, formatting, referencing, and overall technical writing of the dissertation/project report.
6. Originality & Innovation – Look for independent thinking, novelty of the solution, and avoidance of plagiarism.
7. Viva-Voce / Presentation – Evaluate student's understanding, ability to defend work, and clarity in oral communication.

Guidelines for Examiners (Industrial Project Evaluation)

1. Problem Identification & Industry Relevance: Assess whether the project addresses a real-world industrial problem and its relevance to current practices/technologies.
2. Project Objectives & Scope: Evaluate clarity of objectives, scope definition, and alignment with industry requirements.
3. System Design & Methodology: Examine the design models, architecture, frameworks, and tools used for problem-solving.
4. Assess quality of coding, integration, testing, and overall execution of the project.
5. Assess clarity, completeness, and professionalism of the project report, including industry-specific standards followed.
6. Viva-Voce / Presentation: Evaluate student's ability to present the project, explain technical decisions, and respond to queries confidently.

ZOOLOGY:SEMESTER-VII

Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
For Honours in Zoology/ Honours with Research in Zoology	CC-H1 4credit	B23-ZOO-701	Advances of Cell Biology	4	4	30	70	100	3hrs.

Level of the course: **400-499**

Pre-requisite for the course(if any): **Zoology as single major in 3 years UG**

Course Learning Outcomes(CLO)

1. This core course will make students able to understand how the cell functions as a unit of life.
2. Through this course, students will be able to appreciate the importance of various cell function and structures in the evolution of multi cellular organisms.
3. The studies will make the students reveal elegance, dynamics and economy in the living cell and a gratifying unity in the principles by which a cell functions.
4. The students will know about the basic cellular and molecular approaches for cancer development and treatment.

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	1. Bio membranes 1.1 Molecular composition and arrangement, functional consequences 1.2 Cellular Transport – Recapitulation of the plasma membrane; diffusion, active transport and pumps, uniports, symports and antiports. 1.3 Donnan equilibrium; ion movements and cell function: acidification of cell organelles 1.4 Maintenance of cellular pH; cell excitation; bulk transport; Receptor mediated endocytosis 1.5 Trans epithelial transport 2. Cytoskeleton and cell movement 2.1 Introduction to cytoskeleton and its role 2.2 Molecular structure of Actin, myosin and their organisation 2.3 Structure and dynamic organizations of microtubules and microfilaments 2.4 Microtubule motors and movement 2.5 Intermediate filaments 2.6 Role of Centrioles and basal bodies 2.7 Structure and functions of Cilia and flagella	15
II	3 The Extra Cellular Matrix and Cell interactions 3.1 Cell walls 3.2 The E C M and cell-matrix interactions 3.3 Cell-cell interactions: adhesion junctions, tight junctions, gap junctions, plasmodesmata 3.4 Ca ⁺⁺ dependent and Ca ⁺⁺ independent Homophilic cell-cell adhesion 4 Cell matrix adhesion 4.1 Integrins 4.2 Collagen 4.3 Non-collagen components 4.4 Auxin and cell expansion 4.5 Cellulose fibril synthesis and orientation 5 Protein sorting and transport 5.1 Protein uptake into the ER 5.2 Membrane proteins and Golgi sorting 5.3 Mechanism of vesicular transport 5.4 Lysosomes 5.5 Molecular mechanism of secretory pathway	15

III	6	Cell cycle 6.1 Eukaryotic cell cycle 6.2 Regulators of cell cycle progression 6.3 Role of Meiosis in Genetic Variation	15	
	7	Cell–Cell signaling 7.1 Signaling molecules and their receptors 7.2 Pathways of intracellular signal transduction		
	8	Biology of Cancer 8.1 The development and causes of cancer 8.2 Oncogenes 8.3 Tumor suppressor genes 8.4 Molecular approaches to cancer treatment		
IV	9	Genome organization 9.1 Chromosomal organization of genes 9.2 Transposons in prokaryotes and eukaryotes 9.3 Morphological and functional elements of eukaryotic chromosomes	15	
	10	Cell Death 10.1 Necrosis and Programmed cell death 10.2 Molecular Mechanism 10.3 Applications and Significance		
	11	Biology of Ageing 11.1 Morphological, Physiological and Functional changes during Ageing 11.2 Telomeres and Ageing 11.3 Theories of Ageing		
Total Contact Hours			60	
Suggested Evaluation Methods				
Internal Assessment: 30		End Term Examination: 70		
➤ Theory		30	➤ Theory:	70
• Class Participation:		5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:		10		
• Mid-Term Exam:		15		
Part C-Learning Resources				
Recommended Books/e-resources/LMS:				
1. Molecular Cell Biology ,J. Darnell, H.Lodish and D.Baltimore ScientificAmerican Book,Inc., USA.				
2. Molecular Biology of the Cell,B.Alberts,D.Bray,J.Lewis,M.Raff,K.RobertsandJ.D.Watson.Garland Publishing Inc., New York.				
3. Cell and molecular biology Phillip Sheeler,Donald E.BianchiWiley,1987				
4. Life: The Science of Biology by David Sadava				
5. Cell and Molecular Biology by De Robertis				
6. Cell Biology by A.K.Berry, EMKAY Publications				
7. Molecular Cell Biology, Lodish et al.,W.H. Freeman and Company (8thEd.2016)				
8. Molecular Biology, Weaver R. F.,Mc Graw-Hill Education(5thEd. 2011)				

ZOOLOGY: SEMESTER-7 (FOR HONOURS/HONOURS WITH RESEARCH IN ZOOLOGY)									
Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
For Honours in Zoology/ Honours with Research in Zoology	CC-H2 4credit	B23-ZOO-702	Biochemistry and Bio-techniques	4	4	30	70	100	3hrs.
Level of the course: 400-499									
Pre-requisite for the course(if any): Zoology as single major in 3 years UG									
Course Learning Outcomes (CLO): Students will be able to understand A basic knowledge of the underlying principles and practical strategy of the analytical and preparative techniques that are fundamental to study and understanding of life processes. - The general reactions of various metabolic pathways. - The principle, working, materials used and applications of various biological techniques that are used to study the basic biological processes. - The underlying description of the structure and classification of bio molecules.									
Instructions for Paper-Setter - Nine questions will be set in all. All questions will carry equal marks. - Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No.1 and four more questions selecting one question from each unit.									
UNIT	TOPICS							CONTACT HOURS	
I	1.0 General Principles of Biochemistry and chemical composition of life 1.1 General Introduction to Bio molecules 2.0 Protein Biology: 2.1 Primary, Secondary, tertiary and quaternary structure of proteins : i) Domain, ii) Ramachandran plot and its significance 3.0 Enzyme: 3.1 Classification and nomenclature, 3.2 Co-enzymes and Cofactors 3.3 Induced fit and Molecular Mechanism of Enzyme action, 3.4 Enzyme feedback mechanism, Isozymes. 4.0 Nucleic acids: Structure and Functions 4.1 DNA structure and functions 4.2 RNA structure and functions, 4.3 DNA choreography 4.4 Qualitative and quantitative estimation of DNA							15	
II	5.0 Metabolism: 5.1 Glycolysis, citric acid cycles its regulation and role as metabolic hub. 5.2 Hexose monophosphate pathway its regulation and significance. 5.3 Cholesterol biosynthesis, its metabolism and steroidogenesis. 5.4 Bile acids and their metabolism 5.5 Saturated and unsaturated fatty acid and their metabolism.							15	

III	6.0 Chemical and Biological assays(<i>in vitro</i> and <i>in vivo</i> assays). 7.0 Principles and uses of analytical instruments: 7.1 Microscopes and imaging 7.2 Spectrophotometers, 7.3 NMR spectrophotometer 8.0 Microbiological and cell culture Techniques 8.1 Setting of microbiological laboratory, 8.2 Sterilization and Media preparation techniques 8.3 Inoculation and growth monitoring (Standard plate count technique), 8.4 Isolation of a microbial colony and slant preparation. 8.5 Design and functioning of tissue culture laboratory, 8.6 Basics of cell/tissue culture, Culture media preparation, 8.7 Cell proliferation measurements 8.8 Cell viability testing and Cell harvesting methods. 8.9 Bio safety levels 9.0 Cryotechniques: 9.1 Cryopreservation for cells, tissue, organisms 9.2 Cryotechniques for microscopy.	15
IV	10.0 Separation techniques in biology. 10.1 Molecular separations by chromatography, electrophoresis, precipitation etc. 10.2 Organelle separation by centrifugation. Density gradient centrifugation, Ultra Centrifugation, unit gravity centrifugation, affinity adsorption, anchorage based techniques etc. 10.3 Cell separation by flowcytometry and FACS 11.0 Radio isotope and mass isotope techniques in biology: 11.1 Carbon dating and radioactive counting 11.2 Autoradiography 11.3 Biosensors 12.0 DNA fingerprinting	15
	Total Contact Hours	60
Suggested Evaluation Methods		
Internal Assessment: 30 > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 10 • Mid-Term Exam: 15		End Term Examination: 70 > Theory • Written Examination
Learning Resources		
1. Animal Cell Culture—A practical approach, Ed. John R.W. Masters, IRL Press. 2. Introduction to Instrumental analysis, Robert Braun, McGraw Hill International editions 3. A Biologists guide to Principles and Techniques of Practical Biochemistry, K.Wilson and K.H. Goulding, ELBS Edn. 4. Lehninger AL, Nelson DL & Cox MM (1993) Principles of Biochemistry, 2nd edn. New York: Worth. 5. Stryer L (1995) Biochemistry, 4th edn. New York: W H Freeman. 6. Voet D, Voet J G & Pratt C W (1999) Fundamentals of Biochemistry. New York: Wiley.		

ZOOLOGY:SEMESTER-VII

Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
For Honours in Zoology/ Honours with Research in Zoology	CC-H3 4credit	B23-ZOO-703	Structure and Function of Invertebrates	4	4	30	70	100	3hrs.

Level of the course: **400-499**

Pre-requisite for the course (if any): **Zoology as single major in 3 years UG**

Course Learning Outcomes (CLO)

- The study of invertebrates reveals progressive evolutionary history and adaptations together which forms the basis of huge complex and diverse life forms.
- Students will acquire a clear understanding about organization of minor phyla and their relationship with other animal phyla
- Students will be able to know the structure and significance of various systems of Invertebrates
- Will have detail understanding of adaptations and significance of Invertebrates

Instructions for Paper-Setter

- Nine questions will be set in all. All questions will carry equal marks.
- Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	1.0 Introduction to invertebrates with their general characters, Basic body plan, Concept of Invertebrate v/s Vertebrata and Non-Chordata v/s Chordata 2.0 Organization of coelom 2.1 Concept and structure of Acoelomate, Pseudo coelomates and Coelomates. 2.2 Protostomia and Deuterostomia 2.3 Metamerism in Annelida, Pseudometamerism. 3.0 Minor Phyla: 3.1 Concept and significance 3.2 Organization and general characters of Acoelomate, Pseudo coelomates and Coelomates minor phyla (with special emphasis on Ctenophora, Rotifera, Endoprocta, Ectoprocta, Phoronida, Sipunculida and Echiuroidea).	15
II	4.0 Locomotion 4.1 Flagella and ciliary movement in Protozoa 4.2 Hydrostatic movement in Coelenterata, Annelida and Echinodermata 5.0 Nutrition and Digestion 5.1 Patterns of feeding and digestion in lower metazoa 5.2 Filter-feeding in Polychaeta, Mollusca and Echinodermata 6.0 Respiration 6.1 Organs of respiration: Gills, lungs, trachea, skin, Cloacal chamber, Bucco pharyngeal area etc. 6.2 Respiratory pigments 6.3 Mechanism of respiration	15
III	7.0 Excretion 7.1 Organs of excretion: Coelom, coelomoducts, Nephridia and Malpighian tubules. 7.2 Mechanism of excretion and osmoregulation 8.0 Nervous system 8.1 Primitive nervous system: Coelenterata and Echinodermata 8.2 Advanced nervous system: Annelida, Arthropoda (Crustacea and Insecta) and Mollusca (Cephalopoda). 8.3 Trends in neural evolution.	15

	9.0	Social life in insects, Social life in Isoptera and Hymenoptera	
IV	10.0	Invertebrate larvae	15
	10.1	Larval forms of free living invertebrates	
	10.2	Strategies and Evolutionary significance of larval forms	
	10.3	Conservation of invertebrates.	
	11.0	Introduction to insects	
	11.1	Mouthparts of Insects	
	11.2	Mechanism of insect flight and hovering	
	11.3	Metamorphosis in insects	
	11.4	Hormonal control of moulting.	
	12.0	Economic importance of Invertebrates; Various Adaptations in Invertebrates	
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment:30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Hyman,L.H. The invertebrates, Vol.I. Protozoa through Ctenophora, Mc GrawHil lCo., NewYork.			
2. Barrington,E.J.W. Invertebrate structure and function. Thomas Nelson and Sons Ltr J.London.			
3. Jagerstein,G. Evolution of Metazoan life cycle, Academic Press, New York &London.			
4. Barnes,R.D. Invertebrate Zoology, 3 rd edition.W.B.SaundrsCo.,Philadelphia.			
5. Russel-Hunter,W.D. A Biology of higher invertebrates, theMacmillinCo.Ltd.London.			
6. Hyman,L.H.the Invertebratessmaller coelomate groups,Vol. V. Mc GrawHillCo., NewYork			
7. Read, C.P. Animal Parasitism. PrenticeHallInc.,NewJersey.			
8. Sedgwick,A.A. Student text book of Zoology. Vol.I,II and III CentralBookDepot, Allahabad			
9. Parker,T.J.,Haswell,W.A. Textbook of Zoology, McMillanCo., London.			

ZOOLOGY: SEMESTER-VII									
Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
For Honours in Zoology/ Honours with Research in Zoology	DSE-H1 4 credit (option 1)	B23-ZOO-704	Biosystematics and Biostatistics	4	4	30	70	100	3hrs.
Level of the course: 400-499									
Pre-requisite for the course (if any): Zoology as single major in 3 years UG									
Course Learning Outcomes(CLO): Students will be able to understand: 1. Knowledge of Taxonomy helps in classifying and identifying biodiversity and biologist study the well understood relationships by making phylogenetic trees. 2. It will help to understand the overall biodiversity of the world and their application in all the fields of biological sciences. 3. Biostatistics helps to generate a hypothesis from a set of observation and then design experiment to test the hypothesis. 4. Able to acquire, analyze and understand the significance of data.									
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No.1 and four more questions selecting one question from each unit.									
UNIT	TOPICS						CONTACT HOURS		
I	1.0 Biosystematics and taxonomy: Definition and perspectives, 2.0 Historical resume, Importance and applications of systematics in biology. 2.1 Concepts of newer aspects of biosystematics: Chemotaxonomy, Cytotaxonomy, Molecular taxonomy. 3.0 Dimensions of speciation and taxonomic characters: 3.1 Different Species concepts – species category, 3.2 Sub-species and other intra-specific categories. 4.0 Theories of biological classification, hierarchy of categories. 5.0 Taxonomic characters – different kinds, weighing of characters						15		
II	6.0 Methodology: 6.1 Taxonomic collections, preservation, curation process and identification. 6.2 Taxonomic keys-different kinds of taxonomic keys, their merits and demerits. 7.0 Systematic publications: 7.1 Different kinds of publications. 7.2 International code of Zoological Nomenclature (ICZN): principles, objectives and rules: Stability, Priority, Concept of availability, formation of names, synonymy, homonymy, the type method, kinds of type specimen, type-designation: 8.0 Principles of Bioethics in Biodiversity						15		
III	9.0 Measures of central value: 9.1 Arithmetic mean, mode and median, Definition, calculation and its properties. 10.0 Measures of Dispersion: 10.1 Range, Interquartile range, 10.2 Quartile deviation. 10.3 Mean deviation and standard deviation, 10.4 Standard error						15		

	11.0 Correlation: 11.1 Types and Methods studying correlation – Scatter diagram method, Graphic method, Karl Pearson coefficient of correlation, Rank correlation. 12.0 Regression analysis (Regression lines and regression equation) 13.0 Chi-square analysis	
IV	14.0 Concept of sampling and sampling methods: 14.1 Definition and law of sampling, 14.2 Judgment sampling, Random sampling, stratified sampling, systematic sampling, multi-stages sampling and quota sampling. 15.0 Test of significance for large samples and small samples (student t-test, F- test; ANOVA). 16.0 Probability and law of probability, Theoretical probability distribution: Binomial distribution, Poison distribution, Normal distribution. 17.0 Components of computers, Basic functioning of computers, Use of Statistical Software in Biology	15
	Total Contact Hours	60
Suggested Evaluation Methods		
Internal Assessment: 30 > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 10 • Mid-Term Exam: 15		End Term Examination: 70 > Theory • Written Examination
Learning Resources		
1. M. Kato. The Biology of Biodiversity, Springer. 2. E.O. Wilson, Biodiversity, Academic Press, Washington. 3. G.G. Simpson, Principle of animal taxonomy, Oxford ISH Publishing Company. 4. E. Mayer, Elements of Taxonomy. 5. E.O. Wilson, The Diversity of Life (The College Edition), W.W. Northerm & Co. 6. Fundamental of statistics by S.C. Gupta. Himalayan Publishing House 7. Elements of Biostatistics. By Satguru Prasad. Rastogi Publication.		

ZOOLOGY: SEMESTER-VII									
Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
For Honours in Zoology/ Honours with Research in Zoology	DSE-H1 4 credit (option 2)	B23-ZOO-705	Computational Biology	4	4	30	70	100	3 hrs.
Level of the course: 400-499									
Pre-requisite for the course (if any): Zoology as single major in 3 years UG									
Course Learning Outcomes (CLO) 1. Students will be able to describe basic components of computer hardware and software 2. Students will be able to access Working with MS Excel, MS Word and MS power point. 3. Students will be able to describe about computational statistics. 4. Students will be able to understand the bioinformatics techniques of data handling and processing.									
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.									
UNIT	TOPICS							CONTACT HOURS	
I	Basic components of Computer: Hardware, CPU, input devices, output devices). Computer Memory, concepts of computing. Software: Basics of Operating system and its utilities., Application Software, word Processing, introduction to MS excel, Use of worksheet to enter Data, edit data, copy data, move data. Graphical tools in excel for data presentation, Various Formula and functions.							16	
II	MS-word processor-editing, copying, formatting, table insertion, flow charts. Working with MS Powerpoint, Data handling and image Processing. Internet, Search engines, Web browser. E-governance websites, Working with arc GIS, Working with Google Earth Pro, USGS.QGIS , GPS KIT. UTM converter. Working with software like DISTANCE, PREFER., RAVEN.							16	
III	Use of in-built statistical functions for computation of mean, S.D, correlation and regression coefficient, correlation, regression coefficient, ANOVA, PCA, Confidence Interval, Chi square test, Z-test, T-test, F-Test.. Computational use of histogram, bar diagram, scatter plot. Statistical errors. Data handling, Image processing.							16	
IV	Introduction to Bioinformatics, Introduction to computational genomics and proteomics. Basics of Microarray and Image analysis. Basics of Molecular Modelling. Biological Data base, Primary , Secondary and composite database, Protein and Nucleic Acid Data base.							16	
Suggested Evaluation Methods									
InternalAssessment: 30 ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 10 • Mid-Term Exam: 15						End Term Examination: ➤ Theory • Written Examination: 70			
Learning Resources									
1. Kelley, S.T., & Didulo, D. (2018) Computational Biology: A Hyper text book (ASM Books). ASM press. 2. Low,L & Tammi, M (2017) Bioinformatics: A Practical hand book of next generation , sequencing and applications. World scientific publishing cooperation. 3. Ghosh, Z and Mallick, B 92008) Bioinformatics, principles and application. Oxford Universty Press.									

ZOOLOGY: SEMESTER-VII

Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
For Honours in Zoology/ Honours with Research in Zoology	PC-H1 4 credit	B23-ZOO-706	Practical Based on B23-ZOO-701 TO 704/705	4	8	30	70	100	6 hrs.

Level of the course: 400-499

Pre-requisite for the course (if any): **Zoology as a Subject at B.Sc. Level**

Course Learning Outcomes (CLO)

- Students will develop skills in basic laboratory techniques and understand the principles in Biology.
- Students will be able to apply the scientific method to the process of experimentation.
- This course will make students able to understand the regulation of chemical reactions in living cells.
- Students will be able to understand the computational biology and techniques of data handling and processing.

Course Content	TOPICS		CONTACT HOURS
	1. Preparation of mitotic chromosomes from onion root tips. 2. Preparation of meiotic chromosomes from grasshopper testes. 3. Preparation of karyotypes from micrographs. 4. Calculation of morphometric data and preparations of idiogram. 5. Study of permanent slides of different stages of meiosis and mitosis. 6. Proteins: Quantitative estimation of proteins by Biuret method and Lowry’s method. 7. Carbohydrates: quantitative estimation of total carbohydrates and glucose 8. Analysis of Fats/Oils: iodine number, saponification value,acid value quantitative estimation of total lipids. 9. Paper chromatography:amino acids and carbohydrates. 10. Tools: demonstration of parts and working of the following tools: PCR, GLC, Spectrophotometers, various kinds of microscopes, pH meter, Electrophoresis, Centrifuges, Tissue culture unit, Incubators 11. Slides and Museum specimens of phylum Protozoa to Hemichordata 12. Study of various types of Larvae of class Insecta. 13. Study of various types of larvae of class Crustacea. 14. Identification and study of various types of Mouth parts in class insecta.		120 Hrs
	DSE-H1 (option 1) 15. Preparation and use of different types of taxonomic keys. 16. Statistical analysis of data using manual and computer software methods	DSE-H1 (option 2) 15. Use of Search engines like scopus Science direct of collection of reference material. 16. Use of GIS software like ARCGIS, Google earth pro etc	

Suggested Evaluation Methods

Internal Assessment: 30 > Practicum - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 10 - Mid-Term Exam: 15	End Term Examination: 70 > Practicum Lab record, Viva-Voce, Execution of the practical Write up

Learning Resources

- Sharma R K, Sangha S P S (2009). Basic Techniques in Biochemistry and Molecular Biology, I.K. International Publishing House Pvt. Ltd. New Delhi
- Podder T, Mukhopadhyay S, Das SK (2003). An Advanced Laboratory Manual of Zoology Published by Rajiv Beri for Macmillan India Limited, Rajkamal Electric Press, Delhi
- Sadasivam S, Manickam A (1997). Biochemical Methods, Ed. 2nd, New Age International Publishers, New Delhi
- David T. Plummer (1987). An Introduction to Practical Biochemistry. Ed., 3rd, McGraw-Hill Publisher, Rajkamal Electric Press, Delhi

ZOOLOGY:SEMESTER-VIII										
Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration	
Honours in Zoology	CC-H4 4 credit	B23-ZOO-801	Structure and Function of Vertebrates	4	4	30	70	100	3hrs.	
Level of the course: 400-499										
Pre-requisite for the course(if any): Zoology as single major in 3 years UG										
Course Learning Outcomes (CLO)										
1. Students will be able to understand various biological functions, the evolution of life from most primitive to most advanced form with respect to their habit and habitat.										
2. Students will have acquaintance with the basic concepts, external morphology and sexual dimorphism in chordates and understand the various systems, adaptation and dentition in chordates.										
3. Students will also Understand the Classification various classes of phylum Chordate i.e., Pisces, Reptiles, Aves and Mammals.										
4. This course will make students familiarize with the vertebrate diversity around them										
Instructions for Paper-Setter										
1. Nine questions will be set in all. All questions will carry equal marks.										
2. Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.										
UNIT	TOPICS								CONTACT HOURS	
I	1.0	Introduction to Chordates with their general characters.								15
		1.1 Origin of Chordates 1.2 Concept of Proto chordata or pre-vertebrates 1.3 Classification of Vertebrates up to orders								
	1.0	Integument and its derivatives								15
		1.1 Development, general structure and functions of skin and its derivative 1.2 Glands, scales, horns, claws, nails, hoofs, feathers and hair								
II	3.0	Skeletal system								15
		3.1 Form, function, body size and skeletal elements of the body 3.2 Comparative account of jaw suspensorium, Vertebral column 3.3 Limbs and girdles								
	4.1	Digestive system								15
		4.1 Dentition, Stomach, Digestive Glands 4.2 Anatomy of gut in relation of to feeding habits- herbivores, carnivores and omnivores.								
	5.0	Respiratory system								15
		5.1 Characters of respiratory tissue, Internal and External Respiration 5.2 Comparative account of respiratory organs								
III	6.0	General plan of circulation in various groups								15
		6.1 Components of Blood 6.2 General plan of circulation in reptiles, birds and mammals 6.3 Evolution of heart, aortic arches and Portal systems								
	7.0	Evolution of Urino-genital system in vertebrate series								15
		7.1 Structure and functions of different types of kidney 7.2 Urino-genital ducts 8.0 Flight adaptation in birds, Migration in fish and Birds								
IV	8.0	Nervous system								15
		8.1 Comparative anatomy of the brain in relation to its functions 8.2 Comparative anatomy of spinal cord 8.3 Nerves-Cranial, Peripheral and Autonomous nervous systems								
	9.0	Sense organs								15
		9.1 Simple receptors 9.2 Organs of Olfaction and taste 9.3 Lateral line system								

	9.4	Electroreception	
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment:30		EndTermExamination:70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
RecommendedBooks/e-resources/LMS:			
1. Barrington, E.J.W. The Biology of Hemichordata and Protochordata .Oliver and Boyd, Edinbough.			
2. Bourne,G.H.The structure and functions of nervous tissue. Academic Press, New York.			
3. Carter,G.S. Structure and habit invertebrate evolution-Sedgwick and Jackson, London.			
4. Kingsley,J.S. Outlines of Comparative Autonomy of Vertebrates. Central Book Depot, Allahabad.			
5. Kent, C.G. Comparative anatomy of vertebrates.			
6. Milton Hilderbrand. Analysis of vertebrate structure. IV. Ed. John Wiley and Sons Inc., NewYork.			
7. Sedgwick,A. A Students Text Book of Zoology, Vol. II.			
8. Torrey,T.W. Morphogenesis of vertebrates. John Wiley and Sons Inc., New York and London.			
9. Walters,H.E. and Sayles, L.D. Biology of vertebrates. MacMillan &Co. ,NewYork.			

ZOOLOGY:SEMESTER-VIII

Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
Honours in Zoology	CC-H5 4credit	B23-ZOO-802	Comparative Physiology	4	4	30	70	100	3hrs.

Level of the course: **400-499**

Pre-requisite for the course (if any): **Zoology as single major in 3 years UG**

Course Learning Outcomes (CLO)

1. An appropriate understanding of functioning of each system of different groups of animals with their comparison will be acquainted.
2. The students will be able to explore all reasoning and queries that how animals work.
3. The students will be able to learn that how the physiology of different groups of organisms is influenced by the different environments of their niches
4. Since this course also have some important practical component where interesting exercises will be conducted to perform experiment and answer various queries of animal physiology.

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	1.0 Digestion 1.1 Feeding mechanisms and regulation 1.2 Comparative physiology of digestion and absorption in different animal groups 2.0 Respiration 2.1 Respiratory organs, Types of respiration, mechanism of breathing 2.2 Transport of respiratory gases 2.3 Respiratory pigments through different phylogenetic groups. 2.4 Physiological response to oxygen deficient stress. 3.0 Excretion 3.1 Patterns of nitrogen excretion among different animal groups 3.2 Functional anatomy of renal unit; mechanisms of ultra filtration, Counter Current mechanism, Dialysis 4.0 Osmo regulation in different animal groups 4.1 Definition and basic classification of organisms on the basis of osmo regulation 4.2 Osmotic challenges of different environments 4.3 Mechanism of Osmoregulation in fresh water, Estuarine and Marine animals 4.4 Osmoregulation in migratory organisms, Control and regulation of osmoregulation	15
II	5.0 Thermoregulation 5.1 Homeothermic animals, Poikilotherms, Hibernation and Aestivation, 5.2 Physical, chemical, neural regulation, Physiological adaptations acclimatization & acclimation in response to high, low ambient temperature 6.0 Circulation of body fluids and the irregularity among different animal groups 6.1 Systems of circulation, heart beat and blood pressure, 6.2 Cardiac cycle, Cardiac output and its regulation, 6.3 Lymphatic system 7.0 Receptor physiology—a comparative study of Mechanoreception, Photoreception, Chemoreception and Equilibrium reception	15

	8.0 Muscle and Contractile physiology 8.1 Contractile elements, cells and tissues among different phylogenic groups; Muscle structure and function-correlation; 8.2 Electric organs and tissues	
III	9.0 Comparative testicular physiology in animals 9.1 Morphology, Differentiation, Function and its regulation 10.0 Comparative ovarian physiology and differentiation in vertebrates 10.1 Morphology, Endocrinolgy, Oogenesis, vitellogensis 11.0 Neuronal physiology 11.1 Structure and classification of neurons and glial cells. 11.2 Synaptic action, dendritic properties and functional operation of spinal cord, Brain stem 11.3 Autonomic nervous system.	15
IV	12.0 Principles of synaptic transmission 12.1. Ca ²⁺ and neurotransmitter release; post synaptic transmission mechanism; 12.2. Diversity of neurotransmitters: acetylcholine, catecholamine, serotonin, GABA, glycine, histamine, peptides, NO, and opioids. 13.0 Physiological adaptations to different environments 13.1 Physiological adaptations acclimatization &acclimation in response to high, low ambient temperature, 13.2 Physiological adaptation at high altitude and in deep sea environment. 14.0 Stress Physiology: Concept of Stress and Strain, 14.1 Stress hormones and stress regulatory mechanisms.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
PartC-Learning Resources		
RecommendedBooks/e-resources/LMS:		
1. C.L.Prosser. Comparative Animal Physiology. W.B.Saunders & Company. 2. R.Eckert. Animal Physiology: Mechanisms and Adaptation. W.H. Freeman &Company. 3. W.S. Hoar. General and Comparative Animal Physiology 4. Schiemdt-Nielsen. Animal Physiology: Adaptation and Environment. Cambridge. 5. C.L.Prosser. Environment and Metabolic Physiology. Wiley-Liss, NewYork. 6. DavidRandall,WarrenBurggren ,KathleenFrench:Eckert Animal Physiology 7. Guyton, A.X.,Text Book of Medical Physiology,7 th edition,SaundersCompany(1986).		

ZOOLOGY:SEMESTER-VIII									
Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
Honours in Zoology	CC-H6 4credit	B23-ZOO-803	Population Genetics & Evolution	4	4	30	70	100	3hrs.
Level of the course:400-499									
Pre-requisite for the course(if any): Zoology as single major in 3 years UG									
Course Learning Outcomes (CLO)									
- To provide students the basic insight about the mechanism of evolution and to make them able to relate different forms of life on our planet earth. It will also provide them in-depth knowledge about the changing frequency and distribution of alleles within the population. - Acquire a clear understanding about genetic equilibrium in natural populations - To know about genetics of quantitative traits in populations - Detail understanding of molecular phylogenetics and methods of construction of phylogenetic tree									
Instructions for Paper-Setter									
- Nine questions will be set in all. All questions will carry equal marks. - Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.									
UNIT	TOPICS							CONTACT HOURS	
I	1.0 Concepts of evolution and theories of organic evolution with an emphasis on Darwinism. 2.0 Emergence of Neo-Darwinism-Neutral Hypothesis 3.0 Neo Darwinism 3.1 Hardy-Weinberg law of genetic equilibrium 3.2 A detailed account of destabilizing forces: 3.2.1 Natural selection 3.2.2 Mutation 3.2.3 Genetic drift 3.2.4 Migration 3.3 Meiotic drive							15	
II	4.0 Quantifying genetic variability 4.1 Genetic structure of natural populations 4.2 Phenotypic variations 4.3 Models explaining changes in genetic structure of populations 4.4 Factors affecting human disease frequency 5.0 Molecular population genetics 5.1 Patterns of change in nucleotide and amino acid sequences 5.2 Ecological significance of molecular variations 6.0 Genetics of quantitative traits in populations 6.1 Analysis of quantitative traits 6.2 Estimation of heritability 6.3 Genotype-environment interactions 6.4 Inbreeding depression and heterosis 6.5 Molecular analysis of quantitative traits 6.6 Phenotypic plasticity							15	
	7.0 Genetics of speciation 7.1 Concept of species 7.2 Patterns and mechanisms of reproductive isolation								

III	8.0	7.3	Modes of speciation (Allopatric, Sympatric, Parapatric, Peripatric)		15
		Molecular Evolution			
		8.1	Gene Evolution		
		8.2	Evolution of gene families, Molecular drive		
	9.0	8.3	Assessment of molecular variations		
		Origin of higher categories			
		9.1	Phylogenetic gradualism and punctuated equilibrium		
IV	10.0	Molecular phylogenetics		15	
		10.1	Concept of phylogenetic trees.		
		10.2	Methods of construction of Phylogenetic trees.		
	11.0	Population genetics and ecology			
		11.1	Metapopulations		
		11.2	Monitoring Natural Populations		
		11.3	Populations size and extinction		
		11.4	Loss of genetic variations		
		Conservation of genetic resources in diverse taxa			
		Total Contact Hours			
Suggested Evaluation Methods					
Internal Assessment:30			End Term Examination: 70		
➤ Theory			30	➤ Theory:	70
• Class Participation:			5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:			10		
• Mid-Term Exam:			15		
Part C-Learning Resources					
RecommendedBooks/e-resources/LMS:					
1. Dobzhansky, Th .Genetics and Origin of Species. Columbia University Press. Dobzhansky, Th.,F.J.Ayala,G.L. Stebbines and J.M. Valentine. Evolution. Surjeet Publication, Delhi.					
2. Futuyama,D.J. Evolutinary Biology, SuinuaerAssociates,INCPublishers,Dunderland.					
3. Hartl,D.L. APrimer of Population Genetics. Sinaue r Associates,Inc, Massachusetts.					
4. Jha,A.P. Genes and Evolution. JohnPublication,New Delhi.					
5. King,M. Species Evolution-The role of chromosomal change. The Cambridge University Press,Cambridge.					
6. Merrel,D.J .Evolution and Genetics. Holt, Rinehartand Winston,Inc.					
7. Smith,J.M. Evolutinary Gentics. Oxford University Press, New York.					
8. Strikberger,M.W. Evolution. Jones and Bartett Publishers, Boston London.					

ZOOLOGY: SEMESTER-8

Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
Honours in Zoology	DSE-H2 4 credit (Option 1)	B23-ZOO-804	Population and Community Ecology	4	4	30	70	100	3hrs.
Level of the course: 400-499									
Pre-requisite for the course (if any): Zoology as single major in 3 years UG									
Course Learning Outcomes (CLO): Students will be able to understand 1. Explanations of the need for intra- and interdisciplinary cooperation in researching different ecosystems. 2. The all biotic and abiotic factors that are related to individual, population, community and ecosystem and defines the relationships between them. 3. Information about the benefits of ecosystem and can be used in the management of natural resources for sustainable development in ways that leave the environment healthy. 4. Scope of the specialization within ecology such as marine, vegetation and statistical ecology to better understand the environment around them.									
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.									
UNIT	TOPICS							CONTACT HOURS	
I	1.0 Basic Concepts: Definition, Scope and Significance of Ecology, Concept of biosphere, atmosphere, lithosphere and hydrosphere. 2.0 Organizational level of ecological systems, Ecological aspects of abiotic, biotic and edaphic factors, limiting factors 3.0 Ecosystem: Concept, Kinds and components 4.0 Ecological energetic and energy flow: Food chains, food webs, trophic structure; concept of productivity: primary, secondary, gross and net, Energy flow models.							15	
II	5.0 Restoration Ecology Ecology of Disturbed Ecosystems: disturbance and its impact on the structure and functioning of terrestrial and aquatic ecosystems. 6.0 Population Characteristics 6.1 Introduction and concepts of population ecology 6.2 Attributes of populations 6.3 Population density, methods of population density measurement 6.4 Growth rate and growth forms 6.5 Natality, mortality, survivorship curves and life tables 6.6 Biotic potential– Generation time, net reproductive rate reproductive values 6.7 Population and distribution. 6.8 Population dispersion							15	
III	7.0 Population regulation and Interactions 7.1 Extrinsic and intrinsic mechanisms 7.2 Concept of density dependent and density independent factors in population regulation. 7.3 Concept of intra specific and inter specific population interactions 7.4 Proto-cooperation, mutualism and commensalisms 7.5 Host-parasite interactions, Life history strategies–r and k selection. 8.0 Competition and niche theory 8.1 Intra specific and inter specific interactions 8.2 History of niche concepts 8.3 Gause's theory of niche							15	

IV	9.0 Predation	15
	9.1 Theory; predator-prey oscillations	
	9.2 Model of prey–predatory dynamics	
	9.3 Role of predation in nature	
	9.4 Parasitism	
	10.0 Community characteristics	
	10.1 Species diversity; Biodiversity indices: Diversity, dominance, Similarity& dissimilarity Index	
	10.2 Ecological Succession	
	10.3 Ecological dominance	
	10.4 Ecotones and Edge effect	
	11.0 Ecological Impact Assessment	
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30 > Theory •Class Participation:5 •Seminar/presentation/assignment/quiz/class test etc.:10 •Mid-TermExam:15		End Term Examination: 70 > Theory Written Examination
Learning Resources		
1. Colinviaux,P.A.(1993). Ecology. II Edition. Wiley, John and Sons, Inc. 2. Krebs,C.J.(2001). Ecology. VI Edition. Benjamin Cummings. 3. Odum, E.P.,(2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole 4. Robert Leo Smith Ecology and field biology Harper and Row publisher 5. Ricklefs, R.E.,(2000).Ecology. V Edition. ChironPress 6. Rockwood Larry L.(2015) Introduction to Population Ecology, 2 nd Edition Wiley-Blackwell		

ZOOLOGY:SEMESTER-VIII

Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment Marks	End Term Marks	Max. Marks	Exam Duration
Honours in Zoology	DSE-H2 credit (Option 2)	B23-ZOO-805	Environment and Public Health	4	4	30	70	100	3 Hrs.
Level of the course: 400-499									
Pre-requisite for the course (if any) : Zoology as single major in 3 years UG									
Course Learning Outcomes (CLO) 1. Students will be able to explain the linkages between environmental factors (air, water, soil) and public health, and analyze the influence of nutrition, socio-cultural, and developmental aspects on individual health. 2. Students will be able to assess the impacts of climate change and modern agricultural and industrial practices on public health, with emphasis on pollution and disease outcomes. 3. Students will be able to classify various types of diseases (deficiency, infectious, pollution-related, non-communicable) and evaluate the role of hygiene, nutrition, and sanitation in disease prevention. 4. Students will be able to explain key concepts in epidemiology, disease surveillance, and public health interventions, including AYUSH systems, immunization programmes, and occupational health management. 5. Students will be able to critically evaluate environmental management policies and practices in India, particularly in waste management, pollution control, and their role in promoting public health.									
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.									
UNIT	TOPICS							CONTACT HOURS	
I	1.0 Linkages between Environment and Health 1.1 Understanding linkages between Environment and Public Health: Effect of quality of air, water and soil on health. 1.2 Perspective on Individual health: Nutritional, socio-cultural and developmental aspects. 1.3 Dietary diversity for good health, Human developmental indices for public health.							14	
II	2.0 Climate Change and Implications on Public Health 2.1 Global warming: Agricultural practices (chemical agriculture) and Industrial technologies (use of non-biodegradable materials like plastics, aerosols, refrigerants, pesticides). 2.2 Manifestations of climate change on Public Health 2.3 Burning of fossil fuels, automobile emissions and acid rain.							14	
III	3.0 Diseases in Contemporary Society 3.1 Definition and need for good health- factors affecting health. 3.2 Types of diseases: Deficiency diseases, infectious diseases, pollution-related diseases, allergies, respiratory diseases, cardiovascular diseases, and cancer. 3.3 Personal hygiene and food: Balanced diet, food habits and cleanliness, food adulterants, avoiding smoking, drugs and alcohol. 3.4 Communicable diseases: Mode of transmission; epidemic and endemic diseases. 3.5 Management of hygiene in public places: Railway stations, bus stands and other public places. Infectious diseases: Role of sanitation and poverty; case studies on TB, diarrhea, malaria, viral diseases Non-communicable diseases: Role of lifestyle and built environment; diabetes and hypertension.							14	
IV	4.0 Perspectives and Interventions in Public Health 4.1 Epidemiological perspectives: Disease burden and surveillance. 4.2 Alternative systems of medicine: Ayurveda, Yoga, Unani, Siddha and Homeopathy (AYUSH); 4.3 Universal Immunization Programme (UIP). Reproductive health: Youth Unite for Victory on AIDS (YUVA) programme of Government of India. 4.4 Occupational health hazards: physical, chemical and biological. Occupational diseases: prevention and control. 5.0 Environmental Management Policies and Practices 5.1 Municipal solid waste management: Definition, sources, characterization, collection and transportation, and disposal methods. Solid waste management system in urban and rural areas. 5.2 Municipal Solid waste rules.							18	

	5.3 Policies and practices with respect to Environmental Protection Act, Forest Conservation Act, Wildlife Protection Act, Water and Air Act, Industrial, Biomedical and E- waste disposal rules.	
Suggested Evaluation Methods		
Internal Assessment: • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 10 • Mid-Term Exam: 15		End Term Examination: Written Examination: 70
Learning Resources		
1. Indian Academy of Paediatrics. (2011). Guidebook on Immunization. MFC Bulletin, 45-50. 2. Nandini, N., Sunitha, N. and Tandon, S. (2007). Environmental Studies. Sapna Book House, Bangalore. 3. Park, K. (2011). Preventive and Social Medicine. Benarsi Das Publications, (pp. 16- 19, 24-27). 4. McKinney, M. L., Schoch, R. M. and Yonavjak, L. (2015). Environmental Science: systems and solutions. Jones & Barlett Publishers, Canada. 5. Vir, S.C. (2011) Public Health Nutrition in Developing Countries. (Part-2). Woodhead Publishing India 6. Gupta, AD., Sachin, Bhateja, S. and Rajshekhar (2022). Environment and Public Health. Academic Guru Publishing House, India. 7. Biswas, K. and Biswas, P. (2015). Environment and Public Health. Himalayan Publishing House Pvt. Ltd., India.		

ZOOLOGY: SEMESTER-VIII

Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
For Honours in Zoology/	PC-H2 4 credit	B23-ZOO-806	Practical Based on B23-ZOO-801 TO 804/805	4	8	30	70	100	6 hrs.

Level of the course: 400-499

Pre-requisite for the course (if any): **Zoology as single major in 3 years UG**

Course Learning Outcomes (CLO)

- Students will be able to understand the processes involved in the recognition of key groups of vertebrates.
- Students will be able to identify and classify the available specimens of vertebrate classes. This course will make students able to understand the regulation of chemical reactions in living cells.
- Students will be able to understand the computational biology and techniques of data handling and processing.

Course Content	TOPICS		CONTACT HOURS
	1. Museum specimens and slides :from Protochordates to mammals 2. Demonstration of cranial nerves and aortic arches of Scoliodon, Degestive system, Nervous system, Arterial and venous system of frog, Lizard, Pigeon and rabbit. 3. Comparative Osteology of Axial and appendicular skeleton 4. Construction of Phylogenetic tree 5. Histochemistry: Methods of fixation of different tissues. 6. Histochemical test: (a) Haemotoxylin-eosin (b) Toluidine Blue (c) Sudan Block-B (d) Mercury bromophenol blue (e) Methyl green-pyronin-Y (f) Periodic acid Schiff's (g) Acid phosphatase (h) Alkaline phosphatase 7. Demonstration of live gametes and their staining procedure. 8. Determination of optimum pH, temperature and concentration for optimum activity of salivary amylase 9. To demonstrate that the optimum activity of trypsin enzyme is pH and temperature dependent. 10. Qualitative test of vitamins and Quantification of vitamin A and C. 11. Total RBC, WBC and Differential WBC count 12. Estimation of Blood plasma 13. Methods of population density measurements DSE- H2 (option 1) 14. Study of various components of pond and grassland ecosystem. 15. Determination of Water quality characteristics viz: Dissolved oxygen, pH, free carbon dioxide, salinity, transparency, alkalinity, chloride and hardness.. 16. Estimation of biodiversity indices. 17. Field Visit to Aquatic, Forest and other ecosystems for identification of biota. DSE- H2 (option 2) 14. Detection of Adulterants in Common Food Items 15. Survey and Analysis of Waste Management and Sanitation Practices in a Public Place 16. Awareness Survey on Lifestyle Diseases and Personal Habits 17. Observation and Report on Solid Waste Management System in a Locality 18. Case Study Analysis on Occupational Health Hazards 120 Hrs		

Suggested Evaluation Methods	
Internal Assessment: 30 ➤ Practicum • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 10 • Mid-Term Exam: 15	End Term Examination: 70 ➤ Practicum - Lab record, - Viva-Voce, - Execution of the practical - Write up
Learning Resources	
1. Sharma R K, Sangha S P S (2009). Basic Techniques in Biochemistry and Molecular Biology, I.K. International Publishing House Pvt. Ltd. New Delhi 2. Podder T, Mukhopadhyay S, Das SK (2003). An Advanced Laboratory Manual of Zoology Published by Rajiv Beri for Macmillan India Limited, Rajkamal Electric Press, Delhi 3. Sadasivam S, Manickam A (1997). Biochemical Methods, Ed. 2nd, New Age International Publishers, New Delhi 4. David T. Plummer (1987). An Introduction to Practical Biochemistry. Ed., 3rd, McGraw-Hill Publisher, Rajkamal Electric Press, Delhi	

ZOOLOGY:SEMESTER-VIII (FOR HONOURS WITH RESEARCH IN ZOOLOGY)									
Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
Honours with Research in Zoology	CC-H4 4credit	B23-ZOO-801	Structure and Function of Vertebrates	4	4	30	70	100	3hrs.
Level of the course: 400-499									
Pre-requisite for the course (if any): Zoology as single major in 3 years UG									
Course Learning Out comes (CLO)									
1. Students will be able to understand various biological functions, the evolution of life from most primitive to most advanced form with respect to their habit and habitat.									
2. Students will have acquaintance with the basic concepts, external morphology and sexual dimorphism in chordates and understand the various systems, adaptation and dentition in chordates.									
3. Students will also Understand the Classification various classes of phylum Chordate i.e., Pisces, Reptiles, Aves and Mammals.									
4. This core course will make students familiarize with the vertebrate diversity around them									
Instructions for Paper-Setter									
1. Nine questions will be set in all. All questions will carry equal marks.									
2. Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.									
UNIT	TOPICS							CONTACT HOURS	
I	1.0 Introduction to Chordates with their general characters. 1.1 Origin of Chordates 1.2 Concept of Proto chordate or pre-vertebrates 1.3 Classification of Vertebrates up to orders 2.0 Integument and its derivatives 2.1 Development, general structure and functions of skin and its derivative 2.2 Glands, scales, horns, claws, nails, hoofs, feathers and hair							15	
II	3.0 Skeletal system 3.1 Form, function, body size and skeletal elements of the body 3.2 Comparative account of jaw suspensorium, Vertebral column 3.3 Limbs and girdles 4.0 Digestive system 4.1 Dentition, Stomach, Digestive Glands 4.2 Anatomy of gut in relation to feeding habits- herbivores, carnivores and omnivores. 5.0 Respiratory system 5.1 Characters of respiratory tissue, Internal and External Respiration 5.2 Comparative account of respiratory organs							15	
III	6.0 General plan of circulation in various groups 6.1 Components of Blood 6.2 General plan of circulation in reptiles, birds and mammals 6.3 Evolution of heart , aortic arches and Portal systems 7.0 Evolution of Urino-genital system in vertebrate series 7.1 Structure and functions of different types of kidney 7.2 Urino-genital ducts 7.3 Flight adaptation in birds, Migration in fish and Birds							15	
IV	8.0 Nervous system 8.1 Comparative anatomy of the brain in relation to its functions 8.2 Comparative anatomy of spinal cord 8.3 Nerves-Cranial, Peripheral and Autonomous nervous systems 9.0 Sense organs							15	

	9.1 Simple receptors 9.2 Organs of Olfaction and taste 9.3 Lateral line system 9.4 Electroreception	
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment:30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Barrington,E.J.W.The Biology of Hemi-chordata and Protochordata. Oliver and Boyd, Edinburgh.		
2. Bourne,G.H.The structure and functions of nervous tissue. Academic Press, New York.		
3. Carter,G.S. Structure and habit in vertebrate evolution-Sedgwick and Jackson, London.		
4. Kingsley,J.S. Outlines of Comparative anatomy of Vertebrates. CentralBook Depot, Allahabad.		
5. Kent, C.G.Comparative anatomy of vertebrates.		
6. Milton Hilderbrand. Analysis of vertebrate structure. IV.Ed.JohnWiley and Sons Inc., New York.		
7. Sedgwick,A. A Students Text Book of Zoology, Vol. II.		
8. Torrey,T.W. Morphogenesis of vertebrates. John Wiley and Sons Inc., New York and London.		
9. Walters, H.E. and Sayles,L.D. Biology of vertebrates. MacMillan & Co., New York.		

ZOOLOGY:SEMESTER-VIII (FOR HONOURS WITH RESEARCH IN ZOOLOGY)									
Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
Honours with Research in Zoology	CC-H5 4credit	B23-ZOO-802	Comparative Physiology	4	4	30	70	100	3hrs.
Level of the course:400-499									
Pre-requisite for the course(if any): Zoology as single major in 3 years UG									
Course Learning Outcomes (CLO)									
1. An appropriate understanding of functioning of each system of different groups of animals with their comparison will be acquainted.									
2. The students will be able to explore all reasoning and queries that how animals work									
3. The students will be able to learn that how the physiology of different groups of organisms is influenced by the different environments of their niches									
4. Since this course also has some important practical component where interesting									
5. exercises will be conducted to perform experiment and answer various queries of animal physiology									
Instructions for Paper-Setter									
1. Nine questions will be set in all. All questions will carry equal marks.									
2. Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.									
UNIT	TOPICS							CONTACT HOURS	
I	1.0 Digestion 1.1 Feeding mechanisms and regulation, 1.2 Comparative physiology of digestion and absorption in different animal groups 3.0 Respiration 3.1 Respiratory organs, Types of respiration, mechanism of breathing 3.2 Transport of respiratory gases 3.3 Respiratory pigments through different phylogenetic groups. 3.4 Physiological response to oxygen deficient stress. 4.0 Excretion 4.1 Patterns of nitrogen excretion among different animal groups 4.2 Functional anatomy of renal unit; mechanisms of ultra filtration, Counter Current mechanism, Dialysis 4.3 Osmoregulation in different animal groups 4.4 Definition and basic classification of organisms on the basis of osmoregulation 4.5 Osmotic challenges of different environments 4.6 Mechanism of Osmoregulation in freshwater, Estuarine and Marine animals 4.7 Osmoregulation in migratory organisms, Control and regulation of osmoregulation							15	
II	5.0 Thermoregulation 5.1 Homeothermic animals, Poikilotherms, Hibernation and Aestivation, 5.2 Physical, chemical, neural regulation, 5.3 Physiological adaptations acclimatization & acclimation in response to high, low ambient temperature 6.0 Circulation of body fluids and their regulation among different animal groups 6.1 Systems of circulation, heart beat and blood pressure, 6.2 Cardiac cycle, Cardiac output and its regulation, 6.3 Lymphatic system 7.0 Receptor physiology—a comparative study of Mechano reception, Photoreception, Chemo reception and Equilibrium reception							15	

	8.0 Muscle and Contractile physiology 8.1 Contractile elements, cells and tissues among different phylogenic groups; Muscle structure and function-correlation; 8.2 Electric organs and tissues	
III	9.0 Comparative testicular physiology in animals 9.1 Morphology, Differentiation, Function and its regulation 10.0 Comparative ovarian physiology and differentiation in vertebrates 10.1 Morphology, Endocrinolgy, Oogenesis, vitellogenesis 11.0 Neuronalphysiology 11.1 Structure and classification of neurons and glial cells. 11.2 Synaptic action, dendritic properties and functional operation of spinal cord, Brain stem 11.3 Autonomic nervous system.	15
IV	12.0 Principles of synaptic transmission 12.1 Ca2+and neurotransmitter release; post synaptic transmission mechanism; 12.2 Diversity of neurotransmitters:acetylcholine,catecholamine,serotonin, GABA, glycine, histamine, peptides, NO, and opioids. 12.3 Physiological adaptations to different environments 12.4 Physiological adaptations acclimatization & acclimation in response to high, low ambient temperature, 12.5 Physiological adaptation at high altitude and in deep sea environment. 13 .0 Stress Physiology: Concept of Stress and Strain, Stress hormones and stress regulatory mechanisms.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. C.L.Prosser. Comparative Animal Physiology. W.B. Saunders & Company.		
2. R.Eckert. Animal Physiology: Mechanisms and Adaptation. W.H .Freeman &Company.		
3. W.S. Hoar. General and Comparative Animal Physiology		
4. Schiemdt-Nielsen. Animal Physiology: Adaptation and Environment. Cambridge.		
5. C.L.Prosser. Environment and Metabolic Physiology. Wiley-Liss, NewYork.		
6. David Randall, Warren Burggren, Kathleen French: Eckert Animal Physiology		
7. Guyton, A.X., Text Book of Medical Physiology,7 th edition, Saunders Company(1986).		

ZOOLOGY: SEMESTER-VIII (FOR HONOURS WITH RESEARCH IN ZOOLOGY)									
Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks (Report)	End Term Marks (Viva)	Max. Marks	Exam Duration
Honours with Research in Zoology	Project/ Dissertation (12 credit)	B23-ZOO-807	Project/ Dissertation	8+4	-	200 (Report as Dissertation)	100 (Viva-Voce)	300	-
Level of the course:400-499									
Pre-requisite for the course (if any): Zoology as single major in 3 years UG									
Course Learning Outcomes (CLO) :Students will be able to 1. Formulate a focused research question and design a robust, methodologically sound investigation to address it. 2. Employ appropriate experimental, analytical, or field techniques to collect, analyze, and interpret botanical data effectively. 3. Critically evaluate research findings in light of existing theories, and communicate results clearly through well-structured scientific writing and presentations. 4. Exhibit independence, time management, and scientific integrity throughout the research process, while responding thoughtfully to feedback and defending									
Description								CONTACT HOURS	
I	Each student is required to undertake a research project in a relevant area of Zoology. The outcome of this research will be compiled into a dissertation and submitted for evaluation at the end of the semester. Students will also present their dissertation before an external examiner. Both internal and external assessments of the project and training will be conducted as per the prescribed evaluation criteria. Assessment Structure Internal Assessment: - Submission of Project Synopsis - One Mid-Semester Progress Report and/or Presentation External Assessment: - Final Project Report (Dissertation) - Viva-Voce Presentation before an External Examiner Dissertation Report Submission Guidelines 1. Structure of the Dissertation Report: The dissertation should include the following components in order: - Cover page - Certificate signed by the student and supervisor - Table of contents - Introduction - Objectives - Literature review - Methodology - Results and Discussion - Conclusion - References 2. Formatting Requirements: - Paper size: A4 - Font: Times New Roman, size 12 - Line spacing: 1.5 (one and a half spacing) - Printing: Double-sided (print on both sides of the paper) - Length: The written portion should be between 40 to 60 pages 3. Submission Requirements: - Students must submit three hard-bound copies of the dissertation along with a CD containing a soft copy, to the department by the specified deadline. 4. Evaluation and Presentation:								

	○ The student will be required to defend the dissertation/project work through a formal presentation before an external examiner at the end of the semester. ○ Marks will be awarded based on both the written report and the oral presentation.	

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

("A++" Grade, NAAC Accredited)



Syllabus for Post Graduate Programme

M.Sc. ZOOLOGY

**as per NEP 2020
Curriculum and Credit Frame work for Postgraduate Programme**

**With CBCS-LOCF
With effect from the session 2025-26**

**DEPARTMENT OF ZOOLOGY
FACULTY OF LIFE SCIENCES**

KURUKSHETRA UNIVERSITY, KURUKSHETRA-136119

HARYANA, INDIA

Session: 2025-26				
Part A – Introduction				
Name of Programme		M.Sc. Zoology		
Semester		3		
Name of the Course		Molecular Biology		
Course Code		M24-ZOO-301		
Course Type		CC-9		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: Learn the necessary information about the chemistry of life to allow the students to understand the basis of molecules of life. CLO 2: Acquire a clear understanding about protein sorting and their mechanisms CLO 3: To know about Recombination and repair mechanism in DNA CLO 4: Detail understanding of molecular techniques of genomes analysis			
Credits		Theory	Practical	Total
		4	0	4
Teaching Hours per week		4	0	4
Internal Assessment Marks		30	0	30
End Term Exam Marks		70	0	70
Max. Marks		100	0	100
Examination Time		3 hours		
Part B- Contents of the Course				
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.				
Unit	Topics			Contact Hours
I	1. DNA Replication 1.1 Prokaryotic and Eukaryotic DNA replication 1.2 Mechanics of DNA replication 1.3 Enzymes and accessory proteins involved in DNA replication 2. Transcription 2.1 Prokaryotic and Eukaryotic transcription 2.2 General and specific transcription factors 2.3 Regulatory elements and mechanisms of transcription regulation 2.4 Transcriptional and post-transcriptional gene silencing. 2.5 Post-transcriptional Modifications in RNA 2.6 5'-Cap formation, 3'-end processing and polyadenylation 2.7 Splicing, Editing, Nuclear export of mRNA, mRNA stability			15
II	3. Translation 3.1 Genetic code and deciphering of genetic code 3.2 Prokaryotic and Eukaryotic translation 3.3 The translational machinery 3.4 Adaptor hypothesis, Kozak rule 3.5 Mechanisms of initiation, elongation and termination 3.6 Regulation of translation 4. Transport of Protein 4.1 Co- and Post-translational transport of proteins 4.2 Co- and Post-translational modifications of proteins 4.3 Protein trafficking/sorting			15

III	5. Recombination and Repair 5.1 Holiday junction, gene targeting, gene disruption 5.2 Cre/lox recombination 5.3 RecA and other recombinases 5.4 DNA repair mechanisms 6. Antisense and Ribozyme technology 6.1 Molecular mechanisms of antisense molecules 6.2 Inhibition of splicing, polyadenylation and translation 6.3 Disruption of RNA structure and capping 6.4 Biochemistry of ribozyme; hammerhead, hairpin and other ribozymes 6.5 Strategies for designing ribozymes 6.6 Application of antisense and ribozyme technologies	15
IV	7. Molecular mapping of genome 7.1 Genetic and physical maps 7.2 Physical mapping and map-based cloning 7.3 Southern and fluorecence <i>in situ</i> hybridization for genome analysis 7.4 Chromosome micro-dissection and micro-cloning 7.5 Molecular markers in genome analysis RFLP, RAPD and AFLP analysis and their applications 7.6 Molecular markers linked to disease resistance genes 8. rDNA Technology: 8.1 Gene-cloning 8.2 Vectors 8.3 cDNA and genomic libraries 8.4 Blotting techniques 8.5 Chromosome walking 8.6 Application of rDNA technology	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Molecular Biology of the Gene, J.D. Watson, N.H. Hopkins, J.W. Roberts, J.A Steitz and A.M. Weiner. The Benjamin/Cummings Pub. Co., Inc., California. 2. Molecular Cell Biology, J. Darnell, H. Lodish and D. Baltimore Scientific American Books, Inc., USA 3. Molecular Biology of the Cell, B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J,D. Watson. Garland Publishing Inc., New York. 4. Gene VI, Benjamin Lewin, Oxford University Press, U.K. 5. Molecular Biology and Biotechnology. A comprehensive desk reference, R.A Meyers (Ed.), VCH Publishers, Inc., New York. 6. Molecular Cloning: a Laboratory Manual, J. Sambrook, E.F. Fritsch and T. Maniatis, Cold Spring Harbor Laboratory Press, New York. 7. Introduction to Practical Molecular Biology, P.D. Dabre, John Wiley & Sons Ltd., New York. 8. Molecular Biology LabFax, T.A Brown (Ed.), Bios Scientific Publishers Ltd., Oxford.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Zoology		
Semester	3		
Name of the Course	Molecular Endocrinology		
Course Code	M24-ZOO-302		
Course Type	CC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: It helps in explaining hormonal synergism and antagonism at the molecular level CLO 2: Students will be able to identify the organs involved in the endocrine function and an understanding of appropriate key human endocrine disorder will also be developed CLO 3: Develop an in-depth comprehensive knowledge of endocrinology from a physiological, cellular, and molecular perspective. CLO 4: This course will make students understand the basic structure and chemical organization of hormones and various signaling molecules.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	1. Basic concept of endocrinology, its scope and role in molecular biology. 2. Chemical nature of hormones; 2.1 Amino-acid derived hormones 2.2 Peptide hormones 2.3 Glyco-protein hormones, 2.4 Steroid hormones and 2.5 Prostaglandin 3. Biosynthesis of peptide hormones, transcriptional and post-transcriptional modifications 4. Biosynthesis and secretion of thyroid hormones. Thyroid hormone disorders.	15	
II	5. Prostaglandin structure, type, synthesis and biological activities. 6. Mechanism of action of peptide hormones; concept of second messengers, cAMP, cGMP, Ca ⁺⁺ , IP ₃ , DAG, NO, signal transduction mechanisms. 7. Mechanism of action of steroid hormones; Cross talk concept, Heat shock proteins.	15	
III	8. Hormonal regulation of Metabolism: 8.1 Role of Insulin & Glucagon in regulation of Carbohydrate metabolism 8.2 Metabolic regulatory hormones in Lipid & Protein metabolism 9. Gastrointestinal hormones and their role in regulation of metabolic activity. 10. Endocrine regulation of calcium and phosphate homeostasis in mammal	15	

IV	11. Genetic basis of hormonal disorders. 11.1 General principle and classification of hormonal disorders 11.2 Genetic basis of growth hormone disorder 11.3Genetic basis of PCOS 12. Sequence-specific DNA binding receptor proteins 11.4 Nuclear receptor proteins 11.5 Cytosolic receptor proteins 11.6Cell surface receptor proteins 12.4 Their role in gene transcription, cell differentiation and cell proliferation. 13. Regulatory substances –Eicosanoids, Growth factors, Thymus gland & Kinins.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1.	Benjamin Lewin, Genes VII, Oxford University Press.	
2.	Lodish et al. Molecular Cell Biology.	
3.	Ethan Bier. The Coiled Spring, Cold Spring Harbor Press.	
4.	L.P. Freedman. Molecular Biology of Steroid and Nuclear Hormone Receptors, Birkhauser.	
5.	G. Litwack. Biochemical Actions of Hormones, Academic Press.	

Session: 2025-26				
Part A – Introduction				
Name of Programme		M.Sc. Zoology		
Semester		3		
Name of the Course		Applied Zoology		
Course Code		M24-ZOO-303		
Course Type		DEC-1		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: Awareness about use of certain animals and their products for human welfare <i>vis-à-vis</i> animal welfare will be created. CLO 2: Information regarding the animals that are responsible for economic losses will also be acquainted. CLO 3: Students will able to explain the basic concepts of sericulture, apiculture, lac culture and other animal industries along with economics of pest management techniques. CLO 4: Students will able to justify the animals in pharmaceutical research. CLO 5: Students will gain knowledge about various disease vectors and their impact on human.			
Credits		Theory	Practical	Total
		4	0	4
Teaching Hours per week		4	0	4
Internal Assessment Marks		30	0	30
End Term Exam Marks		70	0	70
Max. Marks		100	0	100
Examination Time		3 hours		
Part B- Contents of the Course				
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.				
Unit	Topics			Contact Hours
I	1. Vertebrate and non vertebrate pests (Wheat, Rice, Sugarcane and cotton) their harmful status and economic importance. 1.1 Integrated pest management. Cultural control, Physical control, Mechanical control, Chemical control, Biological control, Herbal control and legal control and Pheromones involved in pest management. 2. Insects of medical and veterinary importance.			15
II	3. Zoonosis: 3.1 Viral-Rabies, 3.2 Japaneses encephalitis; 3.3 Bacterial- Brucellosis, Plague; 3.4 Rickettsial- Rickettsial zoonosis, Q fever, Scrub typhus. 3.5 Protozoan <i>Entamoeba histolytica</i> , <i>Plasmodium vivax</i> and <i>Trypanosoma gambiense</i>), Helminth and Nematode diseases in humans (Schistosomiasis, Cestodiasis, Termatodasis, Filariasis and Ascariasis).			15
III	Sericulture, Apiculture and Lac culture 4. Sericulture : Types of silk, species of silk moth (scientific names), Silkworms and their host plants, mulberry silk worm culture, agricultural aspects of mulberry plant cultivation, extraction and reeling of silk, natural enemies and diseases of silkworm and their control. 5. Apiculture : Species of honey bees in India, life history of <i>Apis cerana indica</i> , agriculture techniques, bee products and their uses, natural enemies and diseases of			15

	honey bee and their control.	
	6. Lac culture: lac insect (Scientific name), composition of lac, strains of lac insect, cultivation of lac host plants (in brief) processing of lac and uses of lac.	
	7. Wool and fur industry, leather industry.	
IV	8. Vermiculture, Poultry keeping and Dairy industry. 9. Prawn culture, Pearl culture. 10. Edible fresh water fishes and their diseases, Snakes (Haryana) and its Economic importance of snake venom 11. Pharmaceuticals from animals and role of animals in stem cell therapy. How to harvest the technology from animals for human welfare 12. Animal welfare and ethics, CPCSEA guidelines and maintenance of experimental animals	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1.	Insect Pest Management by Dent, D.	
2.	Agricultural Entomology by Hill, D.S., Timber Press.	
3.	General and Applied Entomology by David, B. V. & Ananthkrishnan, T. N., Tata McGraw-Hill Publishing.	
4.	Entomology and Pest Management by Pedigo L. P. Prentice Hall, India.	
5.	General and Applied Entomology by Nayar K. K. and T. N. Ananthkrishnan and B. V. Davis, Tata McGraw Hill Publications. New Delhi.	
6.	Agricultural Pests: Biology and Control Measures by B. M. Deoray and T. B. Nikam, Nirali Publication, Pune.	
7.	Concepts of Insect Control by Ghosh M. R. Wiley Eastern Ltd. New Delhi.	
8.	Economic Zoology. Shukla Upadhyay, Rastogi Publication, Meerut, India, 1998.	

Session: 2025-26				
Part A – Introduction				
Name of Programme		M.Sc. Zoology		
Semester		3		
Name of the Course		Molecular Reproduction-I		
Course Code		M24-ZOO-304		
Course Type		DEC-2		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: The cellular, molecular and biochemical changes in reproductive physiology CLO 2: The basic and molecular concepts of spermatogenesis folliculogenesis, ovulation, follicular atresia and germ line- soma interaction. CLO 3: The importance of diet, exercise, stress and yoga during ageing CLO 4: Various problems of male sterility and female infertility			
Credits		Theory	Practical	Total
		4	0	4
Teaching Hours per week		4	0	4
Internal Assessment Marks		30	0	30
End Term Exam Marks		70	0	70
Max. Marks		100	0	100
Examination Time		3 hours		
Part B- Contents of the Course				
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.				
Unit	Topics			Contact Hours
I	1. Male Reproductive system: Cytology of testis and spermatozoon, physiology of spermatogenesis, molecular bases of testicular steroidogenesis, endocrine regulation of steroidogenesis, role of male accessory sex structures. 2. Female Reproductive System: Structural and histochemical aspects of ovary and primordial follicles. 3. Folliculogenesis: Dynamics of follicular growth and maturation, intracellular dynamics of cholesterol synthesis-two cell theory, endocrine regulation of folliculogenesis.			15
II	4. Oocyte Maturation- Nuclear, epigenetic and cytoplasmic; oocyte granulosa interactions 5. Ovulation- Mechanism, Induced and spontaneous ovulators. 6. Corpus Luteum- Structure and functions, molecular mechanism and endocrine regulation of luteinization, luteal steroidogenesis, corpus luteum of pregnancy.			15
III	7. Follicular atresia: Causes, regulation and significance, factors affecting atresia, role of granulosa cells apoptosis in atresia. 8. Male sterility- Azoospermia, Oligozoospermia, Asthenozoospermia, Varicocele, Genetic basis for male infertility. 9. Female infertility- genetic and endocrinal factors, PCOD, atresia.			15
IV	10. Follicular atresia: Causes, regulation and significance, factors affecting atresia, role of granulosa cells apoptosis in atresia. 11. Male sterility- Azoospermia, Oligozoospermia, Asthenozoospermia, Varicocele, Genetic basis for male infertility. 12. Female infertility- genetic and endocrinal factors, PCOD, atresia.			15
Total Contact Hours				60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
• Guraya S.S. (1998). Cellular and Molecular Biology of General development and Maturation in mammals Narosa Publishing House, New Delhi. • Hafez E.S.E.(1994). “Reproduction in farm animals”. Lea Febighiese. • Gurays S.S. (2000). Comparative Cellular and Molecular Biology of Ovary in mammals. I.B.H., New Delhi. • The Physiology of Reproduction, second edition, Vol 1 and 2, edited by Ernst Knobil and Jimmy D. Neil. <i>Raven Press</i>, 2014. • Male Reproductive Function, edited by Christina Wang. <i>Kluwer Academic Publishers</i>, 1999. • The ovary, edited by Solly Zuckerman Baron Zuckerman, Barbara J. Weir, T. G. Baker. <i>Academic Press</i>. • The ovary, edited by Peter C.K. Leung and Eli Y. Adashi, Elsevier (Academic Press), 2004. • Cell and Molecular Biology of Testis, edited by Claude Desjardins and Larry L. Ewing. <i>Oxford University Press US</i>. • Reproductive Endocrinology: Physiology, Pathophysiology, and Clinical Management, edited by Samuel S. C. Yen, Robert B. Jaffe, Robert L. Barbieri. <i>Saunders publisher</i>. • Regulation of Implantation and Establishment of Pregnancy in Mammals, Editors: Rodney D Geisert, Fuller W. Bazer, ISBN 978-3-319-15856-3, Springer International Publishing, 2015. • Implantation and early development, Editors: Hilary Critchley, Ian Cameron and Stephan Smith, ISBN 9781107784680, Cambridge University press, 2014. • Implantation, Biological and Clinical Aspects, Editors: Michael G. Chapman, J. Gedis Grudzinskas, Tim Chard, ISBN 978-1-4471-3531-9, Springer-Verlag, 1988.			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Zoology		
Semester	3		
Name of the Course	Animal Behaviour and Wildlife Conservation – I		
Course Code	M24-ZOO-305		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: It will boost students for betterment of diversified resources and life forms for better conservational measures with keen understanding. CLO 2: Acquire a clear understanding about behavior patterns in animals CLO 3: Students will be aware and understand the concept of protected area system CLO 4: Detail understanding of conservational approaches and organizations		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	1. oncept of Animal behaviour; Mile-Stones in the history of animal behaviour and scope. 2. tereotyped and acquired behaviour patterns: Tropisms, Taxes, Reflexes, Instincts, learning & reasoning; Change in major modes of adaptive behaviour in phylogeny. 3. erception of the environment : Mechanical, Electrical, chemical, olfactory, auditory, visual 4. iological rhythms and concept of biological clock.	15	
II	5. otivation: Introduction, goal oriented behaviour, biological drives – Primary and Secondary drives. 6. oncept of learning: law of learning, types of learning – Habitation, trial & error learning, latent learning, Insight, Imprinting, Classical conditioning & Instrumental learning. 7. oncept of Migratory behavior	15	

III	8. ildlife: Definition, significance and Biogeographic/wildlife zones of India, Bio-diversity of the Indian Subcontinent and World. 9. roTECTED Area Systems: Concept, Historical background, categories and management objectives of protected areas, world growth of protected areas, and Present status of National PA-Systems. 10. heory and Practice of Biosphere Reserves of the world: Biosphere Reserves of India, Wildlife conservation techniques.	15
IV	11. atural Heritage Sites of the world, Natural Heritage sites in India. Important National Park and Wildlife Sanctuaries of India 12. ildlife and livelihood; Wildlife and illegal trade & control; 13. ole of WWF, IUCN, UNEP, 14. ed Data Book; Categories of Endangered Wildlife Species.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Techniques for wildlife Census in India by W.A. Rogers (A field manual); Wildlife Institute of India, Dehradun. 2. Wildlife Wealth of India by T.C. Majupuria; Tecpress Services, L.P., 487/42-SOL-Wattenslip, Pratunam Bangkok, 10400, Thailand 3. Ali, S. Ripley S.D. Handbook of Birds of India, Pakistan 10-Vols. Oxford University Press, Bombay. 4. The Book of Indian Animals by S.H. Prater, BNHS-Publication, Bombay. 5. Wildlife in India by V.B. Saharia Natraj Publishers, Dehradun. 6. E.P. Gee, The Wildlife of India.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Zoology		
Semester	3		
Name of the Course	Fish, Fisheries and Aquaculture – I		
Course Code	M24-ZOO-306		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: Through this core elective paper student/s will learn identification of fish species using classical morphological methods CLO 2: This core elective paper will generate knowledge about various methods and significance of aquaculture CLO 3: It will create awareness about food security, significance of protein in diet and importance of fish in fighting protein deficiency CLO 4: It will also be helpful in acquainting with methods of conserving fish diversity.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	1. Definition of Fish, Fisheries and aquaculture; Types of Aquaculture 2. Classification of fishes with distinguishing characters and examples of each group. 3. Estuarine, Marine, Riverine and wetland fisheries: characteristic species and their exploitation 4. Culture fisheries 4.1 Cultivable organisms for aquaculture. 4.2 Criteria of selection of cultivable fishes	15	
II	5. Design, construction and maintenance of fish culture ponds. 6. Ecology of fish pond ecosystem 6.1 Physico chemical conditions of ponds water and soil 6.2 Biological conditions of waters 6.3 Weeds and their control 6.4 Productivity of fish pond 6.5 Classification of water bodies on the basis of productivity. 7. Aquatic pollution: Sources of water Pollution, Impact of pollution on aquatic organisms, Impact of exotic fish species on aquatic biodiversity, Fishes and their relationships with abiotic and biotic factors. 8. Aquaculture Ranching and Rational fishery.	15	

III	9.	Fish integument: Exoskeleton and colouration	15	
	10.	Fins: origin, types and functions		
	11.	Food and feeding habits of fishes, Digestion in fishes		
	12.	Respiratory system Gill structure and functions, Accessory respiratory organs swim bladder and webberian ossicles		
	13.	Osmoregulation in fishes		
IV	14.	Receptors in fishes 14.1 Chemoreceptors 14.2 Lateral line organs 14.3 Eye Ear 14.4 Pineal organ	15	
	15.	Hormones and reproduction: Induced breeding in carps and catfishes.		
	16.	Identification of different maturity stages of fishes.		
	17.	Migration in fishes		
	18.	Age and growth studies		
	Total Contact Hours			60
	Suggested Evaluation Methods			
	Internal Assessment: 30			End Term Examination: 70
➤ Theory		30	➤ Theory:	70
• Class Participation:		5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:		10		
• Mid-Term Exam:		15		
Part C-Learning Resources				
Recommended Books/e-resources/LMS:				
1. Ponniah, AG, Das, P & Verma SR (Ed.) (1998) Fish Genetics and Biodiversity Conservation. Nature Conservators, Muzaffarnagar, India 474pp.				
2. Bardach, JE, Ryther, JH & Mclarnely, OW (1972) Aquaculture. Wiley Interscience				
3. Boyd, CE (1988) Water quality management for pond fish culture. Developments in Aquaculture and Fisheries Sciences. I. Elsevier Scientific Publishing Company, Amsterdam.				
4. Delince, G (1992) The Ecology of the fish pond system. Kluwer Academic Publishers, Netherlands, 230 pp.				
5. Hoar, WS, Randall, DJ & Donaldson, ME (1983) Fish Physiology. Vol. IXA & IXB. Reproduction. Academic Press, London.				
6. Jhingran, VG (1983) Fish and Fisheries of India. Hindustan Publishing Corporation (India) 954 pp				
7. Tandon, KK & Johal, MS (2006) Age and Growth in Indian Freshwater Fishes.Narendra Publishing House Delhi, 232 pp.				
8. Handbook of Fisheries and Aquaculture, Indian Council of Agricultural Research, New Delhi. 755 pp.				

Session: 2025-26					
Part A – Introduction					
Name of the Programme		M.Sc. Zoology			
Semester		3			
Name of the Course		Practical based on Papers M24-ZOO-301 to M24-ZOO-303			
Course Code		M24-ZOO- 307			
Course Type		PC-5			
Level of the course		500-599			
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology			
Course Learning Outcomes (CLO)	CLO 1: Students will be able to explain the basic principle, procedures and applications of various biological techniques that are used to study the basic biological processes. CLO 2: Will understand the basic concepts of applied Zoology in human welfare. CLO 3: Will be able to perform electrophoresis for scope in research field. CLO 4: Study of endocrinology will help the student to identify the organs involved in the endocrine function and which help in understanding human endocrine disorder.				
Credits		Theory	Practical	Total	
		0	4	4	
Teaching Hours per week		0	8	8	
Internal Assessment Marks		0	30	30	
End Term Exam Marks		0	70	70	
Max. Marks		0	100	100	
Examination Time		0	4 hours		
Part B- Contents of the Course					
Practicals				Contact Hours	
	Course Contents: 1. Non-protein nitrogenous substances: qualitative estimation of serum Bilirubin serum and urine creatintine. 2. Estimation of Acid and alkaline phosphates. 3. Barr body examination from Buccal smear. 4. Sex chromatin from blood sample. 5. <i>In-vitro</i> study of effect of hormones. 6. Study of histological slides and endocrine glands of vertebrates. 7. Blood smear preparation, Blood groups, hematin crystals, haemoglobin count, DLC, TLC etc. 8. Demonstration of SDS-PAGE 9. Demonstration of Agarose gel electrophoresis and preparation of gel 10. Collection of different larva of mosquitoes:- <i>Culex</i> ; <i>Anopheles</i> ; <i>Aedes</i> , marking out the basic morphological differences at larval level. 11. Preparation of permanent mounts of adult mosquitoes: <i>Culex</i> and <i>Aedes</i> and <i>Anopheles</i> - highlight differences, if any, between basic these important vectors. 12. Study of life cycle of honey bee, Lac insect, Silk worm, Cabbage butterfly. 13. Study on common household and agriculture pest.			120	

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. P S Verma (2021). A Manual Of Practical Zoology Chordates, Ed. 11 th , S Chand Publisher, New Delhi			
2. S.S. Lal (2009). Practical Zoology: Vertebrate. Edition, 12. Publisher, Rastogi Publications, Delhi			
3. Podder T, Mukhopadhyay S, Das S K (2003). An Advanced Laboratory Manual of Zoology Published by Rajiv Beri for Macmillan India Limited, Rajkamal Electric Press, Delhi			

Session: 2025-26					
Part A – Introduction					
Name of the Programme		M.Sc. Zoology			
Semester		3			
Name of the Course		Practical based on Papers M24-ZOO-304/			
Course Code		M24-ZOO-308			
Course Type		PC-6			
Level of the course		500-599			
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology			
Course Learning Outcomes (CLO)	CLO 1: To develop the scientific attitude that makes the students open minded, critical observations, curiosity thinking etc. CLO 2: To acquire the specialized knowledge relevant to reproductive biology and biochemistry. CLO 3: To understand the basic and molecular laboratory techniques in both physiology and biochemistry. CLO 4: To acquire the knowledge about various male and female infertility problems				
Credits		Theory	Practical	Total	
		0	4	4	
Teaching Hours per week		0	8	8	
Internal Assessment Marks		0	30	30	
End Term Exam Marks		0	70	70	
Max. Marks		0	100	100	
Examination Time		0	4 hours		
Part B- Contents of the Course					
Practicals				Contact Hours	
	Course Contents: 1. Demonstration of male and female reproductive systems of earthworm, grass hopper, and rat. 2. Processing of reproductive tissues for microanatomy and histochemistry. 3. Study of permanent slides on mammalian reproductive tissues. 4. Study of folliculogenesis and atresia in rat ovary. 5. Study of apoptosis in gonads. 6. Extraction and estimation of macromolecules such as proteins, carbohydrates, lipids, and nucleic acids. 7. Isolation of testicular cells and ovarian follicular cells. 8. Oocyte collection; aspiration and slicing method. 9. Sperm morphology, capacitation, sperm count, and sperm motility. 10. Vaginal smear preparation to examine estrous cycle and pregnancy. 11. Oocyte maturation <i>in vitro</i> . 12. <i>In vitro</i> fertilization			120	

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
• Guraya S.S. (1998). Cellular and Molecular Biology of General development and Maturation in mammals Narosa Publishing House, New Delhi. • Hafez E.S.E.(1994). “Reproduction in farm animals”. Lea Febighiese. • Gurays S.S. (2000). Comparative Cellular and Molecular Biology of Ovary in mammals. I.B.H., New Delhi. • The Physiology of Reproduction, second edition, Vol 1 and 2, edited by Ernst Knobil and Jimmy D. Neil. <i>Raven Press</i>, 2014. • Male Reproductive Function, edited by Christina Wang. <i>Kluwer Academic Publishers</i>, 1999. • The ovary, edited by Solly Zuckerman Baron Zuckerman, Barbara J. Weir, T. G. Baker. <i>Academic Press</i>. • The ovary, edited by Peter C.K. Leung and Eli Y. Adashi, Elsevier (Academic Press), 2004. • Cell and Molecular Biology of Testis, edited by Claude Desjardins and Larry L. Ewing. <i>Oxford University Press US</i>. • Reproductive Endocrinology: Physiology, Pathophysiology, and Clinical Management, edited by Samuel S. C. Yen, Robert B. Jaffe, Robert L. Barbieri. <i>Saunders publisher</i>. • Regulation of Implantation and Establishment of Pregnancy in Mammals, Editors: Rodney D Geisert, Fuller W. Bazer, ISBN 978-3-319-15856-3, Springer International Publishing, 2015. • Implantation and early development, Editors: Hilary Critchley, Ian Cameron and Stephan Smith, ISBN 9781107784680, Cambridge University press, 2014. • Implantation, Biological and Clinical Aspects, Editors: Michael G. Chapman, J. Gedis Grudzinskas, Tim Chard, ISBN 978-1-4471-3531-9, Springer-Verlag, 1988. •			

Session: 2025-26			
Part A – Introduction			
Name of the Programme		M.Sc. Zoology	
Semester		3	
Name of the Course		Practical based on Papers M24-ZOO-305/	
Course Code		M24-ZOO-308	
Course Type		PC-6	
Level of the course		500-599	
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology	
Course Learning Outcomes (CLO)	CLO 1: It will boost students for keen understanding various behavioral activity of animal world CLO 2: Students will acquire a clear practical understanding about behavior patterns in animals CLO 3: Students will know about the practical approaches of protected area system in India CLO 4: Detail understanding of residential and migratory nature of avian fauna		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours	
Part B- Contents of the Course			
Practicals			Contact Hours
	Course Contents: 1. Designing of experiments, observations, techniques of data analysis, presentation of results and writing of laboratory report. 1. To demonstrate locomotive, explorative withdrawal and habituation behaviours in animals. 2. To demonstrate response of animals to light. 3. To demonstrate antennal grooming behaviour in cockroach. 4. Demonstration of food preferences in insects/pests 5. Investigation of habituation of diving response of mosquito larvae. 6. To study the effect of temperature on heartbeat of cockroach/ Gill movements in Fishes. 7. Field study of nesting behaviour of common available avian fauna of the region. 8. Study of Migratory Birds 9. To study mobbing response of birds. 10. Study of animal behavior patterns using repertoire sheets. 11. To prepare charts of wildlife zones of India and the world. 12. Field visits to local areas/Project Report		120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Techniques for wildlife Census in India by W.A. Rogers (A field manual); Wildlife Institute of India, Dehradun.			
2. Wildlife Wealth of India by T.C. Majupuria; Tecpress Services, L.P., 487/42-SOL-Wattenslip, Pratunam Bangkok, 10400, Thailand			
3. Ali, S. Ripley S.D. Handbook of Birds of India, Pakistan 10-Vols. Oxford University Press, Bombay.			
4. The Book of Indian Animals by S.H. Prater, BNHS-Publication, Bombay.			
5. Wildlife in India by V.B. Saharia Natraj Publishers, Dehradun.			
6. E.P. Gee. The Wildlife of India.			

Session: 2025-26				
Part A – Introduction				
Name of the Programme		M.Sc. Zoology		
Semester		3		
Name of the Course		Practical based on Papers M24-ZOO-306/		
Course Code		M24-ZOO-308		
Course Type		PC-6		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: Student/s will be able to identify of fish species using classical morphological methods CLO 2: Students will be able to analyse physico- chemical status of water of lotic and lentic Components CLO 3: Students will be able to conduct qualitative and quantitative analysis of phyto and Zooplanktons CLO 4: This practical course will also be helpful to develop personnel to develop career in organizations where water quality analysis and fish diversity studies are carried out			
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B- Contents of the Course				
Practicals				Contact Hours
	Course Contents: 1. Study of Anatomy and Morphology of important group of fishes. 2. Taxonomic study of common families, genera and species of fishes 3. Survey and Collection of fishes of Haryana 4. Examination of skeleton of cartilaginous and bony fishes 5. Study of histological and microscopic structure in fishes 6. Analysis of physical and chemical properties of water: Temperature, pH, turbidity, salinity, total solids, Dissolved oxygen, Free carbon-di-oxide, hardness, chlorides, orthophosphates, nitrates, ammonia 7. Qualitative and quantitative examination of Phyto and zooplanktons in a water body. 8. Determination of percent composition of different groups of phyto and zoo planktons 9. Determination of species diversity of phyto and zooplanktons 10. Study of Aquatic weeds and aquatic insects			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Ponniah, AG, Das, P & Verma SR (Ed.) (1998) Fish Genetics and Biodiversity Conservation. Nature Conservators, Muzaffarnagar, India 474pp.			
2. Bardach, JE, Ryther, JH & Mclarnely, OW (1972) Aquaculture. Wiley Interscience			
3. Boyd, CE (1988) Water quality management for pond fish culture. Developments in Aquaculture and Fisheries Sciences. I. Elsevier Scientific Publishing Company, Amsterdam.			
4. Delince, G (1992) The Ecology of the fish pond system. Kluwer Academic Publishers, Netherlands, 230 pp.			
5. Hoar, WS, Randall, DJ & Donaldson, ME (1983) Fish Physiology. Vol. IXA & IXB. Reproduction. Academic Press, London.			
6. Jhingran, VG (1983) Fish and Fisheries of India. Hindustan Publishing Corporation (India) 954 pp			
7. Tandon, KK & Johal, MS (2006) Age and Growth in Indian Freshwater Fishes.Narendra Publishing House Delhi, 232 pp.			
8. Handbook of Fisheries and Aquaculture, Indian Council of Agricultural Research, New Delhi. 755 pp.			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	M.Sc. Zoology		
Semester	3		
Name of the Course	Animal Diversity & Conservation		
Course Code	M24-OEC-352		
Course Type	OEC (To be offered by students of other Departments)		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO) :	CLO 1: Biological diversity provides immediate benefits to society such as recreation and tourism CLO 2: It will generate initiative among students for conservation of our rich natural resources and diversified life forms. CLO 3: It gives jobs opportunities for people by establish training research programmes that have been launched for conservation and sustainable use of bio diversity. CLO 4: Expand the knowledge of researchers to explore diversity of animal, its protection from extinction and their habitat from destruction		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	1. Wildlife: Definition, significance 2. Techniques of animal counts (Examples of Tiger count)		7.5
II	3. Wildlife zones of the India 4. Wildlife Tourism		7.5
III	5. Biodiversity: Concept, threats to biodiversity, its 6. Conservation (objectives and strategies), biodiversity indices,		7.5
IV	7. Concept and objectives of Protected areas: 8. Important Protected Areas of India (Biosphere reserve, National Park & Wildlife sanctuaries) 9. Red Data Book, IUCN Categories of wildlife species		7.5
Total Contact Hours			30

Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
➤ Theory	15	➤ Theory	35
• Class Participation:	4	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	4		
• Mid-Term Exam:	7		
Part C-Learning Resources			
Recommended Books/e-resources/LMS: 1.Techniques for wildlife Census in India by W.A. Rogers (A field manual); Wildlife Institute of India, Dehradun. 2.Wildlife Wealth of India by T.C. Majupuria; Tecpress Services, L.P., 487/42-SOL-Wattenslip, Pratunam Bangkok, 10400, Thailand 3.The Book of Indian Animals by S.H. Prater, BNHS-Publication, Bombay. 4.Wildlife in India by V.B. Saharia. Natraj Publishers, Dehradun. 5. E.P. Gee, The Wildlife of India			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Zoology		
Semester	4		
Name of the Course	Developmental Biology		
Course Code	M24-ZOO-401		
Course Type	CC-11		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: Based on learning contents of embryology, students can have a systematic and organised learning about the knowledge and concepts of growth and development. CLO 2: Developmental biology displays a rich array of material and conceptual practices that can be analysed to better understand the scientific reasoning exhibited in experimental life sciences CLO 3: To understand biological processes that takes place in and between cells and in and between organisms in nature. CLO 4: This understanding will make the students capable of describing and explaining both biological processes and their importance for living organisms.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	1. Introduction to animal development: 1.1 Problems of developmental biology 1.2 Developmental patterns in metazoans 1.3 Development in unicellular eukaryotes 1.4 Development in Dictyostelium 2. Creating multicellularity: 2.1 Cleavage types and significance, Blastula, Fate maps, cell lineages 2.2 Comparative account of gastrulation 3. Early vertebrate development: 3.1 Neurulation and ectoderm 3.2 Mesoderm and endoderm	15	
II	4. Cytoplasmic determinants and autonomous cell specification: 4.1 Cell commitment and differentiation 4.2 Germ cell determinants 4.3 Germ cell migration 4.4 Progressive cell - Cell interaction and cell specification fate 4.5 Cell specification in nematodes 5. Body pattern formation: 5.1 Establishment of Body axis in mammals and birds	15	

	5.2 Proximate tissue interactions 5.3 Genetics of axis specification in <i>Drosophila</i>	
III	6. Hormones as mediators of development: 6.1 Amphibian metamorphosis 6.2 Insect metamorphosis 7. Biology of sex determination: 7.1 Chromosomal sex determination – Mammals, <i>Drosophila</i> and Nematodes 7.2 Testis determining genes 7.3 Secondary sex determination in mammals 7.4 Environmental sex determination. 8. Cell death and cell renewal: 8.1 Programmed cell death 8.2 Stem cells and the maintenance of adult tissues 8.3 Embryonic stem cells and therapeutic cloning	15
IV	9. Environmental evolution and animal development: 9.1 Environmental cues and effects 9.2 Malformations and disruptions 9.3 Changing evolution through development modularity 9.4 Developmental constraints 10. Homeobox concept in different phylogenetic groups 10.1 Cell diversification in early animal embryo 10.2 Tetrapod limb development 10.3 Skeletal muscle regeneration 10.4 Connective tissue cell family 10.5 Blood cells formation	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1 .S.F. Gilbert. Developmental Biology. Sinauer Associates Inc., Massachusetts. Ethan Bier. ‘The Cold Spring’. Cold Spring Harbor Laboratory Press, New York. 2.Essentials of Developmental Biology: JMW Slack [Latest edition] . 3. Principles of Development: Louis Wolpert [Latest edition]. 4.An Introduction to Embryology by B.I. Balinsky, Saunders, Philadelphia (1981). 5.Major Problems in Developmental Biology by H. Urspaung, Academic Press, New York, (1972). 6.The Control of Gene Expression in Animal Development by J.B. Gurdon, Harvard University, Press, Oxford (1974). 7.Gene activity in Early Development by Davdson, E.H. Academic Press, London (1977). 8.Development Biology (Vol.II) by Browder, L.W, Saunders (1984).		

Session: 2025-26					
Part A – Introduction					
Name of Programme		M.Sc. Zoology			
Semester		4			
Name of the Course		Vertebrate Immunology			
Course Code		M24-ZOO-402			
Course Type		CC-12			
Level of the course		500-599			
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology			
Course Learning Outcomes (CLO)	CLO 1: How the immune system can fight infection and other diseases CLO 2: The strategies to improve existing vaccines and how to approach these CLO 3: Cellular and molecular basis of inflammatory response CLO 4: Mechanisms involved in control of immune response				
Credits		Theory	Practical	Total	
		4	0	4	
Teaching Hours per week		4	0	4	
Internal Assessment Marks		30	0	30	
End Term Exam Marks		70	0	70	
Max. Marks		100	0	100	
Examination Time		3 hours			
Part B- Contents of the Course					
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.					
Unit	Topics			Contact Hours	
I	1. Phylogeny and Ontogeny of immune system 1.1 Innate and Acquired Immunity 1.2 Organization and structure of lymphoid organs 1.3 Cells of the immune system and their differentiation 2. Nature of antigens and superantigens 2.1 Antigenicity and immunogenicity 2.2 Factors influencing immunogenicity 2.3 Epitopes and haptens 3. Structure and Functions of Antibodies 3.1 Classes and subclasses 3.2 Gross and Fine structure 3.3 Antibody mediated effector functions 4. Antigen-Ab interactions: Principles and Applications 4.1 Cross Reactivity, Precipitation reactions, Agglutination reactions 4.2 Radioimmunoassay, ELISA, Immunoprecipitation, Immunofluorescence			15	
II	5. Nature of immune response 5.1 Humoral Immune Response 5.2 Cellular Immune Response 6. Cytokines 6.1 Cytokine Properties 6.2 Cytokine receptors 6.3 Cytokines and Immune response 6.4 Cytokine Antagonists			15	

	6.5 Cytokine Related Diseases	
	7. Cell-mediated effector functions 7.1 Cell adhesion molecules 7.2 Effector cells and molecules 7.3 CTLs –Mechanism of action 7.4 NK cells-mechanisms of action	
	8. Hypersensitivity -Types and Mechanism.	
III	9. Complement System 9.1 Components and functions of Complement system 9.2 Pathways of complement system 9.3 Regulation and biological consequences. 10. Major Histocompatibility Complex in mouse and HLA system in human 10.1 Class I and class II molecules 10.2 Expression and diversity 10.3 Disease susceptibility and MHC/HLA 11. Organization and expression of Ig genes 11.1 Multigene organization of Ig genes 11.2 DNA rearrangements and mechanisms 11.3 Generation of antibody diversity 11.4 Differential expression of Ig genes.	15
IV	12. T-Cell Maturation, Activation and Differentiation 12.1 T-Cell Receptors- Organization and rearrangement of TCR genes, TCR-CD3 complex 12.2 T-cell maturation and thymus 12.3 T -cell activation and differentiation 12.4 Cell death and T-cell population 13. B-cell generation, activation and differentiation 13.1 B-cell receptors 13.2 B-cell maturation, activation and proliferation 13.3 T H-B-Cell interactions 14. Auto-immunity and Vaccines - Types – subunit, conjugate and recombinant vector vaccines.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Kuby. Immunology, W.H. Freeman, USA.		
2. W. Paul. Fundamentals of Immunology.		
3. I.M. Roitt. Essential of Immunology, ELBS Edition.		
4. Immuno Biology- The immune system in health and disease, Janeway, Travers, Walport and Shlomchik, Garland Science Publishing [Latest edition].		
5. Fundamentals of Immunology by William E. Paul, Lippincott Williams & Wilkins Publishing [Latest edition].		
6. Cellular and Molecular Immunology by Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai, Elsevier Publishing [Latest edition].		

Session: 2025-26				
Part A – Introduction				
Name of Programme		M.Sc. Zoology		
Semester		4		
Name of the Course		Environmental Toxicology		
Course Code		M24-ZOO-403		
Course Type		DEC-3		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: The awareness about toxic agents, their different routes of exposure and their effects on humans and their livestock will be appraised. CLO 2: The students will have the knowledge about mode of transformation of toxicants CLO 3: It will help in creating skilled personnel in the field of environment protection and research. CLO 4: Students will have an understanding of ill-health and diseases that are related to exposure to chemicals in human everyday life			
Credits		Theory	Practical	Total
		4	0	4
Teaching Hours per week		4	0	4
Internal Assessment Marks		30	0	30
End Term Exam Marks		70	0	70
Max. Marks		100	0	100
Examination Time		3 hours		
Part B- Contents of the Course				
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.				
Unit	Topics			Contact Hours
I	1. Introduction to Environmental Toxicology: 1.1 Emergence of toxicity in the environment 1.2 Classical toxicology, ecotoxicology and environmental toxicology. 1.3 Classification of toxicants. 2. Toxic agents: Pesticides, metals, solvents radiation, carcinogens, poisons, bio-toxins, petrochemicals.			15
II	3. Toxicant uptake: 3.1 Route of toxicant uptake/Absorption of toxicant at tissue and cellular level 3.2 Distribution and storage of toxicant. 3.3 Biotransformation and elimination of toxicant. 4. Xenobiotics: Definition, types and significance Target organ toxicity: 4.1 Hematotoxicity 4.2 Hepatotoxicity 4.3 Nephrotoxicity 4.4 Neurotoxicity			15
III	5. Environmental Toxicology: Food additives, air, water and soil pollutants and Bio-indicators. 6. Effect of pollutant on ecosystem with case study of important Organo-phosphorous and Organo-chlorine pesticides and Nitrates 7. Solid waste management: Primary waste products-Solid waste, toxic biological and hospital landfills, incineration, source reduction and recycling.			15

IV	8. Bioremediation, its role and significance. 9. Toxicological risk assessment and management with reference to relevant case study. 10. Principles and significance of systematic toxicology. 11. Genotoxicology: Definition, Effects, molecular mechanisms and prevention. 12. Applications of toxicology anthropogenic activities and environment. 13. Human toxicology and medicinal ethics.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1.	Handbook of Solid Waste Management by Wilson, Van Nostrand, Reinhold.	
2.	Environmental Studies by D.B. Botkin, & E.A. Keller, Martill Publising Co., Columbs, Toronto, London.	
3.	Bioremediation Technology by Fulekar, M.H.	
4.	Biotranformation: Bioremediation Technology for Health & Environmental Protection by R. D. Stapleton Jr. and V.P. Singh (Ed), Elsevier.	
5.	Casarett & Doull's Toxicology: The Basic Science of Poisons by Curtis Klaassen.	
6.	Ecotoxicology: The study of pollutants in ecosystems. 3rd Ed. Elsevier by Moriarty, F.	
7.	Environment concerns and strategies. Ashish Pub. House, NDL by T.N. Khushoo.	
8.	Environmental biology. Akashdeep Pub. House by R.R. Trevedi Gurdeep Raj.	
9.	Textbook: A Textbook of Modern Toxicology. Third Edition by E. Hodgson (Ed.). John Wiley & Sons, Inc. (Posted on the D2L content page.)	
10.	Environmental Health by Monroe T. Morgan	
11.	Handbook of Environmental Health and Safety – principle and practices by H. Koren; Lewis Publishers	
12.	Principles of Environmental Toxicology by I. C. Shaw and J. Chadwick; Taylor & Francis ltd.	
13.	Introduction to Toxicology, 3rd Ed. Taylor & Francis, London by Timbrell, J.	

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Zoology		
Semester	4		
Name of the Course	Molecular Reproduction-II		
Course Code	M24-ZOO-404		
Course Type	DEC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: Basic and molecular concepts of reproductive physiology. CLO 2: Cellular and molecular mechanisms of fertilization, implantation, pregnancy and lactation CLO 3: The biological principles underlying contraceptive technology, and compare and contrast the various options for control of fertility, methods for assisted reproductive technologies to circumvent infertility. CLO 4: The origin and characteristics of common congenital malformations, the maternal responses and complications of pregnancy.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	1. Sex Determination: Chromosomal sex determination in mammals, Autosomal testis determining genes, Hormonal regulation of sex determination. Androgen insensitivity syndrome 2. Reproductive cycles: Menstrual cycle and its regulation in humans, Estrous cycle in rat, Estrous behaviour in cycling animals. 3. Molecular bases of Fertilization in mammals: Gamete transport, fertilization competence by gametes, capacitation, acrosome reaction, oocyte-sperm interaction, oocyte activation, gamete fusion.	15	
II	4. Hormonal regulation: Implantation, pregnancy, parturition, oxytocin- synthesis, secretion and its role in parturition, placenta and its hormones. 5. Mammary glands- Structure, development and physiology of lactation, milk synthesis and secretion; regulation and ejection of milk.	15	
III	6. Apoptosis: Molecular mechanism, regulation, and significance; Apoptosis in reproductive aging. 7. Assisted reproductive techniques- IVF, IUI, ICSI, GIFT, ZIFT, Surrogacy, negative aspects and recent trends in ART. 8. Contraception: Natural method (Fertility awareness), Surgical, Physical/Barrier methods, Chemical methods, Immunocontraception	15	

IV	9. Reproductive failure in females -Ovarian dysfunction, estrus abnormalities, fertilization failure, Pregnancy wastage- embryonic mortality, fetal mortality, infectious and non-infectious causes, prenatal and neonatal mortality.	15	
	10. Reproductive failure in males -Congenital malformations-cryptorchidism, testicular hypoplasia, ejaculatory disturbances, sperm defects, fertilization failure		
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory		30	➤ Theory:
• Class Participation:		5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:		10	
• Mid-Term Exam:		15	
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1.	Guraya S.S. (1998). Cellular and Molecular Biology of General development and Maturation in mammals Narosa Publishing House, New Delhi.		
2.	Hafez E.S.E.(1994).”Reproduction in farm animals”. Lea Febighiese.		
3.	Gurays S.S. (2000). Comparative Cellular and Molecular Biology of Ovary in mammals. I.B.H., New Delhi.		
4.	The Physiology of Reproduction, second edition, Vol 1 and 2, edited by Ernst Knobil and Jimmy D. Neil. <i>Raven Press</i> , 2014.		
5.	Male Reproductive Function, edited by Christina Wang. <i>Kluwer Academic Publishers</i> , 1999.		
6.	The ovary, edited by Solly Zuckerman Baron Zuckerman, Barbara J. Weir, T. G. Baker. <i>Academic Press</i> .		
7.	The ovary, edited by Peter C.K. Leung and Eli Y. Adashi, Elsevier (Academic Press), 2004.		
8.	Cell and Molecular Biology of Testis, edited by Claude Desjardins and Larry L. Ewing. <i>Oxford University Press US</i> .		
9.	Reproductive Endocrinology: Physiology, Pathophysiology, and Clinical Management, edited by Samuel S. C. Yen, Robert B. Jaffe, Robert L. Barbieri. <i>Saunders publisher</i> .		
10.	Regulation of Implantation and Establishment of Pregnancy in Mammals, Editors: Rodney D Geisert, Fuller W. Bazer, ISBN 978-3-319-15856-3, Springer International Publishing, 2015.		
11.	Implantation and early development, Editors: Hilary Critchley, Ian Cameron and Stephan Smith, ISBN 9781107784680, Cambridge University press, 2014.		
12.	Implantation, Biological and Clinical Aspects, Editors: Michael G. Chapman, J. Geddis Grudzinskas, Tim Chard, ISBN 978-1-4471-3531-9, Springer-Verlag, 1988.		

Session: 2025-26				
Part A – Introduction				
Name of Programme		M.Sc. Zoology		
Semester		4		
Name of the Course		Animal Behaviour and Wildlife Conservation – II		
Course Code		M24-ZOO-405		
Course Type		DEC-4		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1:	It will boost students for betterment of diversified resources and life forms for better conservational measures with keen understanding and new approaches.		
	CLO 2:	Acquire a clear understanding about social behavior patterns in animals		
	CLO 3:	To know about the concept of wildlife census techniques		
	CLO 4:	Detail understanding of conservational approaches in wild		
Credits		Theory	Practical	Total
		4	0	4
Teaching Hours per week		4	0	4
Internal Assessment Marks		30	0	30
End Term Exam Marks		70	0	70
Max. Marks		100	0	100
Examination Time		3 hours		
Part B- Contents of the Course				
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.				
Unit	Topics			Contact Hours
I	1. Social behaviour: 1.1 Aggregations and society; 1.2 Advantages of group living; 1.3 Types of social organization in animals 1.4 Group selection, kin selection, altruism, reciprocal altruism. 1.5 Territoriality and parental care 1.6 Behaviour Ecology: Habitat selection 2. Social behaviour of termites, ants and primates. 3. Various means of communication in animals: Chemical, Visual, auditory, touch etc.			15
II	4. Hormones and animal Behaviour: Hormones important to behavioural regulation; Genetic basis of behaviour 5. Aggressive behaviour; sexual attraction and sexual behaviour. 6. Pheromones and animal behaviour: types of pheromones, role of pheromones in animal behaviour; pheromones of social insects, Human Ethology			15

III	7. Wildlife Census: Planning a wildlife census, understanding sample counts, Block counts, Road side counts, Dung counts, Pugmark census, Water-hole census. 8. Study of signs and symptoms: A practice of recording field observations, Bio-telemetry, Ageing and Sexing techniques. 9. Wildlife Tourism: Definition scope and range; Popular Wildlife Tourist Sports of the world, Popular Wildlife spots in India, Sustainable use of wildlife spots.	15
IV	10. Wildlife Damage, its nature and definition, electric fences for wildlife damage control, Basic electric fence design, Trench design, live trapping, Mist netting, Rocket netting Chemical capture: Equipment, Drugs, Plan of operation. 11. Poaching: Its definition and implications, conducting anti-poaching operations, evidence in poaching cases. 12. National Projects: Project Tiger, Project elephant, Project Rhinoceros, Project Crocodiles, Project Hangul, Manipur Brow Antlered Deer.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1.	Techniques for wildlife Census in India by W.A. Rogers (A field mannual); Wildlife Institute of India, Dehradun.	
2.	Wildlife Wealth of India by T.C. Majupuria; Tecpress Services, L.P., 487/42-SOL-Wattenslip, Pratunam Bangkok, 10400, Thailand	
3.	Ali, S. Ripley S.D. Handbook of Birds of India, Pakistan 10-Vols. Oxford University Press, Bombay.	
4.	The Book of Indian Animals by S.H. Prater, BNHS-Publication, Bombay.	
5.	Wildlife in India by V.B. Saharia Natraj Publishers, Dehradun.	
6.	E.P. Gee, The Wildlife of India.	

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Zoology		
Semester	4		
Name of the Course	Fish, Fisheries and Aquaculture – II		
Course Code	M24-ZOO-406		
Course Type	DEC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: The students will learn the techniques using biotechnological approach to improve fish stock and will also understand ethics involved in it. CLO 2: This core elective paper will help in learning culture techniques of aquatic organisms CLO 3: This will help in developing skilled personnel in techniques of improving the fish Stock and yield of aquaculturally important aquatic organisms. CLO 4: The study of culture techniques of various aquatic organisms helps in the production of healthy food for human consumption in a sustainable manner and also in employment generation.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	1. Introduction to fish biotechnology 2. Selection and hybridization 3. Androgenesis and Gynogenesis – natural and induced 4. Polyploidy techniques 5. Sex reversal and sterility	15	
II	6. Transgenesis, transgenes and application 7. Cryopreservation of gametes and embryo 8. Fish-by products 9. Fish preservation process 10. Nutritive aspect of fish meat and oil.	15	
III	11. Different systems for aquaculture: pond culture, cage culture, raceway culture. 12. Culture of important fish species (Major carps, common carps, Chinese carps, cat fish culture and Tilapia culture). 13. Integrated Aquaculture and waste water aquaculture	15	

	14. Pearl Culture 15 Frog culture	
IV	16.Prawn culture-Fresh and brackish water 17. Impact of Aquaculture on Environment 18. Methods of Fishing : Crafts and gear technology 19. Fish diseases and their control 20. Nutrition in Aquaculture 20.1 Nutrient and non-nutrient diet components 20.2 Preparation and processing of feed, feed formulae, 20.3 Natural and supplementary feed and their utilization	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Ponniah, AG, Das, P & Verma SR (Ed.) (1998) Fish Genetics and Biodiversity Conservation. Nature Conservators, Muzaffarnagar, India 474pp.		
2. Bardach, JE, Ryther, JH & McLarnely, OW (1972) Aquaculture. Wiley Interscience		
3. Boyd, CE (1988) Water quality management for pond fish culture. Developments in Aquaculture and Fisheries Sciences. I. Elsevier Scientific Publishing Company, Amsterdam.		
4. Delince, G (1992) The Ecology of the fish pond system. Kluwer Academic Publishers, Netherlands, 230 pp.		
5. Hepher, B (1975) Supplementary feeding in fish culture. In: Nutrition and Production of Fishes. Vol. 3 S. Karger, Basel : 183-198		
6. Hoar, WS, Randall, DJ & Donaldson, ME (1983) Fish Physiology. Vol. IXA & IXB. Reproduction. Academic Press, London.		
7. Jhingran, VG (1983) Fish and Fisheries of India. Hindustan Publishing Corporation (India) 954 pp		
8. Tandon, KK & Johal, MS (2006) Age and Growth in Indian Freshwater Fishes.Narendra Publishing House Delhi, 232 pp.		
9. Handbook of Fisheries and Aquaculture, Indian Council of Agricultural Research, New Delhi. 755 pp.		

Session: 2025-26				
Part A – Introduction				
Name of the Programme		M.Sc. Zoology		
Semester		4		
Name of the Course		Practical (Based on Papers M24-Zoo 401 to M24-ZOO 403)		
Course Code		M24-ZOO-407		
Course Type		PC-7		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: Students will know the principle and various techniques of embryology. CLO 2: Students will be able to identify the various stages involved in the developing embryo of chick. CLO 3: They will able to demonstrate basic principles in sediment chemistry and qualitative analysis of genotoxicity. CLO 4: Students will able to prepare the histological slides of different tissues for clinical studies and for research purpose.			
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B- Contents of the Course				
Practicals				Contact Hours
	Course Contents: 1. Permanent preparation of chick embryo developmental stages. 2. Studies of different types of eggs with reference to their yolk contents 3. To study internal morphology of chick egg 4. Study of development in Dictyostelium 5. Determination of various parameters of chick egg 6. To study the permanent slides of frog embryo developmental stages 5. Antigen-antibody interaction in vitro. 6. ELISA (Demonstration). 7. Phagocytosis <i>in vitro</i> . 8. Immunological diagnosis of pregnancy/infection/cancer. 9. To study permanent slides of Lymphoid and endocrine glands 10. Studies on vaginal smears during different stages of estrous cycle. 11. Bioassay to demonstrate toxicological effect: Micronuclei Assay and demonstration of Single Cell Gel electrophoresis to elucidate toxicological effect 12. Determination of sediment chemistry a. Moisture b. Carbonate c. Nitrate d. pH e. Phosphate f. Texture			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. S.F. Gilbert. Developmental Biology. Sinauer Associates Inc., Massachusetts. Ethan Bier. 'The Cold Spring'. Cold Spring Harbor Laboratory Press, New York. 2. An Introduction to Embryology by B.I. Balinsky, Saunders, Philadelphia (1981). 3. Major Problems in Developmental Biology by H. Ursprung, Academic Press, New York, (1972). 4. The Control of Gene Expression in Animal Development by J.B. Gurdon, Harvard University, Press, Oxford (1974). 5. Gene activity in Early Development by Davidson, E.H. Academic Press, London (1977). 6. Kuby. Immunology, W.H. Freeman, USA. 7. Fundamentals of Immunology by William E. Paul, Lippincott Williams & Wilkins Publishing [Latest edition]. 8. Cellular and Molecular Immunology by Abul K. Abbas, Andrew H. Lichtman, Shiv Pillai, Elsevier Publishing [Latest edition]. 9. Bioremediation Technology by Fulekar, M.H. 10. Ecotoxicology: The study of pollutants in ecosystems. 3rd Ed. Elsevier by Moriarty, F. 11. Handbook of Environmental Health and Safety – principle and practices by H. Koren; Lewis Publishers 12. Introduction to Toxicology, 3rd Ed. Taylor & Francis, London by Timbrell, J.			

Session: 2025-26				
Part A – Introduction				
Name of the Programme		M.Sc. Zoology		
Semester		4		
Name of the Course		Practical based on Papers M24-ZOO-404/ M24-ZOO-408		
Course Code		M24-ZOO-408		
Course Type		PC-8		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: To develop the scientific attitude that makes the students open minded, critical observations, curiosity thinking etc. CLO 2: To acquire the specialized knowledge relevant to reproductive biology and biochemistry. CLO 3: To understand the basic and molecular laboratory techniques in both physiology and biochemistry. CLO 4: To acquire the knowledge about various male and female infertility problems			
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B- Contents of the Course				
Practicals				Contact Hours
	Course Contents: 1. Effects of pesticides, drugs, and xenobiotics on granulosa cells <i>in vitro</i> . 2. Effects of pesticides, oxidants, and free radicals on testicular tissue <i>in vitro</i> . 3. Morphological changes during spermatogenesis. 4. Effects of environmental endocrine disruptors on the fertility after exposure in vitro. 5. Estimation of catalase from reproductive tissues 6. Determination of Glutathione peroxides, glutathione reductase from reproductive tissues. 7. Lipid peroxidation by MDA method. 8. Impact of Vitamin C & E and other antioxidants on pesticides induced cytotoxicity on reproductive tissues <i>in vitro</i> . 9. Isolation of genomic DNA 10. Agarose Gel Electrophoresis: Practical demonstration 11. Age related changes in sperm characteristics. 12. Demonstration of Single Cell Gel electrophoresis/COMET Assay to elucidate toxicological effect.			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1.	Guraya S.S. (1998). Cellular and Molecular Biology of General development and Maturation in mammals Narosa Publishing House, New Delhi.		
2.	Hafez E.S.E.(1994).”Reproduction in farm animals”. Lea Febighiese.		
3.	Gurays S.S. (2000). Comparative Cellular and Molecular Biology of Ovary in mammals. I.B.H., New Delhi.		
4.	The Physiology of Reproduction, second edition, Vol 1 and 2, edited by Ernst Knobil and Jimmy D. Neil. Raven Press, 2014.		
5.	Male Reproductive Function, edited by Christina Wang. Kluwer Academic Publishers, 1999.		
6.	The ovary, edited by Solly Zuckerman Baron Zuckerman, Barbara J. Weir, T. G. Baker. Academic Press.		
7.	The ovary, edited by Peter C.K. Leung and Eli Y. Adashi, Elsevier (Academic Press), 2004.		
8.	Cell and Molecular Biology of Testis, edited by Claude Desjardins and Larry L. Ewing. Oxford University Press US.		
9.	Reproductive Endocrinology: Physiology, Pathophysiology, and Clinical Management, edited by Samuel S. C. Yen, Robert B. Jaffe, Robert L. Barbieri. Saunders publisher.		
10.	Regulation of Implantation and Establishment of Pregnancy in Mammals, Editors: Rodney D Geisert, Fuller W. Bazer, ISBN 978-3-319-15856-3, Springer International Publishing, 2015.		
11.	Implantation and early development, Editors: Hilary Critchley, Ian Cameron and Stephan Smith, ISBN 9781107784680, Cambridge University press, 2014.		
12.	Implantation, Biological and Clinical Aspects, Editors: Michael G. Chapman, J. Gedis Grudzinskas, Tim Chard, ISBN 978-1-4471-3531-9, Springer-Verlag, 1988.		

Session: 2025-26				
Part A – Introduction				
Name of the Programme		M.Sc. Zoology		
Semester		4		
Name of the Course		Practical Based on Papers M24-ZOO- 405		
Course Code		M24-ZOO-408		
Course Type		PC-8		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: It will boost students for keen understanding various population estimation methods in animal world. CLO 2: Students will acquire a clear practical understanding about behavior repertoire sheets CLO 3: Students will understand the practical approaches of diversity indices CLO 4: Will have detail understanding of reported avifaunal status in the field			
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B- Contents of the Course				
Practicals				Contact Hours
	Course Contents: 1 To study the effect of temperature on gill movement in fishes. 2 To study nesting behaviour of squirrels in different habitats vis., urban environment, grain-market-area, roadside plantations, orchards gardens etc. 3 Field study of burrowing behaviour of common available rodent fauna of the region. 4 Study of morphological changes in common avian species during breeding season. 5 Preparation of charts of endangered amphibians, reptiles and mammals with ecological remarks. 6 Animal behaviour patterns using Photostat sheets/ repertoire sheets 7 Analysis of standard pug marks of large sized wild mammals. 8 Study of Migratory Birds 9 Study of Diversity indices : use of software in calculating diversity indices 10 Study of beaks and claws of different bird species. 11 Field visit to a zoo or wildlife part/sanctuary and preparation of field report 12 Preparation of field diary on the basis of observations regarding habitat, habits of common available avian and rodent fauna of the region.			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS: 1. Techniques for wildlife Census in India by W.A. Rogers (A field manual); Wildlife Institute of India, Dehradun. 2. Wildlife Wealth of India by T.C. Majupuria; Tecpress Services, L.P., 487/42-SOL-Wattenslip, Pratunam Bangkok, 10400, Thailand 3. Ali, S. Ripley S.D. Handbook of Birds of India, Pakistan 10-Vols. Oxford University Press, Bombay. 4. The Book of Indian Animals by S.H. Prater, BNHS-Publication, Bombay. 5. Wildlife in India by V.B. Saharia Natraj Publishers, Dehradun 6. E.P. Gee, The Wildlife of India.			

Session: 2025-26				
Part A – Introduction				
Name of the Programme		M.Sc. Zoology		
Semester		4		
Name of the Course		Practical Based on Papers M24-ZOO 406		
Course Code		M24-ZOO-408		
Course Type		PC-8		
Level of the course		500-599		
Pre-requisite for the course (if any)		B.Sc. Honours with Zoology/ Honours with Research in Zoology/PG Diploma in Zoology after UG, Zoology		
Course Learning Outcomes (CLO)	CLO 1: The students will be able to formulate and process fish feed using different ingredients for sustainable fish culture CLO 2: This practical paper will make students capable of quantifying proximate composition of fish feed CLO 3: This will develop skilled personnel in techniques of making pituitary extract and estimating primary productivity CLO 4: This will develop students capable of using different fish nets and gears for capturing fishes and also of conducting small projects .			
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B- Contents of the Course				
Practicals				Contact Hours
	Course Contents: 1. Fish Feed formulation and processing. 2. Proximate analysis of fish feed (Determination of moisture, protein, fat, ash carbohydrate, fiber and energy). 3. Taking out of pituitary gland, preservation and preparation of extract. 4. Estimation of primary productivity 5. Study of benthic macro-invertebrates in natural water bodies. 6. Identification of eggs, spawn, fry and fingerlings of cultivable fishes of India. 7. Determination of length weight relationship. 8. Determination of age of fish using hard parts 9. Analysis of fecundity, Gonado somatic index (GSI), Hepatosomatic index (HIS) in some fishes. 10. Study of crafts and gear and method of operation (Models can also be used) 11. Visit to fish farm and fish market and preparation of report 12. A small experimental project			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Ponniah, AG, Das, P & Verma SR (Ed.) (1998) Fish Genetics and Biodiversity Conservation. Nature Conservators, Muzaffarnagar, India 474pp.			
2. Bardach, JE, Ryther, JH & McLarnely, OW (1972) Aquaculture. Wiley Interscience			
3. Boyd, CE (1988) Water quality management for pond fish culture. Developments in Aquaculture and Fisheries Sciences. I. Elsevier Scientific Publishing Company, Amsterdam.			
4. Delince, G (1992) The Ecology of the fish pond system. Kluwer Academic Publishers, Netherlands, 230 pp.			
5. Hepher, B (1975) Supplementary feeding in fish culture. In: Nutrition and Production of Fishes. Vol. 3 S. Karger, Basel : 183-198			
6. Hoar, WS, Randall, DJ & Donaldson, ME (1983) Fish Physiology. Vol. IXA & IXB. Reproduction. Academic Press, London.			
7. Jhingran, VG (1983) Fish and Fisheries of India. Hindustan Publishing Corporation (India) 954 pp			
8. Tandon, KK & Johal, MS (2006) Age and Growth in Indian Freshwater Fishes.Narendra Publishing House Delhi, 232 pp.			
9. Handbook of Fisheries and Aquaculture, Indian Council of Agricultural Research, New Delhi. 755 pp.			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	M.Sc. Zoology		
Semester	4		
Name of the Course	Entrepreneurship Approaches in Zoology		
Course Code	M24-ZOO-409		
Course Type	EEC		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes (CLO) :	CLO 1: Enhance the skills like innovativeness, creativity to enhance the business performance. CLO 2: Student will be able to assess their readiness or ability for entrepreneurship. CLO 3: Student are able to create presentations and business plans CLO 4: Enable students to identify and make the most opportunities, overcome and learn from setbacks.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Introduction to Zoological Entrepreneurship 1. Concept and scope of entrepreneurship in biological sciences 2. Role of a zoologist as an entrepreneur 3. Types of zoology-based ventures: profit, non-profit, and social enterprises 4. Government schemes and startup support (Make in India, Startup India, MSME)	7.5	
II	Wildlife and Eco-Tourism Enterprise 4. Basics of eco-tourism and its ecological implications 5. Designing nature-based tourism: safaris, trails, herping, birdwatching 6. Legal and ethical considerations (Wildlife Protection Act, 1972) 7. Case studies: Gir National Park, Kaziranga, Great Himalayan National Park	7.5	
III	Bio-products, Animal Farming, and Biotechnology 8. Sustainable use of animal resources: sericulture, aquaculture, apiculture 9. Insect-based products (e.g., biofertilizers, food products) 10. Fish Farming, ornamental fish breeding, vermiculture, Butterfly farming 11. Wildlife forensics, DNA barcoding, Bioinformatics and biotech service startups, AI and Machine learning techniques for studying animal behavior	7.5	

IV	Enterprise Development & Zoological Communication • Basic business planning: idea to implementation • Marketing and outreach strategies for Zoological enterprise • Fundraising, proposal writing, and networking with NGOs/CSR agencies • Media, digital platforms, and content creation (blogs, YouTube, reels)	7.5	
Total Contact Hours		30	
Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
➤ Theory	15	➤ Theory	35
• Class Participation:	4	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	4		
• Mid-Term Exam:	7		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

DISSERTATION

(Note : If A Candidate Is Offered Dissertation Course, Then He/ She Will Also Study CC-11, Dec-4 & EEC From Above Courses Of Semester4)

4	Dissertation/ Project work	M24- ZOO- 410	Dissertation/ Project work	D	12	26	0	0	0	-	0	300	300	-

Course Learning Outcomes (CLO)

Students will be able to

CLO 1:Formulate a focused research question and design a robust, methodologically sound investigation to address it.

CLO 2:Employ appropriate experimental, analytical, or field techniques to collect, analyze, and interpret botanical data effectively.

CLO 3:Critically evaluate research findings in light of existing theories, and communicate results clearly through well-structured scientific writing and presentations.

CLO 4;Exhibit independence, time management, and scientific integrity throughout the research process, while responding thoughtfully to feedback and defending

Description

I

Each student is required to undertake a research project in a relevant area of Zoology. The outcome of this research will be compiled into a dissertation and submitted for evaluation at the end of the semester. Students will also present their dissertation before an external examiner. Both internal and external assessments of the project and training will be conducted as per the prescribed evaluation criteria.

Assessment Structure

Internal Assessment:

- Submission of Dissertation
- One Mid-Semester Progress Report and/or Presentation

External Assessment:

- Final Project Report (Dissertation)
- Viva-Voce Presentation before an External Examiner

Dissertation Report Submission Guidelines

1. Structure of the Dissertation Report:

The dissertation should include the following components in order:

- Cover page
- Certificate signed by the student and supervisor
- Table of contents
- Introduction
- Objectives
- Literature review
- Methodology
- Results and Discussion
- Conclusion
- References

2. Formatting Requirements:

- Paper size: A4
- Font: Times New Roman, size 12
- Line spacing: 1.5 (one and a half spacing)
- Printing: Double-sided (print on both sides of the paper)
- Length: The written portion should be between 40 to 60 pages

3. Submission Requirements:

- Students must submit **three hard-bound copies** of the dissertation along with a **CD** containing a soft copy, to the department by the specified deadline.

4. Evaluation and Presentation:

- The student will be required to **defend the dissertation/project work** through a formal **presentation before an external examiner** at the end of the semester.
- Marks will be awarded based on both the written report and the oral presentation.

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

(A⁺⁺ Grade, NAAC Accredited)



Syllabus of Examination for Post Graduate Programme M.Sc. FORENSIC SCIENCE

**as per NEP 2020
Curriculum and Credit Framework for Postgraduate Programme**

**With CBCS-LOCF
With effect from the session 2025-26**

**DEPARTMENT OF ZOOLOGY
FACULTY OF LIFE SCIENCES**

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119

HARYANA, INDIA

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Forensic Science		
Semester	3		
Name of the Course	Forensic Ballistics and Explosives		
Course Code	M24-FSC-301		
Course Type	CC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)	Science Subjects at UG Level		
Course Learning Outcomes (CLO)	CLO1. To introduce the classification and characteristics of firearms involved in various crimes. CLO2. To understand the methods of identification of firearms and ammunition. CLO3. To understand the ballistics phenomena used in the reconstruction of shooting incidents. CLO4: To learn about forensic analysis of evidence related to shooting case. CLO5. Students will get to know the types, chemistry, and examination of evidence related to explosive substances.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	History and Background of Forensic ballistics: classification and characteristics of firearms, components of firearms, firearm safety, bore and calibre, working and types of firing mechanism, smooth bore and rifled bore firearms, methods to produce rifling, purpose of rifling. Handguns, shot guns. Non-standard firearms: Improvised, Country made, Imitative firearms, identification of origin. Ammunition: Classification and composition of cartridges, propellants, cartridge case, wads, compositional aspects of various types of bullets and shotgun projectiles. Firearms Database, Cartridge & bullet Database		15
II	Forensic Ballistics: Definition types and background, Internal ballistics: General principle, such as size, shape and ignition of propellants, barrel length, pressure curve, recoil, Vibration & Jump, Barrel Fouling. External ballistics, factors affecting external ballistics, measurements of trajectory parameters, ballistic coefficient, air resistance, rifling and bullet stability, ricochet phenomenon. Terminal/wound Ballistics: Factors affecting wound ballistics, bullet penetration phenomena, energy concept, stopping power, temporary and		15

	permanent cavity, characteristics of rifled firearm injury, and smooth bore firearm injury. Forensic evaluation of firearms injury. Entry and exit wound, range, striking angle.	
III	Firearms and Ammunition Linkage: Principles, comparison of fired cartridge cases and bullets, Stereo and comparison microscopy, automated bullet-cartridge identification systems – BDAS,IBIS and NIBIN. Gunshot residues: Introduction, mechanism of GSR production, composition and their forensic evaluation, chemical and instrumental methods of GSR analysis. Shooter identification. Reconstruction of Shooting Incidence: Theory of shooting reconstruction, mathematics of shooting reconstruction, accidental discharge, determination of range and time of fire. Shot pattern testing, laboratory examination of firearms. Law related to examination of firearms in Indian arms act. Prohibited & non-prohibited Firearms.	15
IV	Explosives: Classification, types, Deflagration and Detonation, firearms database, composition and characteristics of low explosives, primary and secondary high explosives. Black powder, NC, NG, TNT, RDX, PETN, HMX, Dynamite, ANFO, Flexible Sheet Explosives, etc. Detonators, blasting cap, boosters, blasting accessories, explosive trains, IEDs and pyrotechniques, explosion process and effects, effects of blast waves on structures and humans. Specific approach to scene of explosion, reconstruction of sequence of events, post-blast residues, collection, analysis of explosion residues.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. B. R. Sharma: Firearms in criminal investigation and trials. Universal Law Publishing; Fourth edition, 2012.		
2. J. Schwoeble and David L. Exline: Current methods in Forensic gunshot residue analysis CRC Press, 2000.		
3. Karl G. Sellier et al; Wound Ballistics and The Scientific Background, Elsevier Pub. Co.London, 1994.		
4. Yinon Jitrin. Modern Methods & Application in Analysis of Explosives, John Wiley & Sons, England, 1993.		
5. Explosive analysis manual, Directorate of Forensic Science, MHA, Govt. of India		
6. Hueske E. E., Practical Analysis and Reconstruction of Shooting Incidents, 2006, CRC Press.		
7. Vincent J. M., Di Maio, Gunshot woundsPractical Aspects of Firearms, Ballistics, and Forensic Techniques Second Edit. 1999, CRC Press		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Forensic Science		
Semester	3		
Name of the Course	Computer Forensics and Recent Advances		
Course Code	M24-FSC-302		
CourseType	CC-10		
Level of the course	500-599		
Pre-requisite for the course (ifany)	Science Subjects at UG Level		
CourseLearningOutcomes (CLO)	CLO1: The student will be able to identify hardware and types of software tools used for committing crime and other related evidence. CLO2: Students will be aware of methods used for revealing the information needed in cybercrime cases, such as the recovery of deleted, encrypted, or damaged files. CLO3: Students will be able to understand the requirements for good practices and quality management of the Forensic Science Laboratory. CLO4: The distribution and security of intellectual property enlighten the students about the legal guidelines on access and distribution of information.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unitand the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Computer Crime: Basics of computers, hardware accessories, operating systems (window, Mac, Linux), Computer languages, Knowledge of LAN, MAN, WAN and Fiber optics, IP address, VOIP, File formats, Memory and its types. Methods of data storage, hash function -calculation and its importance, Meta data and its relevance in Forensics, server architecture, artificial intelligence. Computer crimes: Types of computer crime, unauthorized access, program manipulation, software piracy. Cyber Crime: Definition and classification of cybercrimes. Hacking, virus, obscenity and pornography, encryption and description methods, Investigation of cybercrime: Search and seizure of computer system, computer-based evidences. Data recovery, Forensic analysis of electronic data, Tools for analysis, Repot writing.		15
II	Fundamental of Computer Security: Risk assessment and mitigation developing secure system, security models, damage control, assessment and auditing, and network security.		15

	Recent advances in Computer Forensics: Computer simulation, stenography and cryptography, Forensic linguistics, e- documents, digital signature.IT act 2000 - Introduction to offences and penalties related to cybercrime	
III	Video/Image Forensics -Imaging Softwares, steps of image Processing, Image Enhancement and restoration. Video processing and enhancement, Video authentication, Metadata analysis, hash value generation. Collection, handling and preservation of video files, Introduction to CCTV Forensics. The investigation of erased tapes, analysis of signals (Analog video image Processing), Compression, encryption methods. Cell phone/ Mobile Forensic – Seizing and preserving mobile devices, drones, Robots etc. Methods of acquisition of evidence from mobile devices	15
IV	Quality Management (ISO/IEC-17025, NABL): Introduction, general requirement for competence of testing, standardization and calibration of forensic laboratories—test and calibration methods and their validation, measurements, standards and reference materials, traceability, sampling, proficiency testing and review program, and management and technical requirements for quality assurance. Forensic nanotechnology, forensic sensing. Intellectual property rights: copyright, patents, and trademarks.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Tewari, R.K., et al.: Computer Crime & Computer Forensics selects Publisher, New Delhi, 2003.		
2. Vacca John R: Computer Forensics, Computer Crime Scene Investigation, Firewall Medial, An imprint of Laxmi Pub.		
3. Casey Eoghan: Handbook of Computer Crime Investigation, Forensic Tools & Technology, Academic Press.		
4. Darren R. Hayes, Practical Guide to Computer Forensics Investigations, A (Pearson IT Cybersecurity Curriculum (ITCC)) 1st Edition.		
5. William Oettinger, Learn Computer Forensics: A beginner's guide to searching, analysing, and securing digital evidence 1st Edition.		
6. Investigating Windows Systems 1st Edition by Harlan Carvey.		
7. Wolper, V. E. Photograph Restoration and Enhancement: Using Adobe Photoshop CC 2021 Version (3rd ed.).		
8. Forensic Speaker Identification by Phil Rose & James R. Robertson		
9. The Acoustic Analysis of Speech by Ray D Kent & Charles Read		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Forensic Science		
Semester	3		
Name of the Course	Forensic Medicine		
Course Code	M24-FSC-303		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	Science Subjects at UG Level		
Course Learning Outcomes (CLO)	CLO1: Students will be able to understand the cause of death and medico-legal aspects of death in various crimes. CLO2: Student will be able to understand about establish time since death, and post-mortem examination. CLO3: To understand various sexual offenses and the law related to sexual offenses, and methods of personal identification in crime cases. CLO4: Students will be able to observe and make inferences in order to initiate inquiries into criminal matters and medico-legal problems.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Forensic Medicine: Objectives of medico legal investigation, Inquest and types of Inquest, Thanatology, Cause of death; types of death, Signs of death, mode and manner of death, Aphyxial death- Introduction, characteristics and types of asphyxia death. Mechanical asphyxia-Hanging, strangulation, suffocation, traumatic and drowning, medico legal importance of diatoms, starvation: Characteristics and legal aspects. Evidence related to axphysial death.		15
II	Thermal Death: Characteristics, type, rule of nine, antemortem and post-mortem burn, scald and burn and their medico-legal aspects. Lightning – Electrocution. Estimation of time since death: Somatic, cellular and brain-death, Suspended animation. Immediate changes- cooling of body, lividity, rigor mortis, cadaveric spasm, cold stiffening and heat stiffening. Late change-putrefaction, adipocere, decomposition, skeletonization. Post-mortem examination, Exhumation		15
III	Injuries: Classification, types and characteristics of mechanical injuries, age of injury, antemortem and post mortem injury, artificial injury, grievous injury, suicidal/accidental/homicidal injuries; Regional Injuries and traffic injuries; self-inflicted injuries and examination. causes of death by mechanical, law related to injury and their medicolegal aspects.		15
IV	Crimes against women- Introduction to sexual offences: rape Investigation,		15

unnatural sexual offences, its medicolegal importance, Domestic violence and abuses at work place against women child abuses and abuses of old people, Abortion & Infant Deaths.Amendments in law related to sexual offences. sections of BNS related to sexual offences, Database of Sexual offenders. Identification of living and dead person: Living persons- Identification through race and religion, sex, age, stature, complexion and features. External marks- mole, birthmarks, occupation marks, scars, tattoo marks and deformities; Portrait parley/ Bertillon system, superimposition techniques- photographic and video superimposition.			
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. J. P. Modi: Textbook of Medical jurisprudence &Toxicology, M.M. Tripathi Pub.			
2. K. Parikh: Parikh’s test book of medical jurisprudence Forensic medicine and toxicology			
3. K.S. Narayan Reddy, The Essentials of Forensic Medicine & Toxicology 34 th Edition.			
4. Anil Aggrawal Forensic Medicine and Toxicology.			
5. Simpson’s Forensic Medicine 14 th Edition, Taylor & Francis.			
6. V.V. Pillay: Text book of Forensic medicine and toxicology			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Forensic Science		
Semester	3		
Name of the Course	Forensic Anthropology and Biometrics		
Course Code	M24-FSC-304		
CourseType	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	Science Subjects at UG Level		
Course Learning Outcomes (CLO)	CLO1: To help prospective students learn about the basics of anthropology. CLO2: Learners will be capable to characterize human bones and animal bones. CLO3: Student will be able to understand techniques for recovering skeletonized human remains and their laboratory analysis CLO4: Student will be able to understand the procedure of bone examination to identify the age, sex and stature. CLO5: To help prospective students learn about the basics of disaster victim identification.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Forensic Anthropology: Development of Forensic Anthropology, scope and problems, development and structure of bones, microscopic analysis of bone, morphological study of human skeleton, comparative study of human and animal skeleton. Techniques for recovering skeletonised human remains. Osteometry, Craniometry: Introduction, methods and their importance in personal identification, Statistics	15	
II	Personal identification from skeleton remains: Determination of race from skull and other bones, determination of age, determination of gender, and reconstruction of stature from skeleton remains. Assessing Trauma and Time Since Death.	15	
III	Forensic Odontology: Definition, scope, structural variation and types of teeth. Determination of age and sex from teeth, Gustafson's method, dental anomalies and their significance Bite Marks: Methods of collection, preservation, recording, comparison and their significance. Facial Reconstruction: Introduction, theory and methods, importance of tissue depth to reconstruct various facial features, genital and congenital anomalies. Facial Restoration to identify the victims and human bombs in blast cases.	15	
IV	Biometrics: Scopes, types, biometric characteristics, biometric techniques- data collection, transmission, signal processing, storage, identification. Fingerprint,	15	

	face, Iris and retina imaging, ear, speech recognition, pattern comparison, termination of human gait pattern in living people, Thermogram. Application of biometric tool.		
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Linda L. Klepinger: Fundamentals of Forensic Anthropology, Wiley-LISS.			
2. Bradley J. Adam: Forensic Anthropology. Infobase Publishing			
3. B.C. Smith, et al.: DNA & Forensic Odontology- Manual of Forensic Odontology, Colorado Springs, USA, 1995.			
4. L.C. Jain: Intelligent Biometric Techniques in Fingerprint and face recognition, CRC Press Ohio, 1999.			
5. S. Hillison: Dental Anthropology, Cambridge Univ. Press, UK 1996.			
6. Taylor: Forensic Art and Illustration, CRC Press. 2000			
7. James Wayman, Anil Jain, Davide Maltoni Dario Maio. Biometric Systems Technology, Design and Performance Evaluation. Springer			

Session: 2025-26				
Part A– Introduction				
Name of the Programme		M.Sc. Forensic Science		
Semester		3		
Name of the Course		Practical based on Papers M24-FSC-301 to M24-FSC-302		
Course Code		M24-FSC-305		
Course Type		PC-5		
Level of the course		500-599		
Pre-requisite for the course (if any)		Science Subjects at UG Level		
Course Learning Outcomes (CLO)	CLO1: The students will gain practical knowledge of the identification of firearms and ammunition involved in various crimes. CLO2: The student will be able to conduct forensic analysis of evidence related to shooting incidents, such as bullets, cartridges, barrels, CLO3: The student will be able to analyze explosive substances. CLO4: Students will be able to identify and track suspicious criminal activities going through email or computer-related devices.			
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B-Contents of the Course				
Practicals				Contact Hours
Practical Contents	1. Examination and comparison of fired bullets 2. Examination of characteristics of firearms—calibre, choke, etc. 3. Examination and Comparison of Fired Cartridges/Cases. 4. Determining the number of shots based on their size and weight. 5. To perform chemical tests for powder residues and barrel wash. 6. To determine range of firing. 7. Examination of Firearms Injuries 8. Identification of explosives by chemical colour test. 9. Identification of explosives by TLC methods 10. Image processing using tools like Photoshop, Photo Paint, etc. 11. To study about types of IP addresses. 12. Phishing case report 13. Creation & verification of Digital Signature 14. Virus attack case report			120
Suggested Evaluation Methods				
Internal Assessment: 30			End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70	
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical		
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10			
• Mid-Term Exam:	15			
Part C -Learning Resources				
Recommended Books/e-resources/LMS:				

1. Working Manual, Forensic ballistic. Directorate of Forensic Science MHA, Government of India.
2. Wolper, V. E. (2020). Photograph Restoration and Enhancement: Using Adobe Photoshop CC 2021 Version (3rd ed.). Mercury Learning & Information
3. M. Johari, Identification of Firearms, Ammunition and Firearms Injuries; BPR&D, New Delhi

Session: 2025-26				
Part A– Introduction				
Name of the Programme		M.Sc. Forensic Science		
Semester		3		
Name of the Course		Practical based on Papers M24-FSC-303 to M24-FSC-304		
Course Code		M24-FSC-306		
Course Type		PC-6		
Level of the course		500-599		
Pre-requisite for the course (if any)		Science Subjects at UG Level		
Course Learning Outcomes (CLO)		CLO1: The students will be capable of identifying human bones and animal bones. CLO2: The student will be able to understand the analysis methods for bone for recovering skeletonized human remains. CLO3: Students will be skilled in bone examination to identify the age, sex, and stature of a person. CLO4: Student will gain practical skill in anthropometric measurement of humans for personal identification.		
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B-Contents of the Course				
Practicals				Contact Hours
Practical Contents	1. Morphological identification of Human and animal bones 2. Estimation of stature from long bones 3. To perform craniometric measurements on skull. 4. Lifting identification and comparison of bite marks. 5. Determination of age from skull sutures. 6. Determination of sex from skull. 7. Determination of sex from Pelvis. 8. To Perform osteometric measurements on long bones. 9. To Perform craniometric measurements on skull. 10. To perform somatometric measurement on living. (a) Height vertex,			

Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1.	Working Manual of Directorate of Forensic Science Services MHA, Government of India.	Forensic	Biology,
2.	Jurisprudence and Toxicology	Modi JS:	Medical
3.	contain details of each experiment.	Online	manuals

Session: 2025-26				
Part A – Introduction				
Name of Programme		M.Sc. Forensic Science		
Semester		3		
Name of the Course		Basics of Forensic Science		
Course Code		M24-OEC-353		
Course Type		OEC		
Level of the course		500-599		
Pre-requisite for the course (if any)		Science Subjects at UG Level		
Course Learning Out comes (CLO)	CLO1: Learn about the concept of forensics, principles of forensic science, and handling of evidence at a crime scene. CLO2: Student will be able to understand the scientific methods of interrogations CLO3: The students will be aware of the evidence related to forensic biology. CLO4: To learn about the basics of fingerprints, their characterization, and comparison methods.			
Credits		Theory	Practical	Total
		2	0	2
Teaching Hours per week		2	0	2
Internal Assessment Marks		15	0	15
End Term Exam Marks		35	0	35
Max. Marks		50	0	50
Examination Time		3 hours		
Part B-Contents of the Course				
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unitand the compulsory question. All questions will carry equal marks.				
Unit	Topics			Contact Hours
I	Forensic Science: Definition and concept of forensic science, scope of forensic science, basic principles of forensic science. Physical evidence introduction, types, classification and forensic significance. Forensic Science Laboratory. Handling of crime scene: definition, types of crime scene, protection and recording of crime scene, search for physical clues, collection and preservation of physical clues, and chain of custody.			7.5
II	Personal Identification: Introduction and Analysis of Blood, Semen, Saliva, Hair, DNA Fingerprinting, Facial Superimposition, and Bite Mark Analysis.			7.5
III	Methods of Interrogation: introduction, Principle, lie detection methods, polygraph, Narco Analysis, and Brain Fingerprinting.			7.5
IV	Fingerprints: Introduction, classification of Fingerprints pattern, characteristics, development methods of Latent Finger Prints, Comparison of Finger Prints.			7.5
Total Contact Hours				30
Suggested Evaluation Methods				
Internal Assessment: 15			End Term Examination: 35	
➤ Theory		15	➤ Theory:	35
• Class Participation:		5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:		10		

• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Sharma B.R. Forensic Science in Criminal Investigation and Trials, Universal Law Publishing Company. 2. BS Nabar: Forensic Science in Crime Investigation 3. Gaensselen R., Harris H. and Lee H. (2007), Introduction to Forensic Science and Criminalistics, McGraw-Hill Education.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Forensic Science		
Semester	4		
Name of the Course	Forensic Physics		
Course Code	M24-FSC-401		
Course Type	CC-11		
Level of the course	500-599		
Pre-requisite for the course (if any)	Science Subjects at UG Level		
Course Learning Out comes (CLO)	CLO1: Students will be able to conduct forensic analysis of various pieces of evidence related to hit-and-run cases. CLO2: The student will be able to understand detailed forensic analysis of glass, paint, fiber, and other clues of forensic significance. CLO3: To identify types and composition of building materials and to elucidate the use of tool marks in their restorations CLO4: Student will be able to understand the basics of voice production and comparison methods of voice evidence.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Forensic Physics: Introduction and scope, tools and techniques of forensic physics, examination of vehicle in case of road traffic accident, reconstruction and proactive measures, skid mark evaluation, collision investigation and reconstruction. Glass: Types of glass and their composition—soda-lime, borosilicate, safety glass, laminated, light-sensitive, tempered/toughened, wire glass, and coloured glass. Matching and comparison. Forensic examinations of glass fractures—rib marks, hackle marks, cone fractures, wavy backward fragmentation, and concentric and radial fractures. Colour, fluorescence, physical measurements, refractive index, density gradient, Becke line, specific gravity examination, and elemental analysis of glass evidence.		15
II	Paint: Types of paint and their composition, macroscopic and microscopic analysis of paint pigments, pigment distribution, microchemical analysis (solubility test, pyrolysis gas chromatography, TLC, colorimetric analysis, IR spectroscopy, and X-ray diffraction), elemental analysis, mass spectrometer, and interpretation of paint evidence. Fiber: Types of fibers, forensic aspects of fiber examination—fluorescence, optical properties, refractive index, birefringence, and dye analysis. Physical fit and chemical testing. TLC, IR-micro spectroscopy, Py-MS. Difference between natural and man-made fibers. Miscellaneous Evidence: Wire, broken bangles, seals, counterfeit coins,		15

	ropes/strings, their introduction & forensic examination.			
III	Building Materials: Cement—Composition, Types, Forensic Analysis: bromoform test, fineness test, ignition-loss test, and identification of adulterated cement. Mortar and concrete analysis. Soil: Types and composition of soil, sample preparation, removal of contaminants, colour, molecular particle size distribution, turbidity test, pH measurements, microscopic examination, density gradient analysis, ignition-loss test, elemental analysis, and interpretation of soil evidence. Tool Marks: Theory, types of tool marks, forensic examination, and restoration methods of obliterated tool marks. Methods of lifting tool marks.		15	
IV	Voice Analysis and Tape Authentication: Introduction to voice identification and its forensic importance Anatomy of the vocal tract, Voice production theory, uniqueness in a person’s voice, Resonance and overtones, vocal formants, interspeaker and intraspeaker variations, Discriminating tests: closed test, open test, collection of standards for comparison. Speaker profiling: segregation of speech samples, auditory analysis/listener’s approach, spectrographic approach or voiceprint analysis, and automatic speaker recognition technique.		15	
Total Contact Hours			60	
Suggested Evaluation Methods				
Internal Assessment: 30			End Term Examination: 70	
➤ Theory		30	➤ Theory:	70
• Class Participation:		5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:		10		
• Mid-Term Exam:		15		
Part C-Learning Resources				
Recommended Books/e-resources/LMS:				
1. B.R. Sharma, Forensic Science in Criminal Investigation and Trials, Universal Law Publishing; Fourth edition, 2013.				
2. David A. Crown, The Forensic Examination of Paints and Pigments, Toylor & amp; Francis, NY, 2001.				
3. N. Gilbert: Criminal Investigation; Third edition, Macmillan Publishing Company.				
4. Noon: Forensic Engineering Investigation, 2000.				
5. Saferstein: Forensic Science Handbook, Vol. I, II & III, Prentice Hall Inc. USA.				
6. Richard Saferstein. Criminalistics: An Introduction to Forensic Science. 10th edit. Prentice-Hall, New Jersey.				
7. Forensic Speaker Identification by Phil Rose & James Robertson				
8. Forensic Voice Identification by Harry Hollien				

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Forensic Science		
Semester	4		
Name of the Course	Forensic Dactylography and other impressions		
Course Code	M24-FSC-402		
Course Type	CC-12		
Level of the course	500-599		
Pre-requisite for the course (if any)	Science Subjects at UG Level		
Course Learning Out comes (CLO)	CLO1: The student will understand the history of dactylography and various classification methods of fingerprints. CLO2: The students will learn the conventional and recent techniques of latent fingerprint development. CLO3: The student will be acquainted with the comparison, identification, and retrieval of fingerprint data. CLO4: The students will be able to handle and retrieve information from available foot/tire impression evidence from different surfaces.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	History and development of finger prints: Development of dermal ridges in intra-uterine life. Finger, palm and sole prints, palmer lines and creases. morphology of ridged skin, types, and variations in finger prints: Causes and genetics, population variations. Finger Prints Bureau. Sample collection: Basics of taking inked prints, collection of prints, samples of living and dead, devices and material for recording prints. Classification of finger Prints, pattern types, pattern area. Classification systems: Henry system of classification (Primary to tertiary and key classification) extension of Henry system searching of finger prints, , single finger print.		15
II	Chance Finger Prints: Latent prints, plastic prints, causes, composition of sweat. Development of latent finger prints on porous and non-porous surfaces. Powder methods: such as fluorescent powder, magnetic powder. Fuming methods: Iodine and cyanoacrylate methods. Chemical methods: Ninhydrin and its analogue silver nitrate, physical developer, application of laser technologies, metal deposition method. Methods of development of latent prints on skin.		15
III	Latent print processing: Systematic approach to latent print processing, preserving and lifting of fingerprints. Photography of fingerprints, comparison of fingerprints: basis of comparison, class characteristics, individual characteristics, and various types of ridge characteristics.		15

	Automatic Fingerprint Identification System (AFIS) and its variants, digital image processing of fingerprints and their enhancement. Presentation of expert evidence on fingerprints in court.	
IV	Foot/footwear/tire impressions: Introduction, class and individual characteristics, types, collection, preservation and forensic examination and evaluation of impressions, and gait pattern. Lip Prints and Ear Prints: Nature, Location, Collection, Forensic Examination, and Significance.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. B.R. Sharma, Forensic Science in Criminal Investigation and Trials, Universal Law Publishing, 2013. 2. Bridges BC: Criminal Investigation, Practical Finger Printing, Thumb Impressions, Hand writing Expert testimony opinion Evidence, University Book Agency, Allahabad. 3. Cowger, James F: Friction ridge skin- Comparison and Identification of fingerprints, CRC Press, 1993. 4. William J. Bodziak: Footwear Impression Evidence Elsevier Science Publishing Co. New York. 5. R. Saferstein: Forensic Science Handbook, Vol.-I, II, Prentice Hall, NJ, 1988. 6. C. Champod et al. Ridge skin impression, CRC Press, London, 2004. 7. Richard Saferstein. Criminalistics: An Introduction to Forensic Science. 10th edit. Prentice-Hall, New Jersey.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Forensic Science		
Semester	4		
Name of the Course	Forensic Genetics, Serology and Bioinformatics		
Course Code	M24-FSC-403		
Course Type	DEC-3		
Level of the course	500-599		
Pre-requisite for the course (if any)	Science Subjects at UG Level		
Course Learning Outcomes (CLO)	CLO1: The students will be able to understand genetics use in solving paternity tests and other issues. CLO2: Students will gain knowledge of serological analysis of blood, semen, and other biological materials. CLO3: The students will be able to understand the blood protein polymorphism and their profiling methods. CLO4: The students will learn about bioinformatics tools for forensic analysis of various biological materials.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Human Genetics: Human genetic variations. Mendelian Inheritance. Hardy-Weinberg Equilibrium. Mutation—their types and causes. Relevance of population genetics. Allele frequency, genotype frequency. Polymorphism and heterozygosity. Measures of genetic variations. Phenotypic and ancestry informative markers.		15
II	Forensic Serology: Blood groups – history, biochemistry, biosynthesis of ABO antigen. Genetics of ABO, Rh, MN and other blood group systems. Secretors and non-secretors, rare alleles. Bombay blood group. Blood identification – presumptive and confirmatory assays. Methods of ABO blood grouping from dried blood stains and other body fluids (absorption elution method, absorption inhibition method and mix-agglutination method), species identification from blood-Double Immunodiffusion Assays, Crossed-Over Electrophoresis. Forensic Protein Profiling: Erythrocyte Isoenzymes polymorphism. Role of sero-genetic markers in individualization, paternity disputes, and their limitations.		15
III	Identification of Vaginal Secretions and Menstrual Blood: Identification of Vaginal Stratified squamous epithelial cells, vaginal acid phosphatase, and vaginal bacteria Semen- composition, spermatozoa morphology, presumptive and confirmatory tests for semen- acid phosphatase, prosthetic antigen test (P30), vesicle specific		15

	antigen test, RNA based assay. Biochemistry: Chemistry of Carbohydrates - classification and their importance in forensic investigation. Chemistry of Lipids -Definition, classification and their importance in forensic investigation. Types and properties of amino acids, structure of proteins and their importance in forensic investigation.	
IV	Bioinformatics/ Bio computing: Biological data base- introduction, types, and importance. Forensic bioinformatics. Types of Bioinformatics Tools: Sequence Analysis Tools, structure analysis tools, functional analysis tools, application of bioinformatics tools. Common sequence file formats, FASTA, BLAST and other variants of BLAST, Multiple Sequence Alignment and Whole genome analysis. Bioinformatics analysis of DNA Microarray. Statistical evaluation of DNA profiles using Bioinformatics tools.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Richard Li. Forensic Biology: Identification and DNA Analysis of Biological Evidence, CRC Press. 2. Alan Gunn: Essential Forensic Biology, 2 nd Edition, John Wiley and Sons. 2009. 3. Chowdhari, S., Forensic Biology B.P.R. &D, Govt. of India 4. Gupta, S.K. “Essentials of Immunology”, Arya Publications, 2008. 5. Goodwin, William; “An Introduction to Forensic Genetics”, John Wiley & Sons Ltd. 2007. 6. John M. Butler: Forensic DNA Typing, 2nd Edition 7. Sharada Avadhanam et. al. Next Generation DNA Led Technologies, 1st ed. (2016), Springer, ISBN: 978-981-287-669-0 8. Balding, I. Moltke and J. Marioni Handbook of Statistical Genomics, 1st ed. (2019), Wiley, ISBN: 9781119487845. 9. J.-M. Claverie, C. Notredame, Bioinformatics for dummies.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Forensic Science		
Semester	4		
Name of the Course	Forensic Pharmacology and Drug Analysis		
Course Code	M24-FSC-404		
Course Type	DEC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	Science Subjects at UG Level		
Course Learning Outcomes (CLO)	CLO1: The students will be able to understand pharmacokinetics and metabolism of drugs and their metabolic fates of forensic interest. CLO2: To understand detailed chemistry and analysis methods of narcotics and barbiturates and benzodiazepines. CLO3: The students will be able to understand the characteristics of stimulant and hallucinogen compounds and their analysis by spectroscopy and GC-MS. CLO4: The students will learn classical and automated methods of drug analysis from various biological materials.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Forensic Pharmacology: Concepts of pharmacology, basic concepts of pharmacokinetics, route of administration of drugs, absorption—first-pass metabolism, bioavailability, bioequivalence and bioaccumulation, efficacy and potency, various biological barriers, dose-response relationship, distribution, elimination of drugs—drug half-life, excretion. Ferguson's principle. Drug Therapeutic Index. Drug Metabolism—Phase 1 and Phase 2 Reactions. Factors affecting the pharmacokinetics of drugs. Pharmacodynamics and pharmacogenesis. Metabolism of ethanol, methanol.	15	
II	Narcotic Drugs and Psychotropic Substances: Classification of narcotic substances, NDPS Act. Drugs of abuse. Opiate: introduction of opium alkaloids, metabolism of morphine, codeine, and heroin. Analysis of opium alkaloids, using spot tests, microcrystal tests, TLC, spectroscopy, and GC-MS. Barbiturates and Benzodiazepines: Chemistry, types, metabolism, extraction and isolation from blood, urine, and viscera, characterization by spot tests, TLC, and IR spectrometry, and HPLC-MS.	15	
III	Stimulants and Hallucinogen Compounds: Stimulants—Amphetamines: introduction, metabolism, extraction isolation from blood, urine, viscera, etc., and their preliminary and confirmatory tests. Cocaine: introduction and analysis from biological materials.	15	

	Hallucinogens —cannabis, LSD, psilocybin, and mescaline: Introduction, preliminary and confirmatory tests. Analysis of Prohibited Drugs: Detection of anabolic steroids, peptide hormones, beta agonist, metabolic modulators, diuretics by different techniques.	
IV	Conventional drugs Extraction methods: Extraction of volatile compounds (distillation methods, headspace-GC). Principle of solvent extraction method: extraction and isolation of neutral non-volatile compounds and acidic and basic non-volatile compounds from viscera, blood, urine, and hair Advanced methods of sample Purification: Introduction of solid-phase extraction, solid-phase microextraction techniques, liquid-phase microextraction method, and supercritical fluid extraction (<i>SFE</i>) method.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. John Joseph Fenton, TOXICOLOGY: A Case-Oriented Approach		
2. Javed I. Khan and Thomas J. Kennedy: Donnell R. Christian, Jr., Basic Principles of Forensic Chemistry, Humana Press.		
3. Lawrence Kobilinsky: Forensic Chemistry Handbook, A John Wiley & Sons, Inc., Publication.		
4. Beth E. Zedeck, Forensic Pharmacology, Chelsea House publisher.		
5. EGC Clarke, Analysis of drugs and poisons. 3 rd edition. Pharmaceutical press		
6. Toxicology Manual, Directorate of Forensic Science, New Delhi.		
7. THE NARCOTIC DRUGS AND PSYCHOTROPIC SUBSTANCES ACT, 1985.		
8. Toxicology Manual Directorate of Forensic Science, MHA Government of India, Scientific and Selective, New Delhi.		
9. Recommended Methods for the Identification and Analysis of Barbiturates and Benzodiazepines, United Nations Office on Drugs and Crime Vienna		

Session: 2025-26					
Part A– Introduction					
Name of the Programme		M.Sc. Forensic Science			
Semester		4			
Name of the Course		Practical based on Papers M24-FSC-401 to M24-FSC-402			
Course Code		M24-FSC-405			
CourseType		PC-7			
Level of the course		500-599			
Pre-requisite for the course (if any)		Science Subjects at UG Level			
Course Learning Outcomes (CLO)	CLO1: Students will be able to conduct forensic analysis of various pieces of evidence related to hit-and-run cases. CLO2: The student will be able to conduct forensic analysis of glass, paint, Fiber, and other clues of forensic significance. CLO3: Students will be research-oriented and able to innovate in the subdomains of forensic physics and pattern analysis. CLO4: The students will be acquainted with the comparison and identification of voice evidence.				
Credits		Theory	Practical	Total	
		0	4	4	
Teaching Hours per week		0	8	8	
Internal Assessment Marks		0	30	30	
End Term Exam Marks		0	70	70	
Max. Marks		0	100	100	
Examination Time		0	4 hours		
Part B-Contents of the Course					
Practicals				Contact Hours	
Practical Contents	1. Physical examination of glass fragments. 2. Density measurement of paints and glass by density gradient methods. 3. Comparison of soil samples using microscopic and density-gradient distribution of particles methods. 4. Comparison of tool marks with a comparison microscope. 5. Physical and chemical examination of paints. 6. Collection of plain and rolled inked fingerprints to identify patterns and ridge characteristics. 7. Analyze the fingerprints—1st, 2nd, and 3rd level details. 8. Developing and comparing latent fingerprints with powder, fuming, and chemical methods. 9. To prepare a cast of footwear/tire impression marks and their comparison. 10. To record footmarks by the tracing method. 11. Visit crime scene related to road accident and prepare report. 12. Examine vehicle in case of accident. 13. Recording, editing, processing, and conversion of audio files. Detection of tampering in audio file.			120	
Suggested Evaluation Methods					
Internal Assessment: 30			End Term Examination: 70		
➤ Practicum		30	➤ Practicum	70	
• Class Participation:		5	Lab record, Viva-Voce, write-up and		
• Seminar/Demonstration/Viva-voce/Lab records etc.:		10			

• Mid-Term Exam:	15	execution of the practical
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1.	manual speaker identification & audio-video analysis, Directorate of Forensic Science Services Ministry of Home Affairs, Govt. Of India	Working procedure
2.	forensic physics, Directorate of Forensic Science MHA, Government of India.	Working Manual

Session: 2025-26				
Part A–Introduction				
Name of the Programme		M.Sc. Forensic Science		
Semester		4		
Name of the Course		Practical based on Papers M24-FSC-403 to M24-FSC-404		
Course Code		M24-FSC-406		
Course Type		PC-8		
Level of the course		500-599		
Pre-requisite for the course (if any)		Science Subjects at UG Level		
Course Learning Outcomes (CLO)		CLO1: The students will be able to examine narcotics drugs. CLO2: The students will be skilled forensic chemists who can handle modern techniques used for the analysis of narcotics and psychotropic substances. CO3: The students will learn classical and automated methods of drug analysis from various biological materials. CLO4. The students will be able to analyse biological evidence, protein profiling.		
Credits		Theory	Practical	Total
		0	4	4
Teaching Hours per week		0	8	8
Internal Assessment Marks		0	30	30
End Term Exam Marks		0	70	70
Max. Marks		0	100	100
Examination Time		0	4 hours	
Part B-Contents of the Course				
Practicals				Contact Hours
Practical Contents	1. Systematic identification of Narcotic Drugs and Psychotropic substances (opiates, cannabis and barbiturates, benzodiazepines and amphetamines) by spot colour tests. 2. U.V/Vis spectrophotometric analysis of barbiturates, benzodiazepine and amphetamines. 3. IR/FTIR analysis of drug of abuses. 4. Analysis of drugs and metabolites by GC-MS 5. Systematic analysis of plant alkaloids (Opium, Datura, Nicotine). 6. Systematic Forensic analysis of blood 7. Systematic Forensic analysis of semen 8. Extraction of proteins from various biological samples. 9. Protein estimation by different techniques. 10. SDS-PAGE for protein analysis 11. ELISA 12. Western Blotting			120
Suggested Evaluation Methods				
Internal Assessment: 30			End Term Examination: 70	
➤ Practicum	30		➤ Practicum	70
• Class Participation:	5		Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records, etc.:	10			
• Mid-Term Exam:	15			
Part C-Learning Resources				
Recommended Books/e-resources/LMS:				
1. Laboratory Procedure Manual, Forensic Toxicology: DFS 2. Working Manual forensic biology, Directorate of Forensic Science Services, MHA, Government of India.				

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.Sc. Forensic Science		
Semester	4		
Name of the Course	Entrepreneurship Approaches in Forensic Science		
Course Code	M24-FSC-407		
Course Type	EEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	Science Subjects at UG Level		
Course Learning Outcomes (CLO)	1. Understand the meaning, scope, and purpose of entrepreneurship. 2. Learn the concept of management in profit and non-profit organizations. 3. Learn how a forensic scientist can become an entrepreneur. 4. The students will understand how a forensic scientist can discover business opportunities within the realm of entrepreneurship.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper Setter: The examiner will set 9 questions, asking two questions from each unit and one compulsory question by taking the course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Entrepreneurship: Entrepreneurship: introduction, concept, and types of entrepreneurs. Core elements of entrepreneurship; Factors affecting entrepreneurship development; Attributes of an entrepreneur; skill gap analysis. Innovation: meaning and types; Methods of protecting innovation: branding, trademarks, copyrights, patents, and registered design protection.		15
II	Introduction of Business: Methods and process of generating ideas; Assessing opportunities; Form of business organization. E- business models: meaning, features, e-commerce and e-markets, digital commerce, mobile commerce, e-governance in India, and e-business applications. Forensic marketing scenario.		15
III	Becoming a forensic entrepreneur: Characteristics of successful entrepreneur in forensic science: Leadership— meaning, definition, and difference between leaders and managers. Types and styles of leaders, leadership traits. Legal and regulatory aspects; Role of government organizations and schemes.		15
IV	Establishing a Forensic Startup: Need for a forensic startup; types of business plan, pitfalls to be avoided in preparation of a business plan.		15

	Steps to establish forensic startup: Physical and human resources; Forensic firms; Training and certification firms; Private practices; Forensic vendors; Private Laboratories; and Licensing.		
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Surjit Singha, Entrepreneurship in Forensic Science, ISBN-13: 9789391413866.			

DISSERTATION

(Note : If A Candidate is offered Dissertation Course, Then He/ She Will Also Study CC-11, Dec-4 & EEC From Above Courses of Semester 4)

4	Dissertation/ Project work	M24- FSC- 408	Dissertation/ Project work	D	12	26	0	0	0	-	0	300	300	-

Course Learning Outcomes (CLO)

Students will be able to

CLO 1:Formulate a focused research question and design a robust, methodologically sound investigation to address it.

CLO 2:Employ appropriate experimental, analytical, or field techniques to collect, analyze, and interpret botanical data effectively.

CLO 3:Critically evaluate research findings in light of existing theories, and communicate results clearly through well-structured scientific writing and presentations.

CLO 4;Exhibit independence, time management, and scientific integrity throughout the research process, while responding thoughtfully to feedback and defending

Description

I

Each student is required to undertake a research project in a relevant area of Forensic Science. The outcome of this research will be compiled into a dissertation and submitted for evaluation at the end of the semester. Students will also present their dissertation before an external examiner. Both internal and external assessments of the project and training will be conducted as per the prescribed evaluation criteria.

Assessment Structure

Internal Assessment:

- Submission of Dissertation
- One Mid-Semester Progress Report and/or Presentation

External Assessment:

- Final Project Report (Dissertation)
- Viva-Voce Presentation before an External Examiner

Dissertation Report Submission Guidelines

1. Structure of the Dissertation Report:

The dissertation should include the following components in order:

- Cover page
- Certificate signed by the student and supervisor
- Table of contents
- Introduction
- Objectives
- Literature review
- Methodology
- Results and Discussion
- Conclusion
- References

2. Formatting Requirements:

- Paper size: A4
- Font: Times New Roman, size 12
- Line spacing: 1.5 (one and a half spacing)
- Printing: Double-sided (print on both sides of the paper)
- Length: The written portion should be between 40 to 60 pages

3. Submission Requirements:

- Students must submit **three hard-bound copies** of the dissertation along with a **CD** containing a soft copy, to the department by the specified deadline.

4. Evaluation and Presentation:

- The student will be required to **defend the dissertation/project work** through a formal **presentation before an external examiner** at the end of the semester.
- Marks will be awarded based on both the written report and the oral presentation.

KURUKSHETRA UNIVERSITY KURUKSHETRA

Syllabus for M.Sc. (5-Year Integrated) Forensic Science SEMESTER 5th and 6th

**Under Multiple Entry-Exit, Internship and
CBCS-LOCF in accordance to NEP-2020
w.e.f. 2025-26**

Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
CC-5 MCC-9 4 credit (Scheme A, B&C)	23-FSC- 501	Fingerprints and Impressions	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Learn basic concepts of fingerprint science 2. Select appropriate chemical and physical techniques for fingerprint detection on various surfaces. 3. Record rolled and plain fingerprints using standard methods. 4. Utilize methods for casting, lifting, and enhancing impressions.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Fingerprints and Palm Prints: Fingerprints as evidence: History and Development of fingerprints, principles of fingerprints. Dermatoglyphics, formation of ridges, sweat glands, composition of Sweat, Fingerprints patterns, Pattern Areas. Classification of fingerprints-Henry System of classification, Single digit Classification, Extension of Henry system, Fingerprint Bureau. AFIS (Automated Fingerprint Identification System).							12
II	Development and recording of fingerprints: Search for Fingerprints, Chance Fingerprints, and Latent Fingerprints. Various methods of development of fingerprints: conventional methods, physical and chemical methods, florescent method, Magnetic Powder method, fuming method, physical developer. Application of laser and other radiations to develop latent fingerprints, metal deposition method and development of latent prints on skin. Taking fingerprints from living and dead persons, preserving and lifting of developed fingerprints, photography of fingerprints.							11
III	Evaluation of fingerprints: Ridge counting and ridge tracing, class and individual characteristics, various types of ridge characteristics. Third level detail, comparison of palm prints on the basis of individual ridge characteristics. Other Prints and Marks: Lip Prints- Nature, Location, collection and evaluation, taking control samples, Forensic Significance. Ear Prints- Nature, Location, collection and evaluation, taking control samples, Forensic Significance.							11
IV	Impressions and Prints: Footprints: class and individual characteristics of footprints, and Importance, Gait Pattern, Taking Control samples. Tyre Marks/ prints: introduction and characteristics, taking control samples, Forensic Significance. Collection, tracing, lifting, casting of impressions, enhancement of footwear impressions, analysis and							11

	comparison of foot impressions and molds.	
V Practical	Practical 1. Recording of Fingerprints Using Ink and Digital Methods. 2. Study and Classification of Fingerprint Patterns: Identification of loops, whorls, and arches 3. Ridge Detail and Minutiae Identification: Marking and naming minutiae points (e.g., bifurcation, ridge ending). 4. Ridge counting and tracing exercises. 5. To develop latent fingerprints with powders, fuming and chemical methods. 6. To preserve and lift developed Fingerprints. 7. To compare fingerprints.	30
Suggested Reading:		
1. Cammins H. and Middle C.: Fingerprints Palms & Soles, Dover Publications. 2. Bodariak W. J: Footwear Impression, Evidences, Elsevier Science Publication Co. New York. 3. Sharma B. R.: Footprints, Tracks and Trials, Central Law Agency, Allahabad. 4. James F. Cowger; Friction Ridge skin CRC Press London. 5. Mehta, M.K: Identification of Thumb Impression & Cross Examination of Finger Prints, N.M. Tripathi (P) Ltd, Bombay.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
MCC-10 4 credit (Scheme B&C)	B23-FSC-502	Analytical Techniques used in Forensic Science-II	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
<u>Course Learning Outcomes (CLOs):</u> At the end of the course the student should be able to:								
1. Understand various sample preparation techniques used in forensic analysis. 2. Learn and handle chromatographic techniques. 3. Learn different spectroscopic techniques used in forensic science. 4. Learn different spectroscopic techniques used in forensic science.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Sample Separation Techniques: General Idea and Basic Principle of Distillation and Various Types of Distillation Techniques. Centrifugation; Centrifuge and its Types. Filtration, Evaporation, and Crystallization. Solvent Extraction Techniques Like LLE, SPE, Micro SPE, and Distribution Law.							12
II	General Idea of Chromatography; Theory and Classification of Chromatography, Principles, Working and Forensic Application of Planer Chromatography; TLC, HPTLC. General Principles, Working and Forensic Application of Column Chromatography General Idea on Working of HPLC and GC.							11
III	Basic Concept of Atomic and Molecular spectra, Basic Principle, Instrumentation and Forensic Application of Ultraviolet-Visible and Infrared Spectroscopy. Basic Principle, Instrumentation and Forensic Application of Atomic Absorption/Emission. X-Ray Spectrometry.							11
IV	Mass spectroscopy: principle, working, and applications. Electrophoresis—Gel Electrophoresis, Isoelectric Focusing, and Capillary Electrophoresis: basic principles and applications.							11

V Practical	Practical 1. Isolation of Non-Volatile Poison by Solvent Extraction. 2. Extraction of Ethanol by Simple Distillation. 3. Measurement of Absorption maxima of organic solvent by UV Visible Spectrophotometer. 4. Calculation of Strength of some organic Solvent by UV Visible Spectrophotometer. 5. Demonstrate electrophoresis. 6. Separation of some dyes by Thin Layer Chromatography.	30
	Suggested Readings: 1. B.K. Sharma. Instrumental Methods of Chemical Analysis. Goel Publishing House, 26th Edition (2007) 2. G. Chatwal and S. Anand. Instrumental Methods of Chemical Analysis. 7th Edition Himalaya Publishing House	

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-2 4 credit Select one Option (Scheme B&C)	B23-FSC-503	Forensic Biology and Wildlife Forensics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. The significance of biological and serological evidence. 2. The forensic importance of hair evidence. 3. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations. 4. How wildlife forensics aid in conserving natural resources. 5. Examine the Biological and Wildlife evidence.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Biological Evidence Nature and importance of biological evidence - Significance of hair evidence. Transfer, persistence and recovery of hair evidence. Structure of human hair. Comparison of hair samples. Morphology and biochemistry of human hair. Comparison of human and animal hair.							12
II	Types of Biological Evidence Types and identification of microbial organisms of forensic significance - Identification of wood, leaves, pollens and juices as botanical evidence. Diatoms and their forensic significance.							11
III	Wildlife Forensics Wildlife Forensics - Fundamentals of wildlife forensic. Significance of wildlife forensic. Protected and endangered species of animals and plants. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants.							11
IV	Wildlife Evidence Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals.							11
V Practical	Practical 1. To perform precipitin test for species of origin determination. 2. To perform an Immunodiffusion test for species of origin. 3. To determine blood groups from fresh blood and various body fluids with Absorption-inhibition, mixed agglutination, and absorption-elution techniques. 4. Crystal Tests for Blood. 5. To prepare gel plates for electrophoresis.							30

	6. Examination of diatoms. 7. Examination of hair of different animals such as cat, dog, cow, horse, and goat. 8. Blood Spatter Pattern Analysis. 9. Examination of Different types of woods	

Suggested Reading:

Suggested Readings:

1. Boorman, K. E.; Dodd, B. E. and Lincoln, P. J. (1988): Blood Group Serology. Churchill Livingstone.
2. Chatterjee, C. C. (1975): Human Physiology. CBS Publisher, India
3. Chowdhuri, S. (1971): Forensic Biology. B P R & D, Govt. of India.
4. Culliford, B. J. (1971): Examination and Typing of Blood Stains in the Crime Laboratory. US Dept. of Justice, Washington.
5. Dunsford, I.; Bowley, C. C. and Race, R. R. (1967): Blood Grouping Techniques. Oliver & Boyd, Edinburgh.
6. Eckert, W. G. and James, S.H. (1999): Interpretation of Blood Stain Evidence at Crime Scenes, 2nd ed. CRC Press, New York.
7. Giblet, E. R. (1969): Genetic Markers in Human Blood. Blackwell Scientific, Oxford.
8. Harris, H. and Hopkinson, D. A. (1976): Handbook of Enzyme Electrophoresis in Human Genetics. North Holland, Amsterdam.

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-2 4 credit Select one Option (Scheme B&C)	B23-FSC-504	Basics of Forensic Ballistics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
<u>Course Learning Outcomes (CLOs): At the end of the course the student should be able to:</u> 1. Identify firearms and their firing mechanisms. 2. Identify and characterised the fired and unfired ammunition. 3. Forensic identification and evaluation of firearm evidence. 4. Learn about the types and nature of firearm injuries. 5. Analyse gunshot residue.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Introduction to Forensic Ballistics: Basics concept of forensic ballistic, its definition, History and development of Forensic Ballistics, Role of Forensic Ballistics Expert. Introduction to firearms: Parts of firearms and its function, Firearm safety, Assembly and disassembly of firearms, Firearms characteristics & classification of firearms. Bore and caliber, choke, rifling – class characteristics of rifled bore. Rifled firearms, shot guns & Non-standard: Improvised, Country-made, Imitative firearms, identification of origin.							12
II	Introduction to Ammunition: Definition of Ammunition, Ammunition & its constructional parts, Introduction to Shotgun ammunition and Rifle Ammunition, Classifications of Ammunition based on constructional features, Bullet and its types, Case studies related to firearm cases. Indian Firearm Act: Introduction to Act, Basic concepts of chapters described in Act, Prohibited & Non-Prohibited Firearms calibres.							11
III	Types of ballistics & their aspects: Internal ballistics: General problems: Heat problems, Pressure, Recoil, Vibration & Jump, Barrel Fouling. External ballistics: Trajectory formation, Parameters involved in exterior ballistics. Terminal/Wound ballistics: Effect of projectile on target based on: nature of target, bullet shape, striking velocity, striking angle and nature of target, intermediate targets, range, etc., Basic concepts of wound ballistics Characterization & evaluation of firearm injuries.							11

IV	Identification of firearm and fired ammunition: principles, Class characteristics & Individual characteristics (Identifiable marks) produced during firing process on cartridge cases & projectiles and their linkage with firearms. Analysis of GSR –Composition of GSR, Location & Collection, Mechanism of formation, Chemical & Instrumental techniques involved in analysis, Shooter Identification Technique. Determination of range of fire & its related phenomena, Techniques involved in ballistic studies, Stereo and comparison microscopy, BDAS, IBIS.	11
V Practical	Practical 1. Characteristics of Firearms-Caliber, Choke, Trigger pull, and Proof marks. 2. Examination and comparison of the fired bullet with reference to caliber, and rifling characteristics. 3. Examination and comparison of fired cartridge case by comparison microscope 4. Determination of shot numbers from size and weight of shots 5. Identification of propellants 6. Chemical tests for powder residue and barrel wash 7. Determination of angle and direction of fire on different surfaces	30

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-3 4 credit Select one Option (Scheme B&C)	B23-FSC-505	Basics of Immunology and Serology	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Understand basics of immunology. 2. Learn about different immunological assays of forensic interest. 3. Examine blood evidences. 4. Examination, and evaluation of body fluids								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Overview of immunology: Phylogeny of immune system, Innate and acquired immunity, clonal nature of immune response, Cells and Organs of the immune system: Hematopoiesis and differentiation, B – Lymphocytes, T- Lymphocytes, Macrophages, Dendritic cells, Natural Killer cells, Lymphokine activated killer cells, Eosinophils, Neutrophils and Mast cells, Organization and structure of lymphoid organs; Structure and properties of Antigen and Antibodies; Types of Antibodies.							12
II	Immunological techniques: Antigen-Antibodies Interaction; Different techniques to study antigen-antibody interactions: Immunodiffusion, Radioimmunoassay, Immuno-electrophoresis, ELISA, Immunohistochemistry, Flow cytometry, development of dot blot, development of monoclonal antibodies and polyclonal antibodies, hybridoma technology.							11
III	Basic forensic Serology: Blood and its composition, Hemoglobin and its variants, Blood Typing/Grouping - 'ABO' system and its significance in forensic investigation., Other blood group antigens - 'Rh sub types', MN, and Bombay blood group, Blood grouping from stains of blood, semen, saliva and other body fluids by Absorption inhibition, Absorption-elution and mixed agglutination techniques, determination of secretor/nonsecretor tatus.							11
IV	Forensic Characterization of Semen: Formation, Composition, Morphology of spermatozoa, forensic significance, Presumptive and Confirmatory tests (including Azoospermic semen stains). Individualization (Blood Grouping, seminal fluid isozymes typing, forensic significance, Collection and analysis of evidences in Rape cases.							11

	Composition and Identification of other biological fluids like Saliva, Urine, and Vaginal secretion, and their forensic significance.	
V Practical	Practical 1. Identification of blood 2. Immunodiffusion 3. Perform ELISA 4. ABO TYPING from fresh blood, and dried blood stains 5. Perform tests for seminal stains. 6. Perform tests for saliva, urine, and menstrual blood stains	30

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-3 4 credits Select one Option (Scheme B&C)	B23-FSC-506	Advance Digital Forensics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to:								
- Learn various digital evidence and digital techniques. - Answer the legal questions on computer/cybercrime. - Explain Forensic Accounting, cyberspace, cryptography, encryption and their breakdown. - Understand about offences and penalties under Information Technology Act, 2000. - Compile reports & testify in the Court.								
Instructions for Paper-Setter - Nine questions will be set in all. All questions will carry equal marks. - Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Digital forensics: introduction of digital forensic, objective, various branches of digital forensic, digital crimes. Digital Evidence: types and sources of digital evidence, challenging aspects of digital evidence, computer image verification and authentication, Digital image watermarking and its application in forensic science, DOS and Windows boot process, how to recover deleted files, data recovery. Digital signature digital signature and authentication, digital signature generation and verification, certification of public keys, certification of authority.							12
II	Seizure of computers: Preparations to be made before seizure, Actions at the scene, Treatment of exhibits, bitstream (exact copies) of the original media, Establishing a case in computer forensics, Investigation: Investigating on various imaging methods. Instruction on the acquisition, collection and seizure of magnetic media. How to best acquire, collect or seize the various operating systems. qualities and ethics of good forensic investigator. Passwords and encryption techniques: Importance of keeping a log, Explanation of passwords keys and hashes. Steganography and cryptography: Introduction, types and use.							11

III	Computer Forensics in Forensic Accounting: Auditing and fraud detection, Internal fraud versus external fraud, Data mining and fraud detection, Fraud detection tools and techniques. Current Practice: Introduction, Secure boot, write blockers and forensic platforms, Disk file organization, Disk and file imaging and analysis, File deletion, media sanitization, Mobile telephones, Discovery of electronic evidence, Forensic tools, EnCase. ILook Investigator, CFIT, Emerging procedures and standards, Seizure and analysis of electronic evidence. Documenting and Reporting, Evaluation and Interpretation of Results, Reporting Conclusions, Case Records.	11
IV	Cyber law: Introduction to Disaster Recovery (DR) planning, Category to Cyber-crime, Cyber Law, IT Act 2000 and its amendments, International Cyber Laws, Cyber Ethics, Child Sexual Abuse Material related to cyber domain, various acts related to social media, privacy and security on cyber domain, Case Studies.	11
V Practical	Practical 1. To identify, seize and preserve digital evidence from crime scenes. 2. To detect deletions, obliterations and modifications of files using encase software. 3. To perform acquisition of any drive (HDD, SSD, USB) using FTKImager. 4. To use symmetric and asymmetric keys for protection of digital record. 5. To perform primary level analysis using HxDEditor. 6. Recovering and Inspecting deleted files using any tool. 7. To study and analyse web browsing history. 8. To study cache and cookies analysis.	30
Learning resources:		
1. Joakim et,al. Fundamentals of Digital Forensics, A Guide to Theory, Research and Applications. 2024. 2. A Practical Guide to Computer Forensics Investigations, 2015, by Darren R. Hayes.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
CC-6 MCC-11 4 credits (Scheme A, B&C)	B23-FSC-601	Computer Forensics and Biometrics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to:								
1. Learn Basics of computer crime. 2. Forensic analysis of different mobile device uses in crime. 3. Analysis of fabricated image and videos. 4. Understand concept of Network Security and Investigation 5. Learn about biometric systems.								
Instructions for Paper-Setter								
1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Introduction to Computers, Software, Hardware, Computer Input-Output Devices, Windows, Basic Computer Terminology, Internet, Networking, Computer Storage, Computer Ethics and Application Programs etc. Cyber Forensic Basics- Introduction to Cyber Forensics, Storage Fundamentals, File System Concepts, Data Recovery, Operating System Software.							12
II	Mobile forensic: definition, use, types of mobile operating systems, process of mobile device forensic, challenges associated with mobile phone forensics, data acquisition, tools for mobile forensic analysis, cloud data acquisition and physical data extraction. Video/Image Forensics- Video/image processing and enhancement, common image enhancement techniques, Video authentication, collection, handling and preservation of video files, Introduction to CCTV Forensics.							11
III	Computers and Networking: Concept of Network Security and Investigation, Basic of Security Planning, Intrusion Triangle, Removing Intrusion Opportunities, Importance of Physical Security, Work Station and Network Devices, Protection of Removable Storage Disks.							11
IV	Biometrics: Introduction to biometrics, Various types of biometric methods, Characteristics of biometrics, Advantages and disadvantages General Biometric System (Identification and Verification), difficulties in implementation of biometrics, Applications of biometrics.							11

V Practical	Practical 1. To identify, seize and preserve digital evidence from crime scenes. 2. To trace routes followed by e-mails and chats. 3. To identify the IP address of the sender of e-mails. 4. To demonstrate concealment techniques using cryptographic PGP. 5. To identify encrypted files. 6. To identify hidden files. 7. To use digital signatures for securing e-mail and online transactions. 8. To perform detailed analysis of Forensic Image using Forensic Toolkit. 9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards. 10. To carry out imaging of hard disks.	30
Learning Resources:		
1 R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, <i>Computer Crimes and Computer Forensics</i>, Select Publishers, New Delhi (2003). 2. Darren R. Hayes: Practical Guide to Computer Forensics Investigations, A (Pearson IT Cybersecurity Curriculum (ITCC)) 1st Edition. 3. William Oettinger: Learn Computer Forensics: A beginner's guide to searching, analysing, and securing digital evidence 1st Edition. 4. Harlan Carvey: Investigating Windows Systems 1st Edition.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
MCC-12 4 credit (Scheme B&C)	B23-FSC-602	Serology and DNA Forensics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
<u>Course Learning Outcomes (CLOs):</u> At the end of the course the student should be able to: 1. Understand basic of forensic serology. 2. Analyse different body fluids. 3. Understand the basic concepts of human genetics. 4. Understand the usefulness of genetic markers in forensic investigation. 5. Understand the legal importance of DNA profiling in various scenarios in India and abroad.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Serology Introduction to forensic serology, Cell structure and functions. haemoglobin and its variants, haptoglobins, blood groups-history, biochemistry and genetics of ABO. Blood identification. Methods of ABO blood grouping from fresh blood and biological stains, body fluids, determination of secretor status, determination of origin of species.							12
II	Other body fluids Semen stains: introduction, composition of semen fluids, and forensic analysis. Identification Origin of Species: Determination of Human and Animal Origin Form Bones, Hair, Flesh, Nails, Skin, Teeth, Body Tissue, and body fluids, Vomit etc., Through Immuno-Diffusion and Immuno-Electrophoresis, Cross Reactivity Among Closely Related Species.							11
III	DNA Profiling Double helical structure of DNA, alternate forms of DNA double helix, denaturation and renaturation of DNA, DNA binding proteins, factors affecting DNA stability, types and structure of RNA. Chemical nature of DNA and RNA. Nature and structure of human genome and its diversity. mt-DNA, and Y-Chromosomes.							11
IV	DNA Polymorphism Concept of gene – Conventional and modern views. Concept of sequence variation - VNTRs, STRs, Mini STRs, SNPs. Detection techniques - RFLP, PCR amplifications, Amp-FLP, sequence polymorphism, Y-STR, Mitochondrial DNA. Disputed paternity cases. Missing person identity,							11

	population genetics and legal admissibility of DNA evidence.	
V Practical	Practical 1. Examination of blood stains: Physical and Chemical tests; spectroscopic examination 2. Examination of body fluids (Saliva, vomit, urine, semen, sweat) 3. Determination of species of origin from blood. 4. Blood grouping from fresh and dried blood stains 5. Determination of secretor status 6. DNA isolation from biological samples, quantitation and profiling	30
Learning Resources:		
1. Butler, J; Advanced Topics in Forensic DNA Typing: Methodology, 1st Ed., Academic Press, London, 2009. 2. Easteal, et al.; DNA Profiling: Principles, Pitfalls and Potential, Harwood Academic Publishers, New Jersey, 1991. 3. Primorac, D.& Schanfield, M; Forensic DNA Applications: An Interdisciplinary Perspective, CRC Press, New York, 2014. 4. Rudin, N. & Inman, K; An Introduction to Forensic DNA Analysis, Second Ed.,CRC press, New York, 2001. 5. Spencer, C; Genetic testimony: a guide to forensic DNA profiling, Pearson, New Delhi, 2004.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-4 4 credit Select one Option (Scheme B&C)	B23-FSC-603	Victimology	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Understand the basic of victimology. 2. Understand the theories of victim. 3. Understand different class of victims. 4. Learn basic principles of justice for victims of crime								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Victimology: Definition, Origin, Victimology in India. Role of Victim Crime, Types of Victims, Compensation to Victims, and Restitution.							12
II	Emerging Concerns for the Victims of Crime, three theories of victims- Precipitation theory, life style theory, and deviant place theory. Classification of Victims Victims of Sexual Offences Women as Victims of Dowry and Domestic Violence Ordinary Crime Victims.							11
III	Problems of Victims in the Criminal Justice System. Victims of Political Violence (Terrorism, Communal Violence, Caste Carnages etc. Victims of Environmental Pollution. Victims of Accidents.							11
IV	Victim Offender Relationship, Victim Surveys, Victim Offender Mediation Programs. UN Declaration on Basic Principles of Justice for Victims of Crime and Abuse of Power. Victimological Research in India.							11

V Practical	Practical 1. Field visit • police station. • Near jail • Juvenile court 2. Prepare case study report. 3. Practicing victim support. 4. Procedure to Interview the victim and interrogate the Suspect. 5. Procedure to conduct search and seizure operations. 6. Recording of Police Station records including FIR, GD, Charge Sheet etc.	30
	Learning Resources:	
	1. Chockalingam, M. 1985. Readings in Victimology. Madras. 2. Irwin Waller, 2010: Rights for Victims of Crime: Rebalancing justice. Rowman and Little Field Publisher, USA	

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-4 4 credit Select one Option (Scheme B&C)	B23-FSC-604	Forensic Photography	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Learn basics of photography. 2. Learn Machansin and working of digital photography. 3. Perform photography of forensic evidences. 4. Prepare Photographs for Court Presentation.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Basics of forensic photography: History and development of forensic photography. Principles of Photography, black & white and color photography, types of cameras, camera lenses, shutter speed, white balance, depth of field, resolution, ISO, film, exposing, development, and scanners and printing techniques. Basics of Light and Optics: Light temperature and sources of light; Light intensity and angles; Fundamentals of optics in forensic photography.							12
II	Modern development in photography: Digital photography, components, working, and basic principles of digital camera; and accessories for forensic photography. UV, IR, fluorescence illumination guided photography; scale photography. Transmitted, and oblique light photography. Microphotography, and macrophotography.							11
III	Crime scene and evidence photography: principles, overall photograph, midrange photography, taking close up photograph, photography of footprints, tyre marks, blood stains, toolmarks and bite marks photography. Fingerprints photography. Photography of Motor Vehicle Accident Scene, and fire arson cases. Photographic Aspect of Physical Injuries, and Fatalities. Videography use of videography in forensic scene. Dron photography, Underwater and Surveillance photography.							11

IV	Photography in Forensics and Court Presentation: Digital photography software and file formats (jpg, gif, bmp, tiff, raw, etc.); Image enhancement techniques, photogrammetry, and digital watermarking; CCTV image enhancement and manipulation detection; Preparation of photographic evidence for court presentations and expert testimony.	11
V Practical	Practical 1. Handling of SLR/ Digital camera. 2. To perform Crime scene photography using the overall photography method. 3. To perform Mid-range photography techniques at a simulated crime scene. 4. To perform Close-up photography of physical and biological evidence. 5. Perform of UV and IR photography for evidence documentation. 6. Perform microphotography for diatoms, fiber, and hair. 7. Preparing a forensic photography report and presenting photographic evidence in a mock trial.	30
Learning Resources:		
1. Freeman, M. (2008). The Complete Guide to Digital Photography. 2. Gernsheim, H. (2016). A Concise History of Photography. Dover Publications. 3. Lark Books. Farrell, I. (2013). Complete Guide to Digital Photography. Quercus Publications. 4. Mancini, K. (2016). Fundamentals of Forensic Photography: Practical Techniques for Evidence Documentation on Location and in the Laboratory. CRC Press. 5. Marsh, N. (2014). Forensic Photography: A Practitioner's Guide. 6. Redsicker, D. R. (1994). The Practical Methodology of Forensic Photography. CRC Press. 7. Robinson, E. M. (2016). Crime Scene Photography (3rd ed.). Academic Press. 8. Weiss, S. (2009). Handbook of Forensic Photography. Academic Press.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-5 4 credit Select one Option (Scheme B&C)	B23-FSC-605	Forensic Pharmacology	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Learn the basics of pharmacology. 2. Learn concepts of forensic pharmacology. 3. Understand the action of various drugs. 4. Pharmaceutical drugs analysis.								
Instructions for Paper-Setter 3. Nine questions will be set in all. All questions will carry equal marks. 4. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Basic Principles of Forensic Pharmacy: Introduction to Pharmacology and Forensic Pharmacy, Branches of Pharmacology, Scope of Forensic Pharmacy, Pharmacopoeias IP, USP, EP, pharmacognosy, pharmacovigilance. Nature and Source of drug, forms of drugs, classification of drugs, Prodrug and soft drug concept, Drug synthesis.							12
II	Concepts of Pharmacology: Pharmacokinetics, Route of administration of Drugs, distribution, elimination, Factor affecting the effects of Drug, Ferguson’s principle, Adverse drug reactions, Bioavailability, Bioequivalence and Bioaccumulation, drug half-life, Dose response relationship. Metabolism: Phase–I and Phase–II mechanism, different conjugates/ prosthetic groups use in phase-II reaction, Pharmacokinetic drug interactions, various biological barriers.							11
III	Pharmacology of Different drugs: Pharmacology of neurotransmitters like GABA, Dopamine. Pharmacology of ethanol and methanol, amphetamines, barbiturates and benzediazapine compounds. Case Studies							11

IV	Pharmacology of Narcotics substances: opiates like morphine, codeine, thebaine, heroin, cocaine. Detection methods of metabolites of different prohibited drugs like HPLC, GC-MS, NMR.	11
V Practical	Practical 1. Preparation of standard and working solutions. 2. Plotting of calibration curve and quantification using UV-Vis Spectroscopy 3. Perform LLE based extraction of drugs 4. Analysis of drugs and metabolites by LC-MS 5. Determining Limit of Detection & Limit of Quantitation of drug by UV-VIS 6. Concept & Parts identification of GC, GCMS, HPLC	30
Learning Resources		
1. Klaassen, C. D. Casarett and Doull's Toxicology: The Basic Science of Poisons, 5th Ed, McGraw-Hill, 1995. 2. Moffat, A.C. Osselton, D. M. Widdop, B. Clarke's Analysis of Drugs and Poisons in pharmaceuticals, body fluids and postmortem materials. 3. Bogusz, M. J. Hand Book of Analytical Separations, Vol. 2: Forensic Science, 1st ed., Elsevier Science ,2000. 4. Rang, P.H., Dale, M.M., Ritter, M.J.: Pharmacology, 4th ed., Harcourt/Churchill Livingstone, 2000. 5. Paranjape, H.M., Bothara, G.K., Jain, M.M: Fundamentals of Pharmacology, 1st ed. Nirali Prakashan, 1990. 6. Budhiraja, R.D. Elementary Pharmacology and Toxicology, Popular Prakashan, 2nd ed.,1999.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-5 4 credit Select one Option (Scheme B&C)	B23-FSC-606	Quality Management System	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Learn about different organization working to control FSL quality. 2. Understand reequipments for Forensic Science labs accreditation. 3. Calibration of tools and techniques. 4. Organize management review								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Introduction to Quality management Systems: Introduction, Scope, Quality, Quality Assurance, Quality Control and Accreditation; Importance of accreditation in Forensic science laboratories. Guide lines of International Organization for Standardization (ISO) ISO/IEC 17025:2017, NABL 113:2008, for accreditation of FSLs, Bureau of Indian Standards (BIS). Notification of Cyber Forensics labs of FSLs/CFSLs u/s 79A of IT Act.							12
II	Forensic Quality Management System: introduction, Quality Management System, Quality Manual, Quality Manager, Quality Assurance, Quality Control, Quality Planning. Quality Audit: Internal and external Audits: Definition, Objectives, Organization of external audits, Planning of audit, Implementation of internal audits.							11
III	Management Requirements: organizational, document control, subcontracting of tests and calibrations, corrective and preventive actions. Traceability and Validation of new methods, measurement of uncertainty, Equipment maintenance and Calibration, Standard Reference Materials and Certified Reference Material and their availability.							11
IV	Management Review- Objectives, organization of management review, planning, implementation, records Proficiency Testing and							11

	Review Program. Assessor Guide: Assessor's role, Assessor assignment procedure, Procedure of assessment of new applicant laboratories. Sample disposal, Assessment, Interpretation and reporting of results. Lab safety	
V Practical	Practical 1. Prepare a report on the accreditation process as per NABL. 2. Prepare a report on the calibration of instruments present in departments. 3. Prepare a report on the internal audit in your departments. 4. Prepare a report on proficiency testing. 5. Prepare a report on control and reference samples required for forensic analysis.	30
Suggested readings:		
1. Directorate Of Forensic Science Services Forensic Science Laboratories Quality Manual in Accordance: ISO / IEC 17025:2017(E) 2. General requirements for the competence of testing and calibration laboratories, ISO / IEC 17025:2017. 3. NABL guidelines for accreditation of forensic science laboratory.		

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

("A++" Grade, NAAC Accredited)



Scheme of Examination for Under Graduate Programme Bachelor of Library & Information Science (1 year) as per NEP 2020

Curriculum and Credit Framework for Undergraduate Programme

With Internship and CBCS-LOCF

With effect from the session 2025 – 26

**DEPARTMENT OF LIBRARY & INFORMATION SCIENCE
Faculty of Arts & Languages**

Kurukshetra University, Kurukshetra

Scheme of Examination for Postgraduate Programme B.Lib.I.Sc. (1 year)
as per NEP - 2020 Curriculum and Credit Framework for Postgraduate Programmes
(CBCS LOCF) with effect from the session 2025-26

Framework-1 Scheme-P

Semester	Course Type	Course Code	Nomenclature of course	Theory (T)/ Practical (P)	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
						Total	L	T	P	Total				
1	CC-1	M24-LIS-101	Foundations of Library and Information Science	T	4	22	4	0	0	4	30	70	100	3
	CC-2	M24- LIS - 102	Library Classification and Cataloguing	T	4		4	0	0	4	30	70	100	3
	CC-3	M24- LIS - 103	Reference and Information Sources	T	4		4	0	0	4	30	70	100	3
	PC-1	M24-LIS-104	Classification Practice	P	4		0	0	8	8	30	70	100	4
	PC-2	M24-LIS-105	ICT Application in LIS Practice	P	4		0	0	8	8	30	70	100	4
	Seminar	M24-LIS-106	LIS Contemporary Issues	S	2		0	0	0	2	0	50	50	1

Semester	Course Type	Course Code	Nomenclature of course	Theory (T)/ Practical (P)	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
						Total	L	T	P	Total				
2	CC-4	M24-LIS-201	Reference and Information Services	T	4	26	4	0	0	4	30	70	100	3
	CC-5	M24-LIS-202	Library Management	T	4		4	0	0	4	30	70	100	3
	CC-6	M24-LIS-203	ICT Application in LIS	T	4		4	0	0	4	30	70	100	3
	PC-3	M24-LIS-204	Cataloguing Practice	P	4		0	0	8	8	30	70	100	4
	PC-4	M24-LIS-205	Information Sources and services Practice	P	4		0	0	8	8	30	70	100	4
	CHM	M24-CHM-201	Constitutional, Human & Moral Values and IPR	T	2		2	0	0	2	15	35	50	3
	Internship	M24-INT-200	An Internship Course of 4 Credits of 4-6 weeks duration during summer vacation after IInd semester is to be completed by every student. Internship can be either for enhancing the employability or for developing the research aptitude.									50	50	100

Kurukshetra University, Kurukshetra

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Syllabus for Under Graduate Programme

Bachelor of Library & Information Science (1 Year)

as per NEP 2020

Curriculum and Credit Framework for Undergraduate Programme

**With Internship and CBCS-LOCF
With effect from the session 2025-26**

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE
FACULTY OF ARTS AND LANGUAGES

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA

1. **Programme Learning Outcomes(PLOs) for B.Lib.I.Sc. Programme as per NEP-2020:**

PLOs include outcomes specific to disciplinary areas of learning associated with the chosen field (s) of learning as well as generic learning outcomes. These also include transferable skills and competencies that Under Graduates of all programmes of study should acquire and be able to demonstrate for the award of the Degree. The programme learning outcomes would also focus on knowledge and skills that prepare students for further study, employment, research and responsible citizenship.

Table-1: Program Learning Outcomes

PLO	Bachelor Degree in Library and Information Science
	After the completion of Bachelor degree in Library and Information Science, the student will be able to:
PLO-1: Knowledge and Understanding	Demonstrate the fundamental and advanced knowledge of the subject and understanding of recent developments and issues, including methods and techniques, related to Library and Information Science.
PLO-2: General Skills	Acquire the general skills required for performing and accomplishing the tasks as expected to be done by a skilled professional in the field of Library and Information Science.
PLO-3: Technical/ Professional Skills	Demonstrate the learning of advanced cognitive technical/professional skills required for completing the specialized tasks related to the profession and for conducting and analyzing the relevant research tasks indifferent domains of Library and Information Science.
PLO-4: Communication Skills	Effectively communicate the attained skills of Library and Information Science in well-structured and productive manner to the society at large.
PLO-5: Application of Knowledge and Skills	Apply the acquired knowledge and skills to the problems in the subject area, and to identify and analyze the issues where the attained knowledge and skills can be applied by carrying out research investigations to formulate evidence-based solutions to complex and unpredictable problems associated with the field of Library and Information Science or otherwise.
PLO-6: Critical thinking and Research Aptitude	Attain the capability of critical thinking in intra/inter-disciplinary areas of Library and Information Science enabling to formulate, synthesize, and articulate issues for designing of research proposals, testing hypotheses, and drawing inferences based on the analysis.
PLO-7: Constitutional, Humanistic, Moral Values and Ethics	Know constitutional, humanistic, moral and ethical values, and intellectual property rights to become a scholar/professional with ingrained values in expanding knowledge for the society, and to avoid unethical practices such as fabrication, falsification or misrepresentation of data or committing plagiarism.
PLO-8: Capabilities/qualities and mindset	To exercise personal responsibility for the outputs of own work as well as of group/team and for managing complex and challenging work(s)that requires new/strategic approaches.
PLO-9: Employability and job-ready skills	Attain the knowledge and skills required for increasing employment potential, adapting to the future work and responding to the rapidly changing demands of the employers/industry/society with time.

Bachelor of Library and Information Science (B.Lib.I.Sc.) will be a One-year degree program (equivalent to **PG Diploma in Library and Information Science**, as per NEP 2020), subject to fulfilment of other requirements.

2. Duration and Credits for B.Lib.I.Sc.

- The **B.Lib.I.Sc.** program is of one year duration spread over into 2 Semesters.
- Every Student of **B.Lib.I.Sc.** program has to earn 48 credits as described under:

Table-2: Duration and Credits for B.Lib.I.Sc.

Component	Total Credits	Semester-wise Distribution
Core Courses	40	Semester I = 20 Semester II =20
Internship	4	Semester II = 4
Seminar	2	Semester I = 2
CHM	2	Semester II = 2
Total	48	

3. Course Outcomes and Mapping Matrix

- Each course of the **B.Lib.I.Sc.** program has two/four Course Learning Outcomes (CLOs) which are mapped or associated with PLOs.
- Mapping of correlation between CLOs and PLOs, CLOs in the scale of 1 to 3 has been done as per Table 1:

Table 3: Scale of Mapping between CLO and PLO

Scale 1	If the contents of course have Low correlation (i.e. in agreement with the particular PLO to a small extent) with the particular Programme Learning Outcome
Scale 2	If the contents of course have Medium correlation (i.e. in agreement with the particular PLO to a small extent) with the particular Programme Learning Outcome
Scale 3	If the contents of course have Strong correlation (i.e. in agreement with the particular PLO to a small extent) with the particular Programme Learning Outcome

Session: 2025 – 26			
Part A - Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	1 st Semester		
Name of the Course	Foundations of Library and Information Science		
Course Code	M24-LIS-101		
Course Type	CC-I		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24-LIS-101.1	Understand the role of different Types of Libraries in Society;		
M24-LIS-101.2	Be aware of theoretical foundations of Library and Information Science;		
M24-LIS-101.3	Acquaint with various Laws related to Library and Information Field; and		
M24-LIS-101.4	Understand the Role of Professional Associations and Outreach Activities.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 Hours		
Part B –Contents of the Course			
Instructions for Paper Setter: The Examiner will set 9 questions asking 2 Questions from each unit and one Compulsory Question by taking Course Learning Outcomes (CLOs) into consideration. The Compulsory Question (Question No. 1) will consist of four questions covering entire syllabus. The examinee will be required to attempt 5 Questions, selecting one question from each Unit and the compulsory question. All Questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Unit-I: Concept of Library in Society		15

	– Social and Historical Foundations of Library. Library and Knowledge Society – Development of Libraries with special reference to India. - Different Types of Libraries - their distinguishing features and functions.	
II	Unit-II: Normative Principles of Library and Information Science – Five Laws of Library Science and their Implications on Library and Information Activities. - Librarianship as a Profession.	15
III	Unit-III: Laws relating to Libraries and Information Centres - Library Legislation in India: Need and essential features. - Public Library Acts of Madras (Tamil Nadu), Andra Pradesh, Karnataka (Mysore) and Haryana - Copyright Act and Delivery of Books (Public Libraries) Act, Right to Information Act	15
IV	Unit-IV: Professional Associations, Public Relations, Extension Activities and Resource Sharing – Professional Associations and their role with particular reference to ILA, IASLIC, ALA, IFLA and UNESCO. – Public Relations and Extension Services. - Resource Sharing.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
• Class Participation	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.	10	
• Mid-Term Exam	15	
Part C – Learning Resources		
1. Recommended Books/e-resources/LMS: (List of suggested readings to be provided by concerned faculty)		

Mapping Matrix of Course M24-LIS-101

Table 101.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-101.1	3	3	3	3	3	3	2	2	2
M24-LIS-101.2	3	3	3	3	3	3	2	2	2
M24-LIS-101.3	3	3	3	3	3	2	2	2	2
M24-LIS-101.4	3	3	3	2	3	2	2	2	2
Average	3	3	3	2.75	3	2.5	2	2	2

Session: 2025 – 26			
Part A - Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	1 st Semester		
Name of the Course	Library Classification& Cataloguing		
Course Code	M24-LIS-102		
Course Type	CC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24- LIS -102.1	Understand the various aspects of Library Classification.		
M24- LIS -102.2	Understand salient features of major Classification Schemes and Current Trends in Classification.		
M24- LIS -102.3	Know different types of Catalogue and understand the process of Library Cataloguing.		
M24- LIS -102.4	Understand the concept of Subject Cataloguing and the process of deriving/assigning Subject Headings.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 Hours		
Part B –Contents of the Course			
Instructions for Paper Setter: The Examiner will set 9 questions asking 2 Questions from each unit and one Compulsory Question by taking Course Learning Outcomes (CLOs) into consideration. The Compulsory Question (Question No. 1) will consist of four questions covering entire syllabus. The examinee will be required to attempt 5 Questions, selecting one question from each Unit and the compulsory question. All Questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Unit – I: Library Classification - Library Classification: Definition, Need and Purpose		15

	- Subjects: Basic, Compound and Complex - Planes of Work. Notation: Need, Type and Quality - Call Number: Class Number, Book Number and Collection Number	
II	Unit-II: Classification Schemes & Current Trends - Overview of Colon Classification: Postulates of Facet Analysis and Facet Sequence, Fundamental Categories, Principles of Helpful Sequence and Facet Sequence, Phase Relations, Devices - Main features of latest editions of DDC and UDC. - Current Trends: Web Dewey, OCLC Classify and Folksonomy.	15
III	Unit-III: Bibliographic Description - Catalogue – Definition, Need and Purpose, Types of Library Catalogue. - Physical Forms: Conventional and Non-conventional - Kinds of Entries and their functioning according to CCC and AACR-II.	15
IV	Unit-IV: Subject Cataloguing - Definition, Need, Purpose and problems of Subject Cataloguing, Methods of Subject Cataloguing. Chain Procedure and Sears List of Subject Headings. Latest trends in Library Cataloguing: OPAC, MARC, ISBD, CCF, RDA	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
•Class Participation	5	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.	10	
•Mid-Term Exam	15	
Part C – Learning Resources		
Recommended Books/e-resources/LMS: 1. DEWEY (Melvil). Dewy Decimal Classification and Relative Index. 23rd Ed. 2011. OCLC Online Computer Library Centre, Ohio. 2. DHYANI (Pushpa). Theory of Library Classification. 2000.VishwaPrakashan, Delhi. 3. KRISHAN KUMAR. Theory of Library Classification. 1985. Vikas, Delhi. 4. RANGANATHAN (SR). Colon Classification. Revised ed. 6. 1963. EssEss Publications. 5. RANGANATHAN (S R) Prolegomena to library classification. 3rded. 1967. Sarda Ranganathan Endowment, Bombay. 6. TRIPATHI (S M) and SHOKEEN (N S). Fundamentals of Library Classification (Hindi Medium). 1988. Y.K., Agra. 7. ALA, et al. 2010. Resource Description and Access.		

Mapping Matrix of Course M24-LIS-102

Table 102.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-102.1	3	3	3	1	3	1	1	2	2
M24-LIS-102.2	3	3	3	2	3	3	3	3	3
M24-LIS-102.3	3	3	3	2	3	3	3	3	3
M24-LIS-102.4	3	3	3	3	3	3	3	3	3
Average	3	3	3	2	3	2.5	2.5	2.75	2.75

Session: 2025 – 26			
Part A - Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	1 st Semester		
Name of the Course	Reference and Information Sources		
Course Code	M24-LIS-103		
Course Type	CC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24-LIS-103.1	Develop an in-depth understanding of the classification of various Information Sources and the Criteria used for their Evaluation		
M24-LIS-103.2	Comprehend various types of Reference Sources and their functions		
M24-LIS-103.3	Gain familiarity with Bibliographical Tools and their functions		
M24-LIS-103.4	Identify and evaluate reliable web-based resources for accessing information		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 Hours		
Part B –Contents of the Course			
Instructions for Paper Setter: The Examiner will set 9 questions asking 2 Questions from each unit and one Compulsory Question by taking Course Learning Outcomes (CLOs) into consideration. The Compulsory Question (Question No. 1) will consist of four questions covering entire syllabus. The examinee will be required to attempt 5 Questions, selecting one question from each Unit and the compulsory question. All Questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Information Sources and their Classifications - Information Sources: Nature, Characteristics, Types and Formats - Documentary and Non-Documentary Sources of Information		15

	- Sources of Information: Primary, Secondary and Tertiary Sources - Human and Institutional Resources of Information	
II	Reference Sources: Types and their Functions - Reference Books: Types, Uses and Criteria for Evaluation - Types and Uses of Factual and Ready Reference Sources: Encyclopedias, Dictionaries, Year Books and Almanacs, Directories, Geographical Sources, Biographical Sources, Sources of Current events	15
III	Bibliographic Information Sources: Types and Functions - Meaning, history, Branches and Functions of Bibliography - Types of Bibliography: Universal Bibliography, National Bibliography, Trade Bibliography, etc.	15
IV	Web-based Information Resources - Concept, Importance, Key Features; Advantages of Web-based Resources - Evaluation of Web-based Information Resources - Types of Web-based Information Resources: - o <i>E-Resources on the Web</i>: E-Books, E-Journals; E-Databases: Bibliographic, Full Text, Numeric, Citation Searching; - o <i>Open Access Databases</i>: DOAJ, DOAR; E-Theses and dissertations: Shodhganga and Shodhgangotri. - o <i>Reference Tools on the Web</i>: Encyclopedias, Dictionaries, Directories etc.; Online Repository-RCLIS	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
•Class Participation	5	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.	10	
•Mid-Term Exam	15	
Part C – Learning Resources		
Recommended Books/e-resources/LMS: 1. BUNCH (Allan). Basics of information work, 1995. Clive Bingley, London. 2. CHANDLER (G). How to find out: A guide to sources of information for all, Ed. 4. 1971. Pergamon, Oxford. 3. Girja Kumar and Krishan Kumar, Bibliography, Rev. Ed. 3. 1990. Vikas, New Delhi. 4. GUHA (B) Documentation and information. Rev. ed. 2. 1983. World Press, Calcutta. K.G. Saur, Michigan. 5. KATZ (William A). Introduction to Reference Work: Ed. 7. 2V, 1996. McGraw Hill, New York. 6. KAWATRA (PS). Fundamentals of Documentation. 983. Sterling Pub., New Delhi. 7. KRISHAN KUMAR. Reference Service.Rev.ed.3. 1987.Vikas, New Delhi. 8. TRIPATHI (SM). Modern bibliographical control, Bibliography and documentation. 1992. Y.K., Agra.		

9. USHA PAWAN and GUPTA (Pawan Kumar) Sandarbh Sewa: Avam Suchna Strot. 1994. RBSA, Jaipur. (Hindi Medium).
10. SEWA SINGH, Handbook on International Sources on Reference and Information. 2001. CREST Publishing, New Delhi.
11. TRIPATHI (S.M.). New Dimensions on Reference and Information Services. 1998. Y.K., Agra.
12. WALFORD (AJ). Walford's Guide to Reference Material. 1999. LA; USA.
13. <https://egyankosh.ac.in/>
14. <https://epgpathshala.ac.in/>
15. Dictionary.com (<http://www.dictionary.reference.com>)
16. Thesaurus.com (<http://www.thesaurus.com>)
17. World of Facts (<http://www.odci.gov/cia/publications/factbook/index.html>)
18. The World-Wide Gazetteer (<http://www.c-allen.dircon.co.uk>)
19. Encyclopedia Britannica Online (available at <http://www.eb.com>).
20. Mc-Graw Hill Encyclopaedia of Science & Technology (<http://www.mhreference.com/EST/est.htm>)

Mapping Matrix of Course M24-LIS-103

Table 103.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-103.1	3	2	3	3	3	3	3	2	3
M24-LIS-103.2	3	2	3	3	3	3	2	3	3
M24-LIS-103.3	3	2	3	3	3	3	3	3	3
M24-LIS-103.4	3	3	3	2	3	3	2	3	2
Average	3	2.25	3	2.75	3	3	2.5	2.75	2.75

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	1 st Semester		
Name of the Course	Classification Practice		
Course Code	M24-LIS-104		
Course Type	PC-I		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
MLIS-104.1	Develop skills of Subject Analysis using Classification Schemes.		
MLIS-104.2	Classifying the documents according to CC and DDC.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	3 Hours	
Part B-Contents of the Course			
Note for the Examiner The paper shall be divided into two parts-A&B and will be intended to know practical skills in the use and application of classification tools.			
Practicals			Contact Hours
Unit-I: Colon Classification (6 th Rev. ed.) Marks: 35 Note: There will be <i>Seven</i> Titles and the examinees will be required to classify any <i>Five</i> titles only. Syllabus - Simple Subject. - Fundamental Categories. - Facet Analysis and Facet Sequence. - Devices. - Common Isolates.			60

- Phase Relations.			
Unit-II: Dewey Decimal Classification (23rd ed.) Marks: 35 Note: There will be Seven Titles and the examinees will be required to classify any Five titles only. Syllabus - Simple Subject (Summaries). - Introduction to Schedules. - Use of Tables. Relative Index.			60
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
• Class Participation	5	Practicum Examination	
• Seminar/Demonstration/Viva-voce/Lab records etc.	10		
• Mid-Term Exam	15		
Part C – Learning Resources			
Recommended Books/e-resources/LMS: 1. RANGANATHAN (SR). Colon Classification. Revised ed. 6. 1963. EssEss Publications. 2. DEWEY (Melvil). Dewey Decimal Classification and Relative Index. 23 rd Ed. 2011. OCLC Online Computer Library Centre, Ohio. 3. KRISHAN KUMAR. Theory of Library Classification. 1985. Vikas, Delhi. 4. RANGANATHAN (S R) Prolegomena to library classification. 3 rd ed. 1967. Sarda Ranganathan Endowment, Bombay. 5. DHYANI (Pushpa). Theory of Library Classification. 2000.VishwaPrakashan, Delhi.			

Mapping Matrix of Course M24-LIS-104

Table 104.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-104.1	3	3	3	3	3	3	2	2	2
M24-LIS-104.2	3	3	3	3	3	3	2	2	2
M24-LIS-104.3	3	3	3	3	3	2	2	2	2
M24-LIS-104.4	3	3	3	2	3	2	2	2	2
Average	3	3	3	2.75	3	2.5	2	2	2

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	1 st Semester		
Name of the Course	ICT Application in LIS Practice		
Course Code	M24-LIS-105		
Course Type	PC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24-LIS-105.1	Use MS WORD efficiently		
M24-LIS-105.2	Use MS POWER POINT efficiently		
M24-LIS-105.3	Conduct Web-search and Communicate through E-mail		
M24-LIS-105.4	Use KOHA for basic Library Operations		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	3 Hours	
Part B-Contents of the Course			
Note for the Examiner: The paper shall be divided into two Parts A&B and will be intended to know practical skills in the use and application of software.			
Practicals			Contact Hours
MS Office - MS WORD: Standard Toolbars, Creating a Document, Editing a Document, Formatting a Document, Maintaining Mailing List. - MS POWER POINT: Creating Presentation Slides, Formatting/ Adding Graphics. Animation and Slide Transition, Slide Show. Customizing and Printing. Online Searching			120

– Basic Web Searching – E-mail		
Introduction to KOHA		
Total Contact Hours		120
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
• Class Participation:	5	Practicum Examination
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C – Learning Resources		
Recommended Books/e-resources/LMS:		
1. BOTT, Ed. Introducing Windows 10 for IT Professionals. Microsoft Press. Washington, 2015. Complete MS Word Tutorial from Basic to Advanced. https://www.youtube.com/watch?v=A_JHmbZT5ro&ab_channel=ComputerTechAcademy 2. GOOKIN (Dan). Word 2016 For Dummies. Wiley & Sons, Inc., 2013. 3. LAMBERT (Joan) and FRYE (Curtis). Microsoft Office 2016 Step by Step. Microsoft Press. Washington, 2015. https://ptgmedia.pearsoncmg.com/images/9780735699236/samplepages/9780735699236.pdf 4. Lambert (Joan) and Frye (Curtis). Microsoft Office Step by Step (Office 2021 and Microsoft 365), Pearson India, 2024. 5. LAMBERT (Joan) and LAMBERT (Steve). Windows 10 Step by Step. Microsoft Press, Washington, 2015. https://ptgmedia.pearsoncmg.com/images/9780735697959/samplepages/9780735697959.pdf LAMBERT. Microsoft Word 2016 Step by Step. PHI. 6. LOWE (Doug). PowerPoint 2016 For Dummies. Wiley & Sons, Inc., 2015. Microsoft Word Tutorial - Complete MS-Word Tutorial for Beginners. https://www.youtube.com/watch?v=YHSLkNzLuqc&ab_channel=LearnMore WEVERKA. Microsoft Office 2021 All-In-One for Dummies, Wiley India, 2023. WEVERKA. Microsoft Office 365 All-In-One for Dummies, 2nd Ed., Wiley India, 2023.		

Mapping Matrix of Course M24-LIS-105

Table 105.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-105.1	2	2	3	1	3	1	1	2	3
M24-LIS-105.2	2	2	3	2	3	1	1	2	3
M24-LIS-105.3	2	3	3	3	3	2	1	2	3
M24-LIS-105.4	3	2	3	1	3	2	1	2	3
Average	2.25	2.25	3	1.75	3	1.5	1	2	3

Session: 2025 – 26			
Part A - Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	2 nd Semester		
Name of the Course	Reference and Information Services		
Course Code	M24-LIS-201		
Course Type	CC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24-LIS-201.1	Develop a comprehensive understanding of Reference Service and the techniques involved in conducting effective Reference Interviews		
M24-LIS-201.2	Learn about different kinds and functions of Information Services		
M24-LIS-201.3	Gain an Understanding of the Services offered by various Information Systems		
M24-LIS-201.4	Explore Current Trends in Reference and Information Services		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 Hours		
Part B –Contents of the Course			
Instructions for Paper Setter: The Examiner will set 9 questions asking 2 Questions from each unit and one Compulsory Question by taking Course Learning Outcomes (CLOs) into consideration. The Compulsory Question (Question No. 1) will consist of four questions covering entire syllabus. The examinee will be required to attempt 5 Questions, selecting one question from each Unit and the compulsory question. All Questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Foundations of Reference Services - Reference Services: Definition, Need and Functions - Theories and Levels of Reference Services		15

	- Reference Service in different Types of Library - Five Laws of Library Science and Reference Service - Reference Process: Reference Question; Reference Interview - Qualities and Competencies of a Reference Librarian	
II	Information Services: Types and Functions - Concept and Types of Information Services: An overview - Current Awareness Service (CAS) - Selective Dissemination of Information (SDI). - Document Delivery Service (DDS) - Translation Service - Referral Service	15
III	Services and Products of specific Information Systems - Concept, Objectives, Functions of Information Systems - Environmental Information System (ENVIS) - Biotechnology Information System (BTIS) - International Nuclear Information System (INIS) - International Information System on Agricultural Sciences and Technology(AGRIS) - National Institute of Science Communication and Information Resources (NISCAIR)	15
IV	Trends in Reference and Information Service - Online/Virtual Reference Services: Concept, Types and Advantages - Synchronous Communication & Content Delivery: Instant Messaging, RSS Feeds, Streaming Media, Podcasts, Vodcasts, SMS Enquiry Service - Collaborative Publishing Tools: Blogs & Wikis, Collaborative Service Platforms: Social Networks, Tagging, Social Bookmarking - Use of Social Media in Information Service - Best Practice and Role of Reference Librarian in Digital Era	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
• Class Participation	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.	10	
• Mid-Term Exam	15	
Part C – Learning Resources		
Recommended Books		
1. AHERTON (Pauline). Handbook for information systems and services. 1977. UNESCO, Paris.		
2. BOPP (Richard E) and SMITH (Linda C), <i>Ed.</i> Reference and information services: An Introduction. Rev. ed. 1995. Libraries Un., USA.		
3. CHATTERJEE (Amitabha). Elements of Information Organization and Dissemination. 2017.Chandos; USA.		

4. KATZ (William A). Introduction to Reference Work. Ed. 7. 2 V. 1996. Mc Graw Hill, New York.
5. KAWATRA (PS). Fundamentals of Documentation. 983. Sterling Pub., New Delhi.
6. KRISHAN KUMAR. Reference Service.Rev.ed.3. 1987.Vikas, New Delhi.
7. RANGANATHAN (S R). Reference Service, 1991. Sarada Ranganathan Endowment, Bangalore.
8. ROWLEY (J E). The Basics of Information Systems.1996. Facet Publishing, London.
9. TRIPATHI (S.M.). New Dimensions on Reference and Information Services. (Hindi Medium) 1998. Y.K., Agra. (Hindi Medium).
10. USHA PAWAN and GUPTA (Pawan Kumar). Sandarbh Sewa: Avam Suchna Strot1994. RBSA, Jaipur. (Hindi Medium).
11. GUHA (B). Documentation and Information: Services, Techniques and Systems. 1983. The world Press, Calcutta,
12. GURDEV SINGH. Information Sources, Services and Systems. 2013. PHI Learning, New Delhi.
13. RASTOGI, K.G. Reference services in Library Science. 2006. Alfa Publications, New Delhi.
14. <https://egyankosh.ac.in/>
15. <https://epgpathshala.ac.in/>

Mapping Matrix of Course: M24-LIS-201

Table 201.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-201.1	3	2	3	3	3	3	2	2	2
M24-LIS-201.2	3	2	3	3	3	3	2	2	2
M24-LIS-201.3	3	2	3	3	3	3	2	3	3
M24-LIS-201.4	3	3	3	2	3	3	3	3	3
Average	3	2.25	3	2.75	3	3	2.25	2.5	2.5

Session: 2025 – 26			
Part A - Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	2 nd Semester		
Name of the Course	Library Management		
Course Code	M24-LIS-202		
Course Type	CC-5		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24-LIS-202.1	Understand the Management aspects of Library & Information Centres.		
M24-LIS-202.2	Understand Library Finance and Budgeting.		
M24-LIS-202.3	Familiarize with the different Sections of the Library & Information Centres.		
M24-LIS-202.4	Understand different aspects of Library maintenance and Space Management.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 Hours		
Part B –Contents of the Course			
Instructions for Paper Setter: The Examiner will set 9 questions asking 2 Questions from each unit and one Compulsory Question by taking Course Learning Outcomes (CLOs) into consideration. The Compulsory Question (Question No. 1) will consist of four questions covering entire syllabus. The examinee will be required to attempt 5 Questions, selecting one question from each Unit and the compulsory question. All Questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Library Environment - Organisation, Management and Administration: A Conceptual Framework.		15

	- Library Organisational Structure, Ranganathan's Staff Formula. - Library Committee: Types, functions and powers.	
II	Library Finance and Budgeting - Sources of Finance. - Methods of Estimating Library Finance. - Budget Preparation for different types of Libraries. - General Administration: Annual Report, Library Statistics, Library Rules.	15
III	Sections of the Library - Book Selection and Procurement: Principles, Policy, Committee, Tools and Procedure. - Technical Processing Section. - Periodicals Section. - Circulation Section. - Reference Section.	15
IV	Maintenance, Building and Space Management - Maintenance Section: Stacking, Shelving, Shelf Rectification, Stock Verification, Binding etc. - Basic elements in designing library building. - Furniture and Equipments.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
• Class Participation	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.	10	
• Mid-Term Exam	15	
Part C – Learning Resources		
Recommended Books/e-resources/LMS:		
1. Application of Management Techniques to Library and Information Systems, 12th IASLIC Conference, Roorkee, 1979.		
2. MITTAL (R L). Library Administration: Theory and Practice. 5 th ed. 1983. New Delhi, Metropolitan.		
3. MOOKERJEE (Subodh Kumar) and SENGUPTA (Beneyendra). Library Organization and Library Administration. 1972. Calcutta, World Press.		
4. PANWAR (B S) and VYAS (S D). Library Management. 1986. Delhi; R.R. Publishing Corporation.		
5. RANGANATHAN (S R) Library Manual for Authorities, Librarians and Honorary Library Workers. 2nd ed. 1967. Bombay, Asia.		
6. SINGH (M). Library and Information Management: Theory and Practice. 1983. Delhi, IBT.		
7. SINGH (R S P). Fundamentals of Library Administration and Management. 1990. Delhi, Prabha.		
8. STEUART (Robert) and EASTILICK (John T). Libraries Management. 2nd ed.1991. Colorado, Libraries Unlimited.		
9. TRIPATHI (S M). Granthalya Prabandh (Hindi medium).		

Mapping Matrix of Course M24-LIS-202

Table 202.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-202.1	3	2	3	3	3	3	3	2	3
M24-LIS-202.2	3	2	3	3	3	3	2	3	3
M24-LIS-202.3	3	2	3	3	3	3	3	3	3
M24-LIS-202.4	3	3	3	2	3	3	2	3	2
Average	3	2.25	3	2.75	3	3	2.5	2.75	2.75

Session: 2025 – 26			
Part A - Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	2 nd Semester		
Name of the Course	ICT Application in LIS		
Course Code	M24-LIS-203		
Course Type	CC-6		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24-LIS-203.1	Familiarize with classification of Computers and Hardware components.		
M24-LIS-203.2	Understand the concept of Computer Software.		
M24-LIS-203.3	Familiarize with different Communication Technologies.		
M24-LIS-203.4	Understand the Areas of Application of Computers in Libraries.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 Hours		
Part B –Contents of the Course			
Instructions for Paper Setter: The Examiner will set 9 questions asking 2 Questions from each unit and one Compulsory Question by taking Course Learning Outcomes (CLOs) into consideration. The Compulsory Question (Question No. 1) will consist of four questions covering entire syllabus. The examinee will be required to attempt 5 Questions, selecting one question from each Unit and the compulsory question. All Questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Unit-I: Computer Hardware – The Evolution and Characteristics of Computers. – Classification of Computers: Super Computer, Mainframe Computer, Mini Computer and Micro Computer. Digital vs.		15

	Analog Computers. – <i>Computer Architecture:</i> Input Devices, Output Devices, Central Processing Unit. Memory (Auxiliary).	
II	Unit-II: Computer Software – System and Application Software. – Operating Systems: Single and Multiuser. – Basics Features of MS Windows and Linux. – Application Software: Concept and Types.	15
III	Unit-III: Communication Technology (Networking) – Communication: An Overview – Networks: Concept and Components – Network Media: Wire and Wireless. – Network Types: PAN, LAN, MAN and WAN. – Topologies: Bus, Star, Ring, Token Ring, Tree and Mesh.	15
IV	Unit-IV: Library Automation – Role of Computers in Libraries – Library automation: definition, need, purpose & objectives – Application of Computers in Library Activities: Housekeeping Operations – Library management software: Basic Features of SOUL and KOHA	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
• Class Participation	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.	10	
• Mid-Term Exam	15	
Part C – Learning Resources		
Recommended Books/e-resources/LMS:		
1. Bharathiar University. Introduction to Information Technology. http://buc.edu.in/sde_book/bcom_ca.pdf		
2. BHARIHOKE (Deepak). Fundamentals of Information Technology. 4 th Ed. Excel Books. New Delhi, 2012.		
3. BOTT, Ed. Introducing Windows 10 for IT Professionals. Microsoft Press. Washington, 2015.		
4. GILL (Nasib Singh). Handbook of Computer Fundamentals. Jain Book Agency. Delhi, 2016.		
5. GOOKIN (Dan). Word 2016 For Dummies. Wiley & Sons, Inc., 2013.		
6. Introducing Windows 10. Microsoft Press, Preview eBook. http://download.microsoft.com/download/D/2/B/D2B18586-8C4F-4F40-828D-99D96489152A/Microsoft_Press_eBook_Introducing_Windows_10_Preview_PDF.pdf		
7. LAMBERT (Joan) and LAMBERT (Steve). Windows 10 Step by Step. Microsoft Press, Washington, 2015. https://ptgmedia.pearsoncmg.com/images/9780735697959/samplepages/9780735697959.pdf		

8. LEON (Alexis) and LEON (Mathews). Fundamentals of Information Technology. 2nd Ed. Vikas Publishing House Pvt. Ltd. New Delhi. 2009.
9. LEON-GARCIA (Alberto) and WIDJAJA (Indra). Communication Networks: Fundamental concepts and key architectures. 2nd Ed. McGraw-Hill, 2006.
10. McFedries (Paul). Teach Yourself Visually Windows 10. Wiley, 2015.
11. Nagpal (D P). Computer Fundamentals. S. Chand. New Delhi. 2008.
12. NORTON (Peter). Introduction to Computers. Tata McGraw-Hill. New York. 6th Edition. 2008.
<https://onlinestudy4u.files.wordpress.com/2012/10/introduction-to-computers-by-peter-norton-6th-ed.pdf>
13. ROWLEY (Jennifer). Computers for libraries. 3rd ed. Library Association. London. 1993.
14. SALARIA (R S), Computer Fundamentals. Jain Book Agency. Delhi, 2015.
15. SINHA (P K) and Sinha (P). Foundations of computing. BPB Publications. 2008.
<http://www.edutechlearners.com/computer-fundamentals-p-k-sinha-free-pdf/>
16. TANENBAUM (Andrew S) and WETHERALL (David J.). Computer networks. 5th Ed. Prentice Hall of India Pvt. Ltd. 2011. <https://inspirit.net.in/books/networking/Computer%20Networks%20-%20A%20Tanenbaum.pdf>
<https://montcs.bloomu.edu/Readings/Computer%20Networks%20-%20A%20Tanenbaum%20-%205th%20edition.pdf>
17. Umesh Kumar Singh. Fundamentals of Computer and Information Technology. Jain Book Agency. Delhi, 2013.
18. WANG (Wallace). Office 2013 For Dummies. Wiley & Sons, Inc., 2013.
19. WEVERKA (Peter). Microsoft Office Home and Student Edition 2013 All-in-One for Dummies. John Wiley & Sons, Inc., 2013.
20. WEVERKA (Peter). Windows 10 For Seniors For Dummies. Wiley & Sons, Inc., 2015.

Mapping Matrix of Course M24-LIS-203

Table 203.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-203.1	3	2	3	1	3	2	1	2	3
M24-LIS-203.2	3	2	3	1	3	2	1	2	3
M24-LIS-203.3	2	3	3	3	3	2	1	2	3
M24-LIS-203.4	3	2	3	2	3	2	1	2	3
Average	2.75	2.25	3	1.75	3	2	1	2	3

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	2 nd Semester		
Name of the Course	Cataloguing Practice		
Course Code	M24-LIS-204		
Course Type	PC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24-LIS-204.1	Develop skills of Subject Cataloguing.		
M24-LIS-204.2	Cataloguing the documents according to AACR-II and RDA.		
M24-LIS-204.3	Develop skills of document analysis using Resource Description and Analysis (RDA).		
M24-LIS-204.4	Prepare Catalogue Entries according to RDA.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	3 Hours	
Part B-Contents of the Course			
Note for the Examiner The paper shall be divided into two parts-A&B and will be intended to know practical skills in the use and application of software.			
Practicals			Contact Hours
Unit-I: Anglo-American Cataloguing Rules-II (AACR-II) Marks: 40 - Sections and Skeleton Card of Main and Added entries - Basic features, Personal Author(s), Shared Authorship, Collaborator (s). - Cataloguing Pseudonym Work. - Cataloguing of Multivolume documents. - Cataloguing of Periodical Publications (Simple Periodical			60

Publications)			
Unit-II: Marks: 30 Note: Preparation of Catalogue Entry of Two Documents out of Three in RDA. Preparation of Entries of Simple Books, Composite Books and Periodicals. Unit-III: (i) Viva-voce: 10 Marks	Resource Description and Access (RDA)	60	
Total Contact Hours		120	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
• Class Participation:	5	Practicum Examination	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C – Learning Resources			
Recommended Books/e-resources/LMS: 1. DHYANI (Pushpa). Theory of Library Classification. 2000.VishwaPrakashan, Delhi. 2. KRISHAN KUMAR. Theory of Library Classification. 1985. Vikas, Delhi. 3. RANGANATHAN (SR). Colon Classification. Revised ed. 6. 1963. EssEss Publications. 4. RANGANATHAN (S R) Prolegomena to library classification. 3 rd ed. 1967. Sarda Ranganathan Endowment, Bombay. 5. TRIPATHI (S M) and SHOKEEN (N S). Fundamentals of Library Classification (Hindi Medium). 1988. Y.K., Agra. 6. ALA, et al. 2010. Resource Description and Access. 7. ALA and others. Anglo American Cataloguing Rules. Revised ed. 2. 1998. 8. SEARS (ME). Seats List of Subject Headings. Latest edition.			

Mapping Matrix of Course M24-LIS-204

Table 204.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-204.1	3	3	3	2	3	3	2	3	3
M24-LIS-204.2	3	3	3	3	3	3	3	3	3
M24-LIS-204.3	3	3	3	3	3	3	3	3	3
M24-LIS-204.4	3	3	3	3	3	3	3	3	3
Average	3	3	3	2.75	3	3	2.75	3	3

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Bachelor of Library & Information Science		
Semester	2 nd Semester		
Name of the Course	Information Sources and Services Practice		
Course Code	M24-LIS-205		
Course Type	PC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24-LIS-205.1	Know the criteria to evaluate different types of Reference Sources		
M24-LIS-205.2	Develop proficiency in answering a range of Reference Queries		
M24-LIS-205.3	Prepare Bibliographic Entries according to APA Style Guidelines.		
M24-LIS-205.4	Gain understanding in compiling Journal Content Alerts and organizing Thematic Newspaper Clippings.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	3 Hours	
Part B-Contents of the Course			
Instructions for Paper Setter: This course aims to provide practical skills in evaluating reference sources and delivering various types of information services within a library setting. The examinee will be required to attempt 5 Questions. All Questions will carry equal marks.			
Practical			Contact Hours
1. Evaluation of Reference Source Critical assessment of Reference Source based on their authority, scope, arrangement, treatment and format.			120
2. Providing Answers of Reference Questions Effectively responding to reference queries through the identification of appropriate reference sources accompanied by accurate bibliographical details.			

3. Prepare Bibliographic Entries according to APA Style Guideline Creating bibliographic citations in accordance with APA style guidelines.		
4. Compile Journal Contents Alerts Organizing Current Journal Content List (Broad Subject Headings Arrangement) for user awareness and access.		
5. Organize Thematic Newspaper Clippings Collecting and arranging Newspaper Clippings based on specific themes or subject areas.		
Total Contact Hours		120
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
• Class Participation:	5	Practicum Examination
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C – Learning Resources		
List of Reference Sources for Evaluation:		
1. Bibliographical Sources: Indian National Bibliography, Books-in-Print (Bowker), Guide to Indian Periodical Literature, Library and Information Science Abstracts (LISA).		
2. Encyclopaedias: New Encyclopaedia Britannica, Encyclopaedia of Library and Information Science, International Encyclopaedia of Social Sciences.		
3. Dictionaries: Oxford English Dictionary, Webster's Third New International Dictionary, Samantar Kosh: Hindi Thesaurus, Rogets International Thesaurus.		
4. Geographical Sources: Gazetteer of India, World Geographical Encyclopaedia, Times Atlas of the World.		
5. Biographical Sources: International Who's Who, Chamber's Biographical Dictionary.		
6. Year Books: Europa World Yearbook, Statesman's Yearbook, India: A Reference Annual.		
7. Directories: Universities Handbook India, World of Learning.		
8. Statistical Sources: Statistical Abstracts of India, UNESCO Statistical Yearbook.		
9. Handbooks: Limca Book of Records, Guinness Book of World Records.		
Recommended Books/e-resources/LMS:		
1. American Psychological Association. (2010). <i>Publication manual of the American Psychological Association</i> (6th ed.). Washington, DC: American Psychological Association		
2. Katz, William A. (1996). <i>Introduction to Reference Work</i> . Ed. 7 2V. New York: McGraw Hill.		
3. https://egyankosh.ac.in/ https://inflibnet.ac.in/		

Mapping Matrix of Course: M24-LIS-205

Table 205.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-205.1	3	3	3	3	3	3	2	2	2
M24-LIS-205.2	3	3	3	3	3	3	2	2	2
M24-LIS-205.3	3	3	3	3	3	3	3	2	2
M24-LIS-205.4	3	3	3	2	3	3	2	2	2
Average	3	3	3	2.75	3	3	2.25	2	2

Session: 2025-26			
Part-A - Introduction			
Name of the Programme	Common to all PG Programmes		
Semester	2 nd Semester		
Name of the Course	Constitutional, Human and Moral Values, and IPR		
Course Code	M24-CHM-201		
Course Type	CHM		
Level of the course	400-499		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes(CLO): After completing this Course, the Learner will be able to:			
M24-CHM-201.1	Learn the different Constitutional Values, Fundamental rights and duties enshrined in the India Constitution.		
M24-CHM-201.2	Understand humanism, human virtues and values, and idea of International peace.		
M24-CHM-201.3	Grasp the basic concepts of Moral Values and Professional Conduct which are required to become a part of the civil society and for developing professionalism.		
M24-CHM-201.4	Understand concepts of Intellectual Property Rights, Copyright, Patent, Trademark etc., and about threats of Plagiarism.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of four questions covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each Unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Constitutional Values: Historical Perspective of Indian Constitution; Basic Values enshrined in the Preamble of the Indian Constitution; Concept of Constitutional Morality; Patriotic Values and Ingredients Nation Building; Fundamental Rights and Duties ; Directive Principles of the State Policy.		8
II	Humanistic Values: Humanism, Human Virtues and Civic Sense; Social Responsibilities of Human Beings; Ethical ways to deal with human aspirations; Harmony		7

	with society and nature; Idea of International Peace and Brotherhood (Vasudhaiv Kutumbkam).	
III	Moral Values and Professional Conduct Understanding Morality and Moral Values; Moral Education and Character Building; Ethics of Relations: Personal, Social and Professional; Introduction to Gender Sensitization; Affirmative approach towards Weaker Sections (SCs, STs, OBCs, EWS& DAs); Ethical Conduct in Higher Education Institutions; Professional Ethics.	8
IV	Intellectual Property Rights: Meaning, Origins and Nature of Intellectual Property Rights (IPRs);Different Kinds of IPRs – Copyright, Patent, Trademark, Trade Secret/Dress, Design, Traditional Knowledge; Infringement and Offences of IPRs – Remedies and Penalties; Basics of Plagiarism policy of UGC.	7
Note: Scope of the syllabus shall be restricted to generic and introductory level of mentioned topics.		
Total Contact Hours		30
Suggested Evaluation Methods		
Internal Assessment: 15		End Term Examination: 35
•Class Participation:	4	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.:	4	
•Mid-Term Exam:	7	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Ahuja, V K. (2017). <i>Law relating to Intellectual Property Rights</i> , India, IN: Lexis Nexis. 2. Bajpai, B. L., <i>Indian Ethos and Modern Management</i> , New Royal Book Co., Lucknow, 2004. 3. Basu, D.D., <i>Introduction to the Constitution of India</i> (Students Edition) Prentice Hall of India Pvt. Ltd., New Delhi, 20th ed., 2008. 4. Dhar, P.L. & R.R. Gaur, <i>Science and Humanism</i> , Commonwealth Publishers, New Delhi, 1990. 5. George, Sussan, <i>How the Other Half Dies</i> , Penguin Press, 1976. 6. Govindarajan, M., S. Natarajan, V.S. Sendil kumar (eds.), <i>Engineering Ethics (Including Human Values)</i> , Prentice Hall of India Private Ltd, New Delhi, 2004. 7. Harries, Charles E., Michael S. Pritchard & Michael J. Robins, <i>Engineering Ethics</i> , Thompson Asia, New Delhi, 2003. 8. Illich, Ivan, <i>Energy & Equity</i> , Trinity Press, Worcester, 1974. 9. Meadows, Donella H., Dennis L. Meadows, Jorgen Randers & William W. Behrens, <i>Limits to Growth: Club of Rome's Report</i> , Universe Books, 1972. 10. Myneni, S.R, <i>Law of Intellectual Property</i> , Asian Law House. 11. Narayanan, P, <i>IPRs</i> . 12. Neeraj, P., & Khusdeep, D. (2014). <i>Intellectual Property Rights</i> , India, IN: PHI learning Private Limited. 13. Nithyananda, K V. (2019). <i>Intellectual Property Rights: Protection and Management</i> . India, IN: Cengage Learning India Private Limited. 14. Palekar, Subhas, <i>How to practice Natural Farming</i> , Pracheen (Vaidik) Krishi Tantra Shodh, Amravati, 2000. 15. Phaneesh, K.R., <i>Constitution of India and Professional Ethics</i> , New Delhi. 16. Pylee, M.V., <i>An Introduction to Constitution of India</i> , Vikas Publishing, New Delhi, 2002.		

17. Raman, B.S., *Constitution of India*, New Delhi, 2002.
18. Reddy, B., *Intellectual Property Rights and the Law*, Gogia Law Agency.
19. Reddy, N.H., SantoshAjmera, *Ethics, Integrity and Aptitude*, McGraw Hill, New Delhi.
20. Sharma, Brij Kishore, *Introduction to the Constitution of India*, New Delhi,
21. Schumacher, E.F., *Small is Beautiful: A Study of Economics as if People Mattered*, Blond & Briggs, Britain, 1973.
22. Singles, Shubham et. al., *Constitution of India and Professional Ethics*, Cengage Learning India Pvt. Ltd., Latest Edition, New Delhi, 2018.
23. Tripathy, A.N., *Human Values*, New Age International Publishers, New Delhi, 2003.
24. Wadehra, B.L., *Law relating to Intellectual Property*, Universal Law Publishing Co.
25. Relevant Websites, Movies and Documentaries:
Value Education Websites, <http://uhv.ac.in>, <http://www.uptu.ac.in>.
Story of Stuff, <http://www.storyofstuff.com>
 Cell for IPR Promotion and Management: <http://cipam.gov.in/>.
 World Intellectual Property Organization: <https://www.wipo.int/about-ip/en/>
 Office of the Controller General of Patents, Designs & Trademarks: <http://www.ipindia.nic.in/>
26. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA.
27. Charlie Chaplin, *Modern Times*, United Artists, USA.
28. *Modern Technology – The Untold Story*, IIT, Delhi.
29. A. Gandhi, *Right Here Right Now*, Cyclewala Productions.

Mapping Matrix of Course M24-CHM-201
Table CHM-201.1: CLO-PLO Matrix

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-CHM-201.1	3	2	3	3	3	3	3	2	3
M24-CHM-201.2	3	2	3	3	3	3	2	3	3
M24-CHM-201.3	3	2	3	3	3	3	3	3	3
M24-CHM-201.4	3	3	3	2	3	3	2	3	2
Average	3	2.25	3	2.75	3	3	2.5	2.75	2.75

Table-4: PLO MAPPING

Course Code	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-101	3	3	3	2.75	3	2.5	2	2	2
M24- LIS-102	3	3	3	2	3	2.5	2.5	2.75	2.75
M24- LIS-103	3	2.25	3	2.75	3	3	2.5	2.75	2.75
M24-LIS-104	3	3	3	2.75	3	2.5	2	2	2
M24-LIS-105	2.25	2.25	3	1.75	3	1.5	1	2	3
M24-LIS-201	3	2.25	3	2.75	3	3	2.25	3	2.5
M24-LIS-202	3	2.25	3	2.75	3	3	2.5	2.75	2.75
M24-LIS-203	2.75	2.25	3	1.75	3	2	1	2	3
M24-LIS-204	3	3	3	2.75	3	3	2.75	3	3
M24-LIS-205	3	3	3	3	3	3	2.25	3	3
M24-CHM-201	3	2.25	3	2.75	3	3	2.5	2.75	2.75

CLO-PLO MAPPING**Attainment of CLOs:**

The attainment of COs will be measured on the basis of the results of Internal Assessment and end Semester Examination. The attainment is measured on scale of 3 as per the target for CLOs attainment.

Following table shows the CLO attainment levels at the set target of 60%.

Table-5: CLO Attainment Levels for Internal Assessment

Attainment Level	Description
1 (low level of attainment)	60% of students score more than 60% or higher grade in Class Tests/Assignments of B.Lib.I.Sc. course.
2 (Medium level of attainment)	70% of students score more than 60% or higher grade in Class Tests/Assignments of B.Lib.I.Sc. course.
3 (High level of attainment)	80% of students score more than 60% or higher grade in Class Tests/Assignments of B.Lib.I.Sc. course.

The questions in tests/assignments for Internal Assessment will be based on CLOs. Class Test-I/Assignment-I will be based on first two CLOs (**e.g. M24-LIS-101.1 and M24-LIS-101.2 in case of Foundations of Library and Information Science**) with equal weightage given to both CLOs. Similarly, Class Test-II/Assignment-II will be based on next two CLOs (**e.g. M24-LIS-**

101.3 and M24-LIS-101.4 in case of Foundations of Library and Information Science) with equal weightage given to these two CLOs. For each Internal Assessment Test/Assignment, the percentage of students attaining the target level of CLO will be estimated and averaged percentage will decide the attainment level of CLOs. Following steps will be taken for determining the attainment level in Internal Assessment of **B.Lib.I.Sc.** course:

- (i) The %age of students scoring set target i.e. 60% marks or more in the question(s) of Test–I/Assignment-I will be estimated based on first CLO e.g.**M24-LIS-101.1.**
- (ii) The %age of students scoring set target i.e. 60% marks or more in the question(s) of Test–I/Assignment-I will be estimated based on second CLO e.g. **M24-LIS-101.2.**
- (iii)The %age of students scoring set target i.e. 60% marks or more in the question(s) of Test–II/Assignment-II will be estimated based on third CLO e.g.**M24-LIS-101.3.**
- (iv)The %age of students scoring set target i.e. 60% marks or more in the question(s) of Test–II/Assignment-II will be estimated based on fourth CLO e.g. **M24-LIS-101.4.**
- (v) The average of the percentages obtained above will be calculated.
- (vi)The attainment level i.e. 3, 2 or 1 will be determined as per scale defined in **the above table.**

For determination of attainment levels for End Semester Examination, it is considered that the questions in the End Term Examination will be based on all CLOs of MLIS courses. Attainment levels for End Semester Examination of MLIS will be determined after the declaration of the results. The CLO attainment levels for End Semester Examination are given **in the following Table-6:**

Table-6: CLO Attainment Levels for End Semester Examination (ESE)

Attainment Level	Description
1 (Low level of attainment)	60% of students obtained letter grade of B+ or above.
2 (Medium level of attainment)	70% of students obtained letter grade of B+ or above.
3 (High level of attainment)	80% of students obtained letter grade of B+ or above.

Overall CLO Attainment level of B.Lib.I.Sc. course:

The overall CLO attainment level of the course will be obtained as:

Overall CLO attainment level = 50% of CLO attainment level in Internal Assessment + 50% of CLO attainment level in End Semester Examination.

The overall CLOs attainment level will be obtained for all the courses of the programme in a similar manner.

Attainment of PLOs:

The overall attainment level of PLOs will be based on the values obtained using direct and indirect methods in the ratio of 80:20. The direct attainment of PLOs is obtained through the attainment of CLOs. The overall CLO attainment value as estimated above and CLO-PLO mapping value as shown in **Table 7** will be used to compute the attainment of PLOs. PLO attainment values obtained using direct method will be written as shown **in the following Table-10:**

Table-7: PLO Attainment Values using Direct Method

CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
M24-LIS-101									
M24-LIS-102									
M24-LIS-103									
M24-LIS-104									
M24-LIS-105									
M24-LIS-106									
M24-LIS-201									
M24-LIS-202									
M24-LIS-203									
M24-LIS-204									
M24-LIS-205									
M24-CHM-201									
M24-INT-200									

The PLO attainment values to be filled in above table can be obtained as follows:

For M24-LIS-101-PLO1 Cell:

PLO1 attainment value = (Mapping factor of **M24-LIS -101**-PLO1 from **Table 4** × Overall CLO attainment value for the course **M24-LIS-101**)/3

For M24-LIS -101-PLO1 Cell:

Similarly, values for each cell **of the above Table-7** can be obtained. The direct attainment of PLOs is average of individual PLO attainment values.

In order to obtain the PLO attainment using indirect method, a student exit survey based on the questionnaire of PLOs will be conducted at end of last semester of the program. The format for the same is given **in the following Table-8**. Average of the responses from the outgoing students for each PLO will be estimated. The overall PLO attainment values are obtained by adding attainment values estimated using direct and indirect methods in the proportion of 80:20 as follows:

Overall attainment value for PLO1 =
 $0.8 \times \text{average attainment value for PLO1 using direct method (from Table 4)} +$
 $0.2 \times \text{average response of outgoing students for PLO1}$
 Similarly, overall attainment value can be obtained for each PLO.

Table-8: Questionnaire for indirect measurement of PLO attainment (For outgoing students)

At the end of my degree programme I am able to do:

Programme Outcome			Please tick any one		
PLO1	Knowledge and Understanding	Demonstrate the fundamental and advanced knowledge of the subject and understanding of recent developments and issues, including methods and techniques, related to Library and Information Science.	3	2	1
PLO2	General Skills	Acquire the general skills required for performing and accomplishing the tasks as expected to be done by a skilled professional in the field of Library and Information Science.	3	2	1
PLO3	Technical/ Professional Skills	Demonstrate the learning of advanced cognitive technical/professional skills required for completing the specialized tasks related to the profession and for conducting and analyzing the relevant research tasks indifferent domains of Library and Information Science.	3	2	1
PLO4	Communication Skills	Effectively communicate the attained skills of Library and Information Science in well-structured and productive manner to the society at large.	3	2	1
PLO5	Application of Knowledge and Skills	Apply the acquired knowledge and skills to the problems in the subject area, and to identify and analyze the issues where the attained knowledge and skills can be applied by carrying out research investigations to formulate evidence-based solutions to complex and unpredictable problems associated with the field of Library and Information Science or otherwise.	3	2	1
PLO6	Critical thinking and Research Aptitude	Attain the capability of critical thinking in intra/inter-disciplinary areas of Library and Information Science enabling to formulate, synthesize, and articulate issues for designing of research proposals, testing hypotheses, and drawing inferences based on the analysis.	3	2	1
PLO7	Constitutional, Humanistic, Moral Values and Ethics	Know constitutional, humanistic, moral and ethical values, and intellectual property rights to become a scholar/professional with ingrained values in expanding knowledge for the society, and to avoid unethical practices such as fabrication, falsification	3	2	1

		or misrepresentation of data or committing plagiarism.			
PLO8	Capabilities/qualities and mindset	To exercise personal responsibility for the outputs of own work as well as of group/team and for managing complex and challenging work(s) that requires new/strategic approaches.	3	2	1
PLO9	Employability and job-ready skills	Attain the knowledge and skills required for increasing employment potential, adapting to the future work and responding to the rapidly changing demands of the employers/industry/society with time.	3	2	1
	3: Strongly Agree; 2: Agree; 1: Average				

Overall PLO attainment values can be written as shown **in the following Table-9:**

Table-9: Overall PLO attainment Values

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
Direct PLO attainment									
Indirect PLO attainment									
Overall PLO attainment									
Target	2	2	2	2	2	2	2	2	2

The overall PLO attainment values obtained above are compared with set target. The set target for each PLO may be different and will be finalized by the staff councils of the departments/institutes. If overall PLO attainment value is less than the set target value then an action plan may be prepared for improvement in the subsequent academic session.

The overall PLO attainment level based on CLO-PLO mapping values and overall CLO attainment values will be obtained in a similar manner.

Session 2025-2026			
Part-A Introduction			
Subject	Economics		
Semester	II		
Name of the Course	Economic Data Collection Methods		
Course Code	B25-SEC-231		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC	SEC		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	After completing this course, the learners will be able to: 1. Understand the fundamentals of data and its importance in economics 2. Identify different sources of economic data (primary and secondary) 3. Learn simple techniques to collect, classify, and present data 4. Gain hands-on exposure to basic tools and formats used in surveys and interviews 5. Develop skills to prepare simple economic questionnaires and data reports		
	5*.		
Credits: 3	Theory	Tutorial	Total
	03	0	03
Contact Hours	03	0	03
Max. Marks: 75 Internal Assessment Marks: 25 End Term Exam Marks: 50	Time: 3 Hrs		
Part-B Contents of the Course			
Instructions for Paper Setters			
1. Nine Questions will be set in all and students will be required to attempt 5 questions. 2. Question No. 1 will be compulsory and will consist of 4 short answer type questions of 2.5 marks spread over the entire syllabus (2.5*4=10 marks). 3. For the remaining four questions, students will attempt 1 out of 2 questions from each of the four units (10 marks each).			
Unit	Topics		Contact Hours
I	Introduction to Economic Data Meaning and types of data; importance of data in economics; primary and secondary data – distinction and examples; qualitative and quantitative data – features and uses; structured and unstructured data; basic concepts – population, sample, variable, unit of observation.		12

II	Sources and Types of Data Primary sources – surveys, interviews, focus group discussions, direct observation; secondary sources – Census, NSSO, RBI reports, Economic Survey, Budget documents; administrative records and official databases; introduction to online data portals such as MOSPI, World Bank, IMF; advantages and limitations of various data sources.	11
III	Methods of Primary Data Collection Steps in designing a simple questionnaire; modes of survey – personal interviews, telephone surveys, online forms; sampling methods – random sampling, stratified sampling, convenience sampling; pre-testing and pilot surveys; basics of fieldwork – planning, conduct, and ethical considerations.	11
IV	Presentation and Recording of Data Classification and tabulation of data; preparation of frequency tables; graphical presentation – bar charts, pie charts, line graphs; introduction to tally sheets and field registers; basics of MS Excel for data entry, sorting, and presentation; writing a simple data report based on collected information.	11
V*		
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 07 • Mid-Term Exam: 13 ➤ Practicum • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: • Mid-Term Exam:		End Term Examination: 50 Theory
Part-C Learning Resources		
Recommended Books/E-Resources/LMS: • Gupta, S. C., & Kapoor, V. K. (2020). Fundamentals of applied statistics (4th ed.). Sultan Chand & Sons. • Goon, A. M., Gupta, M. K., & Dasgupta, B. (2013). Fundamentals of statistics (Vol. 1). World Press. • Kothari, C. R., & Garg, G. (2019). Research methodology: Methods and techniques (4th ed.). New Age International. • Bajpai, N. (2011). Business research methods. Pearson Education India. • Ministry of Statistics and Programme Implementation. (2021). Basic statistics for Indian official statistics system. Government of India. • Ministry of Statistics and Programme Implementation (MOSPI). (n.d.). Official website. https://www.mospi.gov.in • Reserve Bank of India. Database on Indian Economy. https://dbie.rbi.org.in • National Sample Survey Office (NSSO). Reports and data. https://mospi.gov.in/national-sample-survey-office • World Bank. DataBank. https://databank.worldbank.org • IMF . Data and Statistics. https://www.imf.org/en/Data		

PartA– Introduction			
Subject	Economics		
Semester	III		
NameoftheCourse	Economics Using Excel		
CourseCode	B23-SEC- 332		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	SEC		
Levelofthecourse(Asper Annexure-I)	200-299		
Pre-requisiteforthecourse(ifany)	None		
CourseLearningOutcomes(CLO):	Aftercompletingthiscourse, thelearnerwill beableto: 1. Use Excel’s mathematical functions for economic calculations and data handling. 2. Apply Excel’s statistical functions for economic data analysis. 3. Utilize Excel’s financial functions for economic decision-making. 4. Develop custom formulae for economic modeling and decision-making. 5*.Apply Microsoft Excel tools, including mathematical, statistical, financial functions, and custom formulae, to analyze and visualize economic data for informed decision-making		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours/Week	2	2	4
Max. Marks:75 InternalAssessmentMarks: 20 (15 Theory+ 05 Practical) EndTermExamMarks: 55 (35 Theory+ 20 Practical)		Time: Theory- 3 Hours; Practical- 4 Hours	

PartB-Contentsof theCourse		
<u>InstructionsforPaper-Setter</u> The Paper-Setter shall set <i>nine</i> questions in all and the question paper shall be divided into two parts. Part ‘A’ shall comprises <i>seven</i> short answer type questions from the whole of the syllabus carrying one mark each, which shall be compulsory. Part ‘B’ shall comprise <i>eight</i> questions (<i>two</i> questions from each unit) carrying 07 marks each and the student will be required to attempt <i>four</i> questions selecting <i>one</i> question from each unit.		
Unit	Topics	Contact Hours
I	Introduction to Excel and Basic Mathematical Operations: Excel interface, cells, worksheets; arithmetic operators for economic data (e.g., price × quantity); Percentage and Growth Calculations ;Weighted Averages and Indices; Data Visualization with Mathematical Insights : Using charts (line, bar) to visualize mathematical results (e.g., economic growth trends).	07
II	Descriptive Statistics for Economic Data: Using AVERAGE, MEDIAN, MODE, STDEV for economic variables (e.g., income distribution); Frequency Distributions and Histograms : Creating frequency tables; using HISTOGRAM tool for economic data (e.g., sales distribution). Correlation Analysis in Economics : Using CORREL to study relationships (e.g., price vs. demand); interpreting coefficients. Conditional Statistical Analysis :Using COUNTIF, SUMIF for selective economic analysis (e.g., sales above a threshold).	07
III	Time Value of Money Concepts: Using FV, PV for economic decisions (e.g., savings, loans); understanding interest rates; Loan and Investment Analysis : Using PMT, IPMT for loan repayment schedules in economic contexts; Net Present Value and Investment Decisions : Using NPV, IRR for evaluating economic projects (e.g., infrastructure investments).	08
IV	Break-Even Analysis: Using financial functions and Goal Seek for break-even point calculations. Custom Formulae for Economic Metrics : Designing formulae for economic indicators (e.g., profit margin, elasticity). What-If Analysis for Economic Scenarios : Using Data Tables and	08

	Scenario Manager for economic planning (e.g., price change impacts); Economic Dashboards with Formulae : Combining formulae and charts for interactive economic reports.	
V*	Practicums ○ Creating a dataset for market prices and calculating total revenue. ○ Calculating annual inflation rates from price data. ○ Computing a weighted price index for a basket of goods. ○ Plotting GDP growth rates with trendlines. ○ Analyzing household expenditure data for central tendency and variability. ○ Visualizing consumer spending patterns by income groups. ○ Examining correlation between advertising spend and sales revenue. ○ Calculating total expenditure for specific product categories. ○ Calculating future value of an investment with compound interest. ○ Designing a loan amortization table for a small business. ○ Assessing profitability of a business project using NPV. ○ Determining break-even sales for a business. ○ Calculating price elasticity of demand using custom formulae. ○ Summarizing export data by product and region. ○ Practical: Building a dashboard for inflation and unemployment trends.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory 15 ● Class Participation: 04 ● Seminar/presentation/assignment/quiz/class test etc.: 04 ● Mid-Term Exam: 07 ➤ Practicum 05 ● Class Participation: ● Seminar/Demonstration/Viva-voce/Lab records etc.: 05 ● Mid-Term Exam: NA		End Term Examination: 55 (35 Theory + 15 Practical)
Part C - Learning Resources		

Recommended Books/e-resources/LMS:

1. Microsoft Excel (latest version or compatible).
2. Online tutorials: Microsoft Excel Support, Coursera (Excel for beginners).
3. Book: *Excel 2019 for Economic Analysis* or similar beginner-friendly guides.
4. Economic datasets from open sources (e.g., World Bank, RBI).

Session 2025-2026			
Part-A Introduction			
Subject	Economics		
Semester	IV		
Name of the Course	Understanding Economic Survey and Budget		
Course Code	B25-SEC-407		
Course Type: (CC/MCC/MDC/ CCM/ DSEC/VOC/DSE/PC/AEC/ VAC	SEC		
Level of the course (As per Annexure-I)	Intermediate		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	After completing this course, the learners will be able to: 1. Understand Core Fiscal Concepts 2. Interpret Budget and Survey Documents 3. Analyze Government Priorities and Policy Impact 4. Engage in Informed Policy Discussions 5*.		
Credits	Theory	Tutorial	Total
	2	0	2
Contact Hours /Week	2	0	2
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35			
Part-B Contents of the Course			
Instructions for Paper Setters			
The Paper-Setter shall set nine questions in all and the question paper shall be divided into two parts. Part ‘A’ shall comprise four short answer type questions from the whole of the syllabus carrying 1.75 marks each, which shall be compulsory. Part ‘B’ shall comprise eight questions (two questions from each unit) carrying 7 marks each and the student will be required to attempt four questions selecting one question from each unit.			
Unit	Topics	Contact Hours	
I	Basic Concepts of Economic Survey Meaning and purpose of the Economic Survey; Role of Economic Survey in policymaking and budget preparation; Institutions responsible for preparing the Economic Survey; Key macroeconomic concepts: Gross Domestic Product (GDP): Real vs. Nominal, Inflation, Fiscal Deficit, Current Account Deficit, Public Debt, Unemployment and Employment Trends.	8	
II	Economic Survey – Structure and Highlights Structure and chapter-wise layout of the Economic Survey; Sectoral performance overview: Agriculture, Industry, Services, Infrastructure, Social development; Policy	7	

	recommendations and their intended economic impact. (Previous Fiscal Year Economic Survey)	
III	Basic Concepts Related to Union Budget Definition and objectives of the Union Budget; Constitutional provisions and the budget-making process; Classification of government receipts: Tax Revenue (Direct & Indirect Taxes), Non-Tax Revenue; Classification of government expenditure: Revenue Expenditure, Capital Expenditure; Key fiscal concepts: Budget Deficit, Revenue Deficit, Primary Deficit.	8
IV	Union Budget – Structure and Key Highlights Structure and components of the Union Budget; Sector-wise allocations and expenditure priorities: Education, Health, Agriculture, Defence, Infrastructure; Major schemes and reforms announced in the latest budget. (Previous Fiscal Year Union Budget)	7
Suggested Evaluation Methods		
Internal Assessment: 30 ➤ Theory • Class Participation :4 • Seminar/Presentation/Assignment/Quiz/Class Test etc. :4 • Mid Term Exam :7 ➤ Practicum • Class Participation • Seminar/Demonstration/Viva Voce/Lab Records etc. • Mid Term Exam:		End Term Examination: 35
Part-C Learning Resources		
Recommended Books/E-Resources/LMS: 1. The Key to Budget Documents, available at: https://www.indiabudget.gov.in/doc/Key to Budget Document 2023.pdf 2. Budget at a Glance, available at: https://www.indiabudget.gov.in/doc/Budget_at_Glance/budget_at_a_glance.pdf 3. Let's Talk About Budget. Centre for Budget and Governance Accountability. Chapters 4 to 6. Union Budget of India, Making of Union Budget, What does Union Budget papers look like? This text can be downloaded from PRIMER-1-FIN.pdf (cbgaindia.org). De-emphasize pages: Pg 29 (Chapter 4 Plan and Non-plan Expenditure) and 37 (Preparation of Union Budget Section) 4. Dipak Dasgupta and Supriyo De (2012), "Fiscal Deficit", in Basu and Maertens. https://dea.gov.in/sites/default/files/FPI_trends_Trajectory.pdf		

5. Y V Reddy (2015), “Continuity, Change and The Way Forward: Fourteenth Finance Commission”, EPW Vol. 50, Issue No. 21, 23 May 2015. (Pg.27-31, Subpoint 1-9)
6. Chakraborty, Lekha (2019) “Indian Fiscal Federalism at the Crossroads: Some Reflections”, NIPFP working paper no 260 available at: https://www.nipfp.org.in/media/medialibrary/2019/05/WP_260_2019.pdf
7. The Fifteenth Finance Commission (FFC) Report for the Year 2021-26 Chapter 1 titled “Introduction” available at: <https://fincomindia.nic.in/ShowContent.aspx?uid1=3&uid2=0&uid3=0&uid4=0>
8. [Economic Survey](https://www.indiabudget.gov.in/economicsurvey) :<https://www.indiabudget.gov.in/economicsurvey>
9. Singh, R. *Indian economy*. McGraw Hill Education (India) Private Limited. (Latest Edition)

Session 2025-2026			
Part-A Introduction			
Subject	Economics		
Semester	III		
Name of the Course	Indices in Economic Analysis		
Course Code	B25-VOC-143		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/ VAC	VOC		
Level of the course (As per Annexure-I)			
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	After completing this course, the learners will be able to: 1. Ability to analyse index numbers 2. Understand the types of indices 3. Apply the concept of index numbers 4. Develop proficiency for analyzing economy through the lense of index numbers		
	5*.		
Credits	Theory	Tutorial	Total
	03	1	04
Contact Hours	03	1	04
Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70	Time: 3 Hrs		
Part-B Contents of the Course			
Instructions for Paper Setters			
1. Nine Questions will be set in all and students will be required to attempt 5 questions. 2. Question No. 1 will be compulsory and will consist of 7 short answer type questions of 2 marks spread over the entire syllabus (2*7=14 marks). 3. For the remaining four questions, students will attempt 1 out of 2 questions from each of the four units (14 marks each).			
Unit	Topics	Contact Hours	
I	Introduction to Indices -Definition and Purpose of Index Numbers; Types of indices: Price, Quantity, Value, Volume; Uses in economic policy and business decision-making, Limitations of index numbers	15	
II	Methods of Index Number Construction - Laspeyres, Paasche, Fisher’s Ideal Index; Tests of Adequacy: Time Reversal and Factor Reversal Tests; Base shifting, splicing, and deflating techniques	15	
III	Meaning, indicators and uses of WPI, CPI(R), CPI(U), CPI(COMBINED), CPI(IW), IIP,SENSEX, NIFTY	15	

IV	Meaning, indicators and uses of International indices(HDI, Inequality adjusted IHDI, Gender Inequality Index,) and indices by NITI Aayog(Multi Dimentional Poverty Index, State Health Index, India Innovation Index, State Energy Index, Export Preparedness Index)	
V*		
Suggested Evaluation Methods		
Internal Assessment: 30 ➤ Theory (All these activities will be covered under Tutorials. Approximate contact Hours =15) Class Participation:5 Seminar/Presentation/Assignment/Quiz/Class Test etc.:10 Mid Term Exam:15 ➤ Practicum Class Participation Seminar/Demonstration/Viva Voce/Lab Records etc. Mid Term Exam:		End Term Examination:70 Theory
Part-C Learning Resources		
Recommended Books/E-Resources/LMS: • R.G.D. Allen – Index Numbers in Theory and Practice • V.K. Kapoor & S.C. Gupta – Fundamentals of Applied Statistics • Government of India – Manual on Consumer Price Index (Labour Bureau, MOSPI) • UNDP and IMF Statistical Manuals • www.mospi.gov.in • www.rbi.org.in • www.data.gov.in • www.worldbank.org		

Session 2025-2026			
Part-A Introduction			
Subject	Economics		
Semester	IV		
Name of the Course	Understanding Economic Policy		
Course Code	B25-VOC-241		
Course Type: (CC/MCC/MDC/CCM/ DSEC/VOC/DSE/PC/AEC/ VAC	VOC		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	After completing this course, the learners will be able to: 1. Understand meaning and objectives of Economic Policy. 2. Analyze government policy responses. 3. Evaluate policy outcomes using data and theory. 4. Understand major Economic Policy domains of India. 5*.		
Credits	Theory	Tutorial	Total
	03	1	04
Contact Hours	03	1	04
Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70	Time: 3 Hrs.		
Part-B Contents of the Course			
Instructions for Paper Setters 1. Nine Questions will be set in all and students will be required to attempt 5 questions. 2. Question No. 1 will be compulsory and will consist of 7 short answer type questions of 2 marks spread over the entire syllabus (2*7=14 marks). 3. For the remaining four questions, students will attempt 1 out of 2 questions from each of the four units (14 marks each).			
Unit	Topics	Contact Hours	
I	Introduction to Economic Policy, Scope and objectives of Economic Policies , Need and Role of the state in economic development, Types of Economic policies: Fiscal, Monetary, Trade, Industrial, Agriculture, Indian Economic policy of 1990.	15	
II	Fiscal Policy in India, Public expenditure and taxation trends, Fiscal deficit and public debt, Centre-state financial relations, Fiscal Responsibility and Budget Management (FRBM) Act, Gender budgeting.	15	

III	Monetary and Financial Policy, Role of RBI: Monetary policy tools and objectives, Inflation targeting, Banking sector reforms (e.g., NPA crisis, recapitalization), Financial inclusion.	15
IV	Industrial policy in India since Independence, Make in India, Start-Up India, Industrial growth trends and challenges, Corporate Social Responsibility(CSR), Agriculture Policy Vision, Minimum Support Price, Public Distribution System (PDS).	15
V*		
Suggested Evaluation Methods		
Internal Assessment: 30 ➤ Theory (All these activities will be covered under Tutorials. Approximate contact Hours =15) Class Participation :5 Seminar/Presentation/Assignment/Quiz/Class Test etc. :10 Mid Term Exam :15 ➤ Practicum Class Participation Seminar/Demonstration/Viva Voce/Lab Records etc. Mid Term Exam:		End Term Examination:70 Theory
Part-C Learning Resources		
Recommended Books/E-Resources/LMS: • Kapila, U. (2023). Indian economy: Performance and policies (27th ed.). Academic Foundation. • Mishra, S. K., & Puri, V. K. (2024). Indian economy (41st ed.). Himalaya Publishing House. • Dutt, R., & Sundaram, K. P. M. (2023). Indian economy (74th ed.). S. Chand Publishing. • Jalan, B. (1996). India's economic policy: Preparing for the twenty-first century. Penguin Books India. • Ministry of Finance, Government of India. (Annual). Economic Survey of India. (https://www.indiabudget.gov.in/) • Ministry of Finance, Government of India. (Annual). Union Budget documents. (https://www.indiabudget.gov.in/) • Reserve Bank of India (RBI). (Annual). RBI Annual Reports and Monetary Policy Statements. https://www.rbi.org.in/ • NITI Aayog. (Various years). Planning and policy reports. https://niti.gov.in/		

Session 2025-2026			
Part-A Introduction			
Subject	Economics		
Semester	VI		
Name of the Course	Financial Literacy and Household Economics		
Course Code	B25-VOC-342		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC	VOC		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	After completing this course, the learners will be able to: 1. Ability to analyse banking and insurance products 2. Understand the digital financial products 3. Apply the concept of investment planning 4. Develop proficiency for personal and family financial planning		
	5*.		
Credits	Theory	Tutorial	Total
	03	1	04
Contact Hours	03	1	04
Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70	Time: 3 Hrs		
Part-B Contents of the Course			
Instructions for Paper Setters			
1. Nine Questions will be set in all and students will be required to attempt 5 questions. 2. Question No. 1 will be compulsory and will consist of 7 short answer type questions of 2 marks spread over the entire syllabus (2*7=14 marks). 3. For the remaining four questions, students will attempt 1 out of 2 questions from each of the four units (14 marks each).			
Unit	Topics		Contact Hours
I	Introduction to Savings and Investments; Time value of money- Discounting and Compounding; Banking products and services – Deposits and Loans		15
II	Digitisation of financial transactions: Debit Cards {ATM Cards} and Credit Cards., Net banking and UPI, digital wallets; Security and precautions against Ponzi schemes and online frauds		15
III	Investment Products: Equities, Bonds, Mutual Funds; Exchange Traded Funds; Commodities; Hedge Funds; Private Equity; Crypto Currencies		15
IV	Insurance Products: Life Insurance; Health Insurance; Property and casualty Insurance; Disability Insurance; Annuities; Latest personal Income Tax structure		15
V*			

Suggested Evaluation Methods	
Internal Assessment: 30 ➤ Theory (All these activities will be covered under Tutorials. Approximate contact Hours =15) - Class Participation :5 - Seminar/Presentation/Assignment/Quiz/Class Test etc. :10 - Mid Term Exam :15 ➤ Practicum - Class Participation - Seminar/Demonstration/Viva Voce/Lab Records etc. - Mid Term Exam:	End Term Examination:70 Theory
Part-C Learning Resources	
Recommended Books/E-Resources/LMS: • Introduction to Financial Planning (4th Edition 2017)- Indian Institute of Banking 27 & Finance. • Sinha, Madhu. Financial Planning: A Ready Reckoner July 2017, McGraw Hill. Suggested readings • Halan, Monika, Lets Talk Money: You've Worked Hard for It, Now Make It Work for You, July 2018 Harper Business. • Pandit, Amar The Only Financial Planning Book that You Will Ever Need, Network 18 Publications Ltd.	

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समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Scheme of Examination for Under-Graduate Programmes
Bachelor of Computer Applications (Industry-Linked Program)

SCHEME D

according to

Curriculum Framework for Under-Graduate Programmes

As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

(For the Batches Admitted From 2025-2026)

Program Learning Outcomes (PLOs)

1. Domain Knowledge & Technical Proficiency

- i. Apply core knowledge of computer science and software development to solve real-world problems.
- ii. Demonstrate proficiency in programming languages, database systems, web technologies, and software tools.
- iii. Develop applications using modern software development frameworks and tools.

2. Work-Based Learning & Industry Exposure

- i. Gain hands-on experience through on-the-job training in live industrial environments.
- ii. Demonstrate understanding of workplace expectations, professional behavior, and organizational structure.
- iii. Translate classroom concepts into practical deliverables in a professional setting.

3. Critical Thinking & Problem Solving

- i. Analyze complex computing problems and apply logical reasoning and algorithmic thinking for solutions.
- ii. Employ debugging, testing, and optimization strategies to improve software performance.

4. Communication and Teamwork

- i. Communicate effectively in both written and oral forms in academic and workplace settings.
- ii. Collaborate in teams and interdisciplinary environments, demonstrating interpersonal skills and conflict resolution.

5. Apprenticeship-Based Learning Outcomes

- i. Reflect measurable growth in workplace competencies, productivity, and workplace readiness through formal apprenticeship assessments.
- ii. Demonstrate the ability to assimilate feedback, maintain logs, and submit detailed training reports for performance evaluation.

Kurukshetra University Kurukshetra
Scheme of Examination for Undergraduate programmes
Subject: BCA (Industry-Linked Program)
According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)

Semester	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs)
1	CC-A1	B25-CIL-101	Computer Fundamentals & Problem Solving using Python	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC-B1	B25-CIL-102	Introduction to Web Technologies	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC-C1	B25-CIL-103	Linux and Shell Programming	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC-M1	B25-CIL-104	Introduction to Data Science	1	1	10	20	30	3
			Practical	1	2	5	15	20	3
	MDC1	B25-CIL-105/ To be taken from other Dept.	Introduction to Statistics	2	2	15	35	50	3
			Practical	1	2	5	20	25	3
2	SEC1	To be taken from SEC Pool		3					
	VAC1	To be taken from VAC Pool		2					
	AEC1	To be taken from AEC Pool		2					
	CC-A2	B25-CIL-201	Programming in C	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC-B2	B25-CIL-202	Front End Engineering	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC-C2	B25-CIL-203	Database Management Systems	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC-M2	B25-CIL-204	Data Analytic using Python	1	1	10	20	30	3
			Practical	1	2	5	15	20	3
	MDC-2	B25-CIL-205/ To be taken from other department	Mathematics for Data Science	2	2	15	35	50	3
			Practical	1	2	5	20	25	3
	SEC-2	To be taken from SEC Pool		3					
	VAC-2	To be taken from VAC Pool		2					
	AEC-2	To be taken from AEC Pool		2					

3	CC-A3	B25-CIL-301	Data Structures	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC-B3	B25-CIL-302	Back End Engineering	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC-C3	B25-CIL-303	Cloud Computing	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC-M3	B25-CIL-304	Data Visualization	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
4	MDC-3	B25-CIL-305/ To be taken from other department	Design Thinking and Innovation	2	2	15	35	50	3
			Practical	1	2	5	20	25	3
	SEC-3	To be taken from SEC Pool		3					
	AEC-3	To be taken from AEC Pool		2					
	CC -A4	B25 -CIL-401	Artificial Intelligence and Machine Learning	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC -B4	B25 -CIL-402	Front End Frameworks	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	CC -C4	B25 -CIL-403	Mobile Application Development	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
	AEC - 4	To be taken from AEC Pool		2					
	VAC - 3	To be taken from VAC Pool		2					
	CC - M4(V)	B25 -CIL-404/ To be taken from VOC Pool	AI for Data Science	2	2	15	35	50	3
			Practical	2	4	15	35	50	3
						A [#]	B [#]	C [#]	D [#]
	5		Apprenticeship	20	600	125	125	250	500
	6		Apprenticeship	20	600	125	125	250	500

A[#] Marks by establishment.

B[#] Marks by faculty mentor.

C[#] Marks through Presentation/Viva-Voce.

D[#] (Total Marks) = A + B + C

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Scheme of Examination for Under-Graduate Programmes
Bachelor of Computer Applications (Industry-Linked Program)

SCHEME D

according to

Curriculum Framework for Under-Graduate Programmes

As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

(For the Batches Admitted From 2025-2026)

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	BCA (Industry-Linked Program)		
Semester	1 st		
Name of the Course	Computer Fundamentals & Problem Solving using Python		
Course Code	B25-CIL-101		
Course Type	CC-A1		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	-		
Course Objectives	This course is designed to introduce students—regardless of their prior experience with computers—to the foundational concepts of computing and the basics of programming using Python. It aims to build a strong understanding of computer organization, data representation, and problem-solving strategies. The course further introduces Python as a beginner-friendly high-level programming language to implement algorithmic solutions, enabling students to develop logical thinking and structured programming skills essential for application development in various domains.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO I: Students will understand the working and organization of computer systems and represent data in various number systems. CLO II: Students will be able to analyze problems and write structured algorithms and pseudocode to solve them using Python. CLO III: Students will apply control structures, functions, and string operations effectively in Python programs. CLO IV: Students will manipulate data using Python's built-in data structures. CLO V: Apply problem-solving skills to design, code, test, and debug simple Python programs using appropriate programming constructs, data structures, and logic to solve real-world computational problems.		
Credits	Theory	Practical	Total
	2	2	4
Teaching Hours per week	2	4	6
Internal Assessment Marks	15	15	30
End Term Exam Marks	35	35	70
Max. Marks	50	50	100
Examination Time	3 hours	3 hours	

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit I to IV and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Components of a computer system: CPU, memory, input and output devices. Types of software: system software, application software, and utility software. Introduction to operating systems: functions, types of operating system. Data representation: number systems (binary, octal, decimal, hexadecimal), conversions and binary arithmetic (addition, subtraction using 1's and 2's complement). Concept of logic gates and truth tables.	7
II	Problem-solving concepts, algorithms, flowcharts, and pseudocode. Characteristics of a good program. Introduction to programming languages: machine, assembly, and high-level languages. Compiler vs interpreter. Basics of Python: features, Python IDEs. Writing first Python program. Python syntax and indentation, variables and data types, type casting, input/output operations.	8
III	Operators in Python: arithmetic, relational, logical, assignment, membership, identity, and bitwise. Conditional control structures: if, if-else, nested if-else, match-case. Looping	7

	structures: while, for, nested loops, break and continue. Python functions: defining and calling functions, arguments and return values, built-in functions, scope of variables. String handling: string operations, string methods, formatting strings.	
IV	Lists: creation, indexing, slicing, updating, list methods (append(), insert(), remove(), pop(), sort(), reverse()), list iteration, nested lists; Tuples: creation, indexing, slicing, immutability, tuple operations, packing and unpacking. Dictionaries: creating, accessing, updating key-value pairs, dictionary methods (get(), items(), keys(), values(), update(), pop()), nested dictionaries; Sets: creation, adding/removing elements, set operations (union, intersection, difference), removing duplicates.	8
V	Practical exercises based on Units I–IV covering problem-solving, algorithm design, and implementation of Python programs using control structures, functions, and data structures. Students will develop small applications to demonstrate data representation, logic operations, and manipulation of strings, lists, tuples, dictionaries, and sets.	60
Total Contact Hours		90
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
Theory	15	Theory 35
Class Participation/ Seminar/ presentation/ assignment/ quiz/ class test etc.:	5	Written Examination
Mid-Term Exam:	10	
Practical	15	Practical 35
Class Participation/ Seminar/ presentation/ assignment/ quiz/ class test etc.:	5	Practical Examination
Mid-Term Exam:	10	
Part C-Learning Resources		
Reference Books		
1) Reema Thareja, Python Programming: Using Problem Solving Approach, Oxford University Press, 2017.		
2) Yashavant Kanetkar, Let Us Python, BPB Publications, Latest Edition.		
3) R.S. Salaria, Problem Solving and Programming in Python, Khanna Publishing, 2020.		
4) Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.		
5) Charles Severance, Python for Everybody: Exploring Data Using Python 3, CreateSpace Independent Publishing, 2016. (Also available as a free online resource)		

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	BCA (Industry-Linked Program)
Semester	1 st
Name of the Course	Introduction to Web Technologies
Course Code	B25-CIL-102
Course Type	CC-B1
Level of the course (As per Annexure-I)	100-199
Pre-requisite for the course (if any)	-

Course Objectives

This course is designed to introduce students to the fundamentals of web technologies. It serves as the foundation for understanding how the web works, including basic concepts of the internet, websites, domain names, hosting, and web protocols. The course covers essential web markup technologies such as HTML and CSS to help students structure and style web pages. Special emphasis is given to equipping beginners with the skills to build simple static websites, paving the way for more advanced web development topics like front-end engineering, back-end development, and frameworks in subsequent semesters.

Course Learning Outcomes (CLO)
After completing this course, the learner will be able to:

CLO I: Students will understand the foundational concepts of how the web and internet function, including protocols, domains, and hosting.
CLO II: Students will be able to create structured web pages using HTML elements including text, images, links, tables, and forms.
CLO III: Students will apply CSS rules to style web pages and enhance the visual presentation using layout techniques.
CLO IV: Students will organize and deploy a basic static website and demonstrate awareness of future web development technologies and practices.
CLO V: Students will be able to design and publish responsive static web pages using HTML and CSS, demonstrating effective use of structure, styling, and interactive elements.

Credits	Theory	Practical	Total
	2	2	4
Teaching Hours per week	2	4	6
Internal Assessment Marks	15	15	30
End Term Exam Marks	35	35	70
Max. Marks	50	50	100
Examination Time	3 hours	3 hours	

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit I to IV and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	History and evolution of the World Wide Web. Basics of Internet technologies: IP address, DNS, URL, HTTP/HTTPS, FTP. Difference between the Internet, Intranet, and Extranet. Web servers and hosting: domain registration, web hosting types, HTTP requests and responses. Introduction to browsers, search engines, and the client-server model.	8
II	Structure of an HTML document: DOCTYPE, html, head, body tags. Text formatting tags: headings, paragraphs, bold, italic, underline, superscript and subscript. Working with hyperlinks, images, lists. Tables in HTML: structure, merging rows and columns, table headers. Forms: input elements, labels, fieldsets, text area, dropdowns, radio buttons, checkboxes, buttons, and submitting forms.	7
III	CSS: Separation of content and design. Types of CSS: inline, internal, external. CSS syntax: selectors, properties, and values. Common CSS properties: colors, fonts, text alignment,	8

	borders, backgrounds, margins and padding. CSS box model and its components. Introduction to layout techniques: flexbox and grid. Applying CSS to HTML elements and building simple styled web pages.	
IV	Planning and organizing a basic website: folder structure, naming conventions, linking multiple HTML files. Introduction to responsive design. Steps to publish a static website. Overview of web accessibility and ethical issues in web development. Introduction to web development workflows: editors, file naming conventions, and previewing in browser.	7
V	Practical exercises based on Units I–IV involving the creation of structured HTML pages with applied CSS styling and layout techniques. Students will design, organize, and publish simple responsive static websites demonstrating the use of hyperlinks, forms, tables, and multimedia elements.	60
Total Contact Hours		90
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
Theory	15	Theory35
Class Participation/ Seminar/ presentation/ assignment/ quiz/ class test etc.:	5	Written Examination
Mid-Term Exam:	10	
Practical	15	Practical35
Class Participation/ Seminar/ presentation/ assignment/ quiz/ class test etc.:	5	Practical Examination
Mid-Term Exam:	10	
Part C-Learning Resources		
Reference Books		
1) Thomas A. Powell, HTML and CSS: The Complete Reference, McGraw-Hill Education, 5th Edition.		
2) Jon Duckett, HTML and CSS: Design and Build Websites, Wiley, Latest Edition.		
3) Robin Nixon, Learning PHP, MySQL & JavaScript with HTML5, CSS3 & jQuery, O'Reilly, 5th Edition (for extended reference).		
4) Achyut Godbole & Atul Kahate, Web Technologies: TCP/IP to Internet Application Architectures, McGraw-Hill Education.		
5) Ivan Bayross, Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl and CGI, BPB Publications.		

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	BCA (Industry-Linked Program)		
Semester	1 st		
Name of the Course	Linux and Shell Programming		
Course Code	B25-CIL-103		
Course Type	CC-C1		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	-		
Course Objectives	This course is designed to introduce students to the fundamentals of the Linux operating system and the essentials of shell scripting. It begins with the architecture and basic commands of Linux, empowering students to navigate and manipulate the Linux file system. The course further develops proficiency in using the command-line interface, understanding file permissions, and executing basic administrative tasks. The latter part of the course focuses on shell scripting using the Bash shell to automate routine tasks and enhance system functionality. Students will develop practical skills in handling files, processes, and control structures in scripts—building a strong foundation for advanced system administration and programming.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO I: Students will understand the structure and philosophy of Linux and be able to perform basic operations in a Linux environment. CLO II: Students will manage files, directories, and permissions effectively using command-line tools. CLO III: Students will monitor and control processes and user accounts using administrative commands. CLO IV: Students will write basic Bash scripts to automate system tasks and solve practical problems. CLO V: Students will be able to apply Linux commands and shell scripting techniques to automate system tasks and manage files, processes, and users efficiently.		
Credits	Theory	Practical	Total
	2	2	4
Teaching Hours per week	2	4	6
Internal Assessment Marks	15	15	30
End Term Exam Marks	35	35	70
Max. Marks	50	50	100
Examination Time	3 hours	3 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit I to IV and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Overview and features of Linux, comparison with other operating systems, Linux architecture and kernel, system startup process. Introduction to Linux distributions, desktop environments, and shells. Linux file system hierarchy, standard directories and file naming conventions. Basic Linux commands: login, logout, date, cal, clear, man, echo, passwd. Using text editors: vi and gedit. Understanding user types: root, regular user, guest.		8
II	Creating and managing files and directories using commands like ls, cd, mkdir, rmdir, touch, cp, mv, rm, and cat. File viewing commands: more, less, head, tail. File permissions and ownership: chmod, chown, chgrp. File compression and archiving: gzip, tar, zip, unzip. Understanding absolute and relative paths. Wildcards, filters and redirection: >, >>, <, , tee. Working with locate, find and grep commands.		7

III	Understanding processes: foreground and background processes, viewing and managing processes using ps, top, kill, nice, and jobs. Introduction to process IDs and signals. Creating and managing users and groups: useradd, userdel, usermod, groupadd. Switching users and setting passwords. Understanding login shells and environment variables. Introduction to disk usage commands: df, du, mount, umount.	8
IV	Introduction to shell scripting, creating and executing shell scripts. Shell variables, command substitution, quoting, and comments. Input and output in shell. Decision-making using if, if-else, nested if, case. Looping constructs: while, until, for loops. Break and continue statements. Functions in shell scripts. Script examples: backups, batch renaming, automation tasks.	7
V	Practical exercises based on Units I–IV involving the use of basic and advanced Linux commands, file and process management, and user administration. Students will write and execute shell scripts for automation tasks such as backups, file operations, and system monitoring, demonstrating command-line proficiency and scripting logic.	60
Total Contact Hours		90
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
Theory	15	Theory 35
Class Participation/ Seminar/ presentation/ assignment/ quiz/ class test etc.:	5	Written Examination
Mid-Term Exam:	10	
Practical	15	Practical 35
Class Participation/ Seminar/ presentation/ assignment/ quiz/ class test etc.:	5	Practical Examination
Mid-Term Exam:	10	
Part C-Learning Resources		
Reference Books		
1) Richard Blum, Linux Command Line and Shell Scripting Bible, Wiley, 4th Edition.		
2) Neil Matthew and Richard Stones, Beginning Linux Programming, Wrox, 4th Edition.		
3) Sumitabha Das, Unix Concepts and Applications, McGraw-Hill Education, 4th Edition.		
4) Machtelt Garrels, Introduction to Linux: A Hands-on Guide, FOSS Publication, Latest Edition. (Free resource)		
5) Christine Bresnahan and Richard Blum, Linux Essentials, Wiley, 2nd Edition.		

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	BCA (Industry-Linked Program)		
Semester	1 st		
Name of the Course	Introduction to Data Science		
Course Code	B25-CIL-104		
Course Type	CC-M1		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	-		
Course Objectives	This course aims to introduce students to the conceptual foundations of data science and its role in modern decision-making. It focuses on familiarizing students with the data science process, types and sources of data, data collection and preparation techniques, and the ethical and professional responsibilities associated with data use. While avoiding statistical depth, the course incorporates introductory-level exposure to R as a tool for data access and manipulation, enabling students to begin thinking computationally about data and laying the groundwork for future studies in analytics and machine learning.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO I: Students will understand the purpose, process, and scope of data science and gain familiarity with basic data types and R environment. CLO II: Students will identify different data sources and demonstrate how to import and inspect data using R. CLO III: Students will perform basic data cleaning and preparation tasks using R, enabling further analysis in later courses. CLO IV: Students will explain ethical considerations in the data science process and identify career and learning opportunities in the field. CLO V: Students will be able to apply Python libraries to handle, clean, and analyze real-world datasets, demonstrating practical understanding of the data science life cycle.		
Credits	Theory	Practical	Total
	1	1	2
Teaching Hours per week	1	2	3
Internal Assessment Marks	10	5	15
End Term Exam Marks	20	15	35
Max. Marks	30	20	50
Examination Time	3 hours	3 hours	

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit I to IV and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Introduction to Data Science; Evolution and applications of Data Science; Data Science life cycle; Roles of a Data Scientist; Types of data: structured, semi-structured, unstructured; Data collection methods and data sources; Overview of real-world data sets and problem-solving using data.	4
II	Introduction to NumPy; Creation of arrays using NumPy; Array indexing and slicing; Array attributes and methods; Mathematical operations on arrays; Array broadcasting; Working with multidimensional arrays; Aggregations and statistical functions; NumPy for linear algebra operations.	3
III	Introduction to pandas; Series and DataFrame objects; Creating and loading data into pandas structures; DataFrame indexing and slicing; Data selection and filtering; Adding and deleting columns; Basic operations on DataFrames; Iterating over data frames.	4

IV	Data cleaning and preprocessing using pandas; Handling missing data; Merging, joining, and concatenating DataFrames; GroupBy operations; Basic descriptive statistics using pandas; Data summarization;	4	
V	Practical exercises based on Units I–IV involving data handling, manipulation, and preprocessing using Python libraries such as NumPy and pandas. Students will work with real-world datasets to perform data loading, cleaning, transformation, and basic statistical analysis, demonstrating the complete workflow of the data science life cycle.	30	
Total Contact Hours		45	
Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
Theory	10	Theory	20
Class Participation/ Seminar/ presentation/ assignment/ quiz/ class test etc.:	5	Written Examination	
Mid-Term Exam:	5		
Practical	5	Practical	15
Mid-Term Exam:	5	Practical Examination	
Part C-Learning Resources			
Reference Books			
1) Wes McKinney, Python for Data Analysis, O’Reilly Media, 2nd Edition, 2018.			
2) Joel Grus, Data Science from Scratch: First Principles with Python, O’Reilly Media, 2nd Edition, 2019.			
3) Allen B. Downey, Think Stats: Probability and Statistics for Programmers, O’Reilly Media, 2nd Edition, 2014.			
4) Peter Bruce, Andrew Bruce, and Peter Gedeck, Practical Statistics for Data Scientists, O’Reilly Media, 2nd Edition, 2020.			
5) Stefanie Molin, Hands-On Data Analysis with Pandas, Packt Publishing, 2nd Edition, 2021.			

With effect from the Session: 2024-25**Part A - Introduction**

Name of the Programme	BCA (Industry-Linked Program)		
Semester	1 st		
Name of the Course	Introduction to Statistics		
Course Code	B25-CIL-105		
Course Type	MDC1		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	-		
Course Objectives	This course introduces students to the foundational concepts of descriptive and inferential statistics. It equips learners with skills to summarize, interpret, and analyze numerical data effectively. Through structured understanding of measures of central tendency, dispersion, correlation, and probability, students develop the statistical literacy needed for data-informed thinking. Without involving any programming or software, the course emphasizes manual calculation, tabular analysis, and logical reasoning. It is designed to provide a strong conceptual base that students can apply in business, computer science, and data-oriented fields.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO I: Students will understand different types of data and sampling methods and organize raw data into tabular and categorical formats. CLO II: Students will compute and interpret various measures of central tendency for given datasets and understand their comparative strengths. CLO III: Students will analyze data variability using standard measures of dispersion and explain the distribution's shape through skewness. CLO IV: Students will estimate relationships between variables using correlation and regression and apply basic probability rules in practical contexts. CLO V: Students will be able to apply statistical methods using digital tools to analyze, interpret, and visualize data for informed decision-making.		
Credits	Theory	Practical	Total
	2	1	3
Teaching Hours per week	2	2	4
Internal Assessment Marks	15	5	20
End Term Exam Marks	35	20	55
Max. Marks	50	25	75
Examination Time	3 hours	3 hours	

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit I to IV and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	Definition, scope, and importance of statistics in decision making. Types of statistics: descriptive and inferential. Types of data: qualitative vs. quantitative, discrete vs. continuous. Levels of measurement: nominal, ordinal, interval, ratio. Methods of data collection and sampling techniques: random, stratified, systematic. Frequency distribution and tabulation.	7
II	Introduction and importance of central tendency. Mean (arithmetic, weighted), median, and mode for ungrouped and grouped data. Properties and merits/demerits of each measure. Comparison of mean, median, and mode. Use cases in business, computer applications, and social studies.	8
III	Concept of dispersion and variability. Range, quartile deviation, mean deviation, and standard deviation. Coefficient of variation and its applications. Concept of skewness:	7

	positive and negative skewness, Karl Pearson’s and Bowley’s methods.		
IV	Meaning and types of correlation: positive, negative, and zero. Karl Pearson’s coefficient of correlation and Spearman’s rank correlation. Introduction to linear regression: regression lines and their interpretation. Concept of probability: random experiment, event, sample space. Basic rules of probability (addition and multiplication). Concept of conditional probability.		8
V	Practical exercises based on Units I–IV involving data collection, tabulation, and computation of statistical measures using spreadsheet tools or statistical software. Students will perform calculations of central tendency, dispersion, correlation, and regression, and interpret results for data-driven decision-making. Hands-on activities will also include visualization of data through charts and frequency distributions.		30
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
Theory	15	Theory	35
Class Participation/ Seminar/ presentation/ assignment/ quiz/ class test etc.:	5	Written Examination	
Mid-Term Exam:	10		
Practical	5	Practical	20
Class Participation/ Seminar/ presentation/ assignment/ quiz/ class test etc.:	5	Practical Examination	
Part C-Learning Resources			
Reference Books			
1) S. P. Gupta, <i>Statistical Methods</i> , Sultan Chand & Sons, Latest Edition.			
2) R.S. Bhardwaj, <i>Business Statistics</i> , Excel Books, Latest Edition.			
3) R. A. Johnson, <i>Elementary Statistics</i> , Cengage Learning, 12th Edition.			
4) S. C. Gupta and V. K. Kapoor, <i>Fundamentals of Mathematical Statistics</i> , Sultan Chand & Sons, Latest Edition.			
5) Richard De Veaux, Paul Velleman, and David Bock, <i>Stats: Data and Models</i> , Pearson Education, Latest Edition.			

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A+’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (7th Semester) for Under-Graduate Programmes
Subject: Computer Science
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Session: 2025-26			
Part A - Introduction			
Subject	Computer Science		
Semester	VII		
Name of the Course	Principles & Paradigms of Programming Languages		
Course Code	B23-CSE-701		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-H1		
Level of the course (As per Annexure-I)	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the fundamental concepts, design issues, and paradigms of programming languages. 2. Compare and contrast different programming paradigms such as imperative, object-oriented, functional, and logic-based. 3. Analyse syntax, semantics, and language features using formal methods and tools. 4. Apply programming paradigms to design and implement solutions for computational problems.		
Credits	Theory	Practical	Total
	4	0	4
Contact Hours	4	0	4
Max. Marks:100 Internal Assessment Marks:30 End Term Exam Marks: 70		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. First			

question will be compulsory.

Unit	Topics	Contact Hours
I	History and Evolution of Programming Languages, Programming Domains and Language Evaluation Criteria, Syntax and Semantics, Lexical and Syntax Analysis (Overview of Compilers), Names, Binding, Scope, Data Types: Primitive, Composite, Abstract Type Systems: Static vs Dynamic, Strong vs Weak Typing, Variable Lifetime and Storage Bindings	15
II	Control Structures and Data Abstraction, Expressions and Assignment Statements, Control Structures: Conditional Statements, Loops, Goto, Structured Programming, Subprograms: Functions, Procedures, Parameter Passing Mechanisms: Call by Value, Reference, etc., Recursion and Tail Recursion, Abstract Data Types and Encapsulation	15
III	Imperative Programming: C, Python, Object-Oriented Programming: Java, C++, Classes, Objects, Inheritance, Polymorphism, Functional Programming: Haskell, Scheme, or Lisp, First-Class Functions, Higher-Order Functions, Lambda Calculus, Logic Programming: Prolog, Facts, Rules, Queries, Backtracking	15
IV	Overview of Language Translation (Compilation vs Interpretation), Virtual Machines and Intermediate Representations, Memory Management: Stack vs Heap, Garbage Collection Exception Handling Mechanisms, Concurrency and Multithreading, Domain-Specific Languages (DSLs), Introduction to Modern Language Features (e.g., Rust, Kotlin, Swift)	15
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20		End-Term Examination: A three-hour exam for theory of 70 marks.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Concepts of Programming Languages by Robert W. Sebesta • Programming Language Pragmatics by Michael L. Scott • Types and Programming Languages by Benjamin C. Pierce (Advanced) • Language documentation: Python, Java, Haskell, Prolog, etc.		

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
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Session: 2025-26			
Part A - Introduction			
Subject	Computer Science		
Semester	VII		
Name of the Course	Software Testing		
Course Code	B23-CSE-702		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-H2		
Level of the course (As per Annexure-I)	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain fundamental concepts, principles, and objectives of software testing. 2. Apply various testing techniques (black-box, white-box, unit, integration, system, regression) to evaluate software quality. 3. Use testing tools and frameworks to design, execute, and automate test cases. 4. Analyse and evaluate test results to ensure reliability, performance, and correctness of software systems.		
Credits	Theory	Practical	Total
	4	0	4
Contact Hours	4	0	4
Max. Marks:100 Internal Assessment Marks:30 End Term Exam Marks: 70		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. First			

question will be compulsory.		
Unit	Topics	Contact Hours
I	Introduction to Software Testing, Importance of testing, Errors, Faults, Failures, and Defects, Software Development Life Cycle (SDLC) & Testing Life Cycle (STLC), Types of Testing: Manual vs Automated, Static vs Dynamic, Functional vs Non-functional, Testing Levels: Unit, Integration, System, Acceptance Testing, Verification vs Validation, Test Planning and Documentation.	15
II	Test Design Techniques and Strategies, Black Box Testing Techniques: Equivalence Partitioning Boundary Value Analysis, Decision Table Testing, State Transition Testing, White Box Testing Techniques: Statement, Branch, Condition Coverage, Path Testing, Control Flow Graph, Integration Testing: Top-Down, Bottom-Up, Big Bang, System and Acceptance Testing Strategies, Regression Testing and Smoke Testing.	15
III	Automation Testing and Tools, Introduction to Test Automation, Benefits and Challenges, Selecting test cases for automation, Test Automation Frameworks, Introduction to Selenium WebDriver, Writing and Executing Test Scripts in Selenium (Java/Python), Unit Testing Tools (JUnit, TestNG, PyTest), Continuous Integration & Testing (Jenkins, GitHub Actions basics).	15
IV	Quality Assurance, Metrics, Software Quality Assurance (SQA) Principles, Defect Management: Lifecycle, Severity, Priority, Test Metrics and Measurements, Defect Density, Test Coverage, Test Effectiveness, Test Reporting and Documentation, Performance Testing (Intro to JMeter), Security Testing (OWASP basics), Agile and DevOps Testing, Behavior-Driven Development (BDD)	15
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20		End-Term Examination: A three-hour exam for theory of 70 marks.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Software Testing: Principles and Practices – Srinivasan Desikan & Gopalaswamy Ramesh (Pearson) 2. Software Testing: A Craftsman's Approach – Paul C. Jorgensen (CRC Press) 3. Foundations of Software Testing – Aditya P. Mathur (Pearson) 4. Foundations of Software Testing: ISTQB Certification – Dorothy Graham, Erik van Veenendaal & Rex Black (Cengage) 5. Software Testing: Principles, Techniques and Tools – M. G. Limaye (McGraw Hill)		

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Session: 2025-26			
Part A - Introduction			
Subject	Computer Science		
Semester	VII		
Name of the Course	Data Mining and Warehousing		
Course Code	B23-CSE-703		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-H3		
Level of the course (As per Annexure-I)	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the fundamental concepts, architectures, and applications of data warehousing and data mining. 2. Apply data pre-processing, transformation, and integration techniques for preparing datasets. 3. Implement data mining methods such as classification, clustering, association, and prediction using suitable tools. 4. Analyze and evaluate the effectiveness of data warehousing and mining techniques for knowledge discovery and decision support.		
Credits	Theory	Practical	Total
	4	0	4
Contact Hours	4	0	4
Max. Marks:100 Internal Assessment Marks:30 End Term Exam Marks: 70		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. First			

question will be compulsory.

Unit	Topics	Contact Hours
I	Introduction to Data Warehousing, Overview of Data Warehousing, Differences between OLAP and OLTP, Data Warehouse Architecture, Data Marts and Metadata, ETL Process: Extraction, Transformation, Loading, Star, Snowflake, and Fact Constellation Schemas, OLAP Operations: Roll-up, Drill-down, Slice, Dice, Pivot.	15
II	Introduction to Data Mining: Definitions and Applications, Types of Data and Patterns, Data Cleaning, Integration, and Transformation, Data Reduction: PCA, Sampling, Binning Data Discretization and Normalization, Introduction to Data Mining Process (KDD)	15
III	Data Mining Techniques, Association Rule Mining: Market Basket Analysis, Apriori and FP-Growth Algorithms , Evaluation Metrics: Support, Confidence, Lift, Classification: Decision Trees (ID3, C4.5), Naive Bayes Classifier, k-NN, Logistic Regression, Model Evaluation: Confusion Matrix, ROC, AUC, Clustering: K-Means, Hierarchical Clustering, DBSCAN, Cluster Evaluation Measures	15
IV	Web Mining and Text Mining Basics, Spatial and Temporal Data Mining, Introduction to Big Data & Data Mining Tools (e.g., Hadoop, Spark), Data Mining Applications: Fraud Detection, Customer Relationship Management (CRM), Recommender Systems Ethical Issues in Data Mining: Privacy, Security, Bias	15
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20		End-Term Examination: A three-hour exam for theory of 70 marks.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, and Jian Pei • Data Warehousing in the Real World by Sam Anahory and Dennis Murray • Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar		

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Session: 2025-26			
Part A - Introduction			
Subject	Computer Science		
Semester	VII		
Name of the Course	NoSQL Databases		
Course Code	B23-CSE-704		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSE6		
Level of the course (As per Annexure-I)	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the principles, characteristics, and types of NoSQL databases. 2. Differentiate between relational and NoSQL databases in terms of data models, scalability, and performance. 3. Apply NoSQL techniques to model, store, and query unstructured and semi-structured data. 4. Use popular NoSQL databases (e.g., MongoDB, Cassandra, Redis) to design and implement real-world applications.		
Credits	Theory	Practical	Total
	4	0	4
Contact Hours	4	0	4
Max. Marks:100 Internal Assessment Marks:30 End Term Exam Marks: 70		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. First			

question will be compulsory.

Unit	Topics	Contact Hours
I	Introduction to NoSQL databases, Characteristics of NoSQL, CAP theorem, Comparison with relational databases, Types of NoSQL databases.	15
II	Key-Value Stores: Concepts, Data modeling, Operations, Use cases, Examples (Redis, Riak).	15
III	Document-Oriented Databases: JSON/XML-based data models, CRUD operations, Indexing, Aggregation, Examples (MongoDB, CouchDB).	15
IV	Column-Oriented and Graph Databases: Column family concepts (Cassandra, HBase), Graph database concepts (Neo4j), Query languages, Applications in big data and real-time analytics.	15
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20		End-Term Examination: A three-hour exam for theory of 70 marks.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: □ Pramod J. Sadalage & Martin Fowler – <i>NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence</i> (Addison-Wesley) □ Kristina Chodorow – <i>MongoDB: The Definitive Guide</i> (O'Reilly) □ C. Strauch – <i>NoSQL Databases</i> (Lecture Notes, Stuttgart Media University) □ Dan McCreary & Ann Kelly – <i>Making Sense of NoSQL</i> (Manning Publications) □ Eben Hewitt – <i>Cassandra: The Definitive Guide</i> (O'Reilly)		

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Session: 2025-26			
Part A - Introduction			
Subject	Computer Science		
Semester	VII		
Name of the Course	Artificial Intelligence		
Course Code	B23-CSE-705		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSE6		
Level of the course (As per Annexure-I)	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the fundamental concepts, history, and applications of Artificial Intelligence and analyze various problem-solving approaches 2. Apply appropriate methods of knowledge representation and reasoning using logic, rule-based systems, semantic networks, and probabilistic reasoning models 3. Implement and evaluate machine learning algorithms including supervised and unsupervised learning, neural networks, and model performance metrics to build intelligent systems 4. Integrate AI techniques in domains such as Natural Language Processing, Computer Vision, Robotics, and Healthcare, and examine ethical, social, and future implications of AI in society		
Credits	Theory	Practical	Total
	4	0	4
Contact Hours	4	0	4
Max. Marks:100 Internal Assessment Marks:30 End Term Exam Marks: 70		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter			
The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. First			

question will be compulsory.

Unit	Topics	Contact Hours
I	Definition, History, and Applications of AI, Intelligent Agents and Environments, State Space Search: Uninformed Search (BFS, DFS, UCS), Informed Search (A*, Greedy Search), Constraint Satisfaction Problems (CSP), Game Playing (Minimax, Alpha-Beta Pruning)	15
II	Knowledge Representation & Reasoning, Propositional Logic and Inference, First-Order Logic (FOL), Rule-Based Systems and Production Rules, Semantic Networks, Frames, Ontologies and Knowledge Graphs, Reasoning under Uncertainty: Bayesian Networks, Markov Models	15
III	Machine Learning and Data-Driven AI, Supervised Learning: Regression, Classification, Decision Trees, k-N, Naive Bayes, Unsupervised Learning: Clustering (K-means, Hierarchical), Dimensionality Reduction (PCA), Introduction to Neural Networks and Deep Learning, Model Evaluation: Accuracy, Precision, Recall, F1 Score	15
IV	Natural Language Processing: Text Preprocessing, Bag-of-Words, Word Embedding, Computer Vision Basics, Introduction to Reinforcement Learning, AI in Robotics, Healthcare, Finance, and Society, Ethical Considerations: Bias, Fairness, Accountability, AI and the Future of Work	15
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20		End-Term Examination: A three-hour exam for theory of 70 marks.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Artificial Intelligence: A Modern Approach by Russell & Norvig • Pattern Recognition and Machine Learning by Christopher Bishop		

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Session: 2025-26			
Part A - Introduction			
Subject	Computer Science		
Semester	VII		
Name of the Course	Practical		
Course Code	B23-CSE-706		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	PC-H1		
Level of the course (As per Annexure-I)	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Apply data preprocessing, association rule mining, classification, and clustering techniques using suitable data mining tools (e.g., Weka, Python, R, or SQL-based tools). 2. Design and implement a simple data warehouse schema and perform OLAP operations for analytical decision-making. 3. Apply software testing concepts by designing and executing manual and automated test cases for different levels of testing such as unit, integration, system, and acceptance testing. 4. Use appropriate testing tools and techniques (e.g., Selenium, JUnit, Postman, Bugzilla) to evaluate software quality and generate detailed test reports.		
Credits	Theory	Practical	Total
	0	4	4
Contact Hours	0	8	8
Max. Marks:100 Internal Assessment Marks:30 End Term Exam Marks: 70		Time: 6 Hrs.(P), Two-sittings of 3hrs. each	
Part B- Contents of the Course			

Sitting	Topics	Contact Hours
A	Candidate will do practicals based on following, but not limited to: • Data cleaning, integration, and transformation on sample datasets. • Implementation of association rule mining (Apriori / FP-Growth algorithms). • Classification using Decision Tree and Naïve Bayes algorithms. • Clustering using K-Means and Hierarchical methods. • Implementation of data normalization and discretization techniques. • Design of a star or snowflake schema for a sample data warehouse. • Implementation of OLAP operations: Roll-up, Drill-down, Slice, and Dice. • Mini project: Building a data mining or warehousing application (e.g., customer segmentation, sales analysis).	60
B	Candidate will do practicals based on following, but not limited to: • Write test cases for basic modules (e.g., login, registration, form validation). • Perform black-box testing using equivalence partitioning and boundary value analysis. • Conduct white-box testing using control flow and path coverage techniques. • Perform unit testing using JUnit (Java) or PyTest (Python). • Perform integration testing for a multi-module application. • Automate web application testing using Selenium WebDriver. • Conduct API testing using Postman and validate JSON responses. • Defect tracking and reporting using Bugzilla or JIRA. • Prepare a comprehensive test report and test summary document. • Mini project: Testing a small web or mobile application end-to-end.	60
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20		End-Term Examination: A six-hour exam having two sittings for practical of 70 marks.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Han, J., Kamber, M., & Pei, J. (2012). <i>Data Mining: Concepts and Techniques</i>. 3rd Edition, Morgan Kaufmann. • Pang-Ning Tan, Steinbach, M., & Kumar, V. (2018). <i>Introduction to Data Mining</i>. Pearson Education. • Inmon, W. H. (2005). <i>Building the Data Warehouse</i>. Wiley. • Pujari, A. K. (2001). <i>Data Mining Techniques</i>. Universities Press. • Korth, H. F., & Silberschatz, A. (2019). <i>Database System Concepts</i>. McGraw-Hill. • Srinivasan Desikan & Gopalaswamy Ramesh (2006), <i>Software Testing: Principles and Practices</i>, Pearson Education. • Pressman, R. S. & Maxim, B. R. (2019), <i>Software Engineering: A Practitioner's Approach</i>, 8th Ed., McGraw-Hill. • Sommerville, Ian (2016), <i>Software Engineering</i>, 10th Ed., Pearson Education.		

- Naik, K. & Tripathy, P. K. (2008), *Software Testing and Quality Assurance: Theory and Practice*, Wiley India.
- Patton, Ron (2014), *Software Testing*, 2nd Ed., Pearson Education.

KURUKSHETRA UNIVERSITY

KURUKSHETRA

(Established by the state legislature Act XII of 1964)
A⁺ Grade NAAC Accredited)



**Revised Scheme of Examination and
Syllabus for**

Under-Graduate Programme

Subject: Chemistry

**Under Multiple Entry-Exit, Internship and
CBCS-LOCF in accordance to NEP-2020
w.e.f. 2025-26 (in phased manner)**

**DEPARTMENT OF CHEMISTRY, KURUKSHETRA UNIVERSITY,
KURUKSHETRA**

FIRST YEAR: SEMESTER-1									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A & C	CC-1	B23 CHE-101	Chemistry-I	3	3	20	50	70	3 hrs.
	MCC-1		Practical	1	2	10	20	30	3 hrs.
Scheme C only	MCC-2	B23 CHE-102	Physical Chemistry-I	3	3	20	50	70	3 hrs.
	4 credit		Practical	1	2	10	20	30	3 hrs.
Scheme A & D	CC-M1	B23 CHE-103	Minor Chemistry-I	1	1	10	20	30	2 hr
	2 credit		Practical	1	2	05	15	20	2 hrs
Scheme A, C & D	MDC-1	B23 CHE-104	Introductory Chemistry-I	2	2	15	35	50	3 hrs.
	3 credits		Practical	1	2	5	20	25	3 hrs.
Scheme C only	CC-M1	From Available CC-I/MCC-I of 4 credits as per NEP							
4 credit									
FIRST YEAR: SEMESTER-2									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A & C	CC-2	B23 CHE-201	Chemistry-II	3	3	20	50	70	3 hrs.
	MCC-3		Practical	1	2	10	20	30	3 hrs.
Scheme C only	DSEC-1	B23 CHE-202	Chemistry Skill-I	3	3	20	50	70	3 hrs.
	4 credit		Practical	1	2	10	20	30	3 hrs.
Scheme A & D	CC-M2	B23 CHE-203	Minor Chemistry-II	1	1	10	20	30	2 hrs.
	2 credit		Practical	1	2	05	15	20	2 hrs

Scheme A, C & D	MDC-2 3 credits	B23 CHE- 204	Introductory Chemistry-II	2	2	15	35	50	3 hrs.
			Practical	1	2	5	20	25	3 hrs.
Scheme C only	CC-M2 4 credit	From Available CC-2/MCC-3 of 4 credits as per NEP							
Internship of 4 credits of 4-6 weeks duration after 2 nd Semester									

SECOND YEAR: SEMESTER-3									
Remark s	Cours e	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A, B & C	CC-3 MCC-4 4 credit	B23 CHE-301	Chemistry-III	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	MCC-5 4 credit	B23 CHE-302	Inorganic Chemistry-I	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme A, B, C & D	MDC-3 3 credits	B23 CHE-303	Introductory Chemistry-III	2	2	15	35	50	3 hrs.
			Practical	1	2	5	20	25	3 hrs.
Scheme A, C & D	CC-M3 4 credits	B23 CHE-304	Minor Chemistry-III	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B only	MCC-2	MCC-2 FROM SCHEME C OF FIRST SEMESTER Physical Chemistry-I							
SECOND YEAR: SEMESTER-4									
Remark s	Cours e	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme	CC-4	B23	Chemistry-IV	3	3	20	50	70	3 hrs.

A, B & C	MCC-6 4 credit	CHE-401	Practical	1	2	10	20	30	3 hrs.
Scheme B & C	MCC-7 4 credit	B23 CHE-402	Organic Chemistry-I	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	MCC-8 4 credit	B23 CHE-403	Physical Chemistry-II	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	DSE-1 4 credit Select one option	Elective Chemistry(Select One option)							
		B23 CHE-404	Elective Chemistry -I	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23 CHE-405	Elective Chemistry -II	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23 CHE-406	Elective Chemistry -III	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		Internship of 4 credits of 4-6 weeks duration after 4th Semester (if not done after second semester)							

THIRD YEAR: SEMESTER-5									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A, B & C	CC-5 MCC-9 4 credit	B23 CHE-501	Chemistry-V	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	MCC-10 4 credit	B23 CHE-502	Inorganic Chemistry-II	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	DSE-2 4 credit Select one Option	Elective Chemistry(Select One option)							
		B23 CHE-503	Elective Chemistry-IV	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23 CHE-504	Elective Chemistry-V	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23 CHE-505	Elective Chemistry-VI	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	DSE-3 4 credit Select one Option	Elective Chemistry (Select One option)							
		B23 CHE-506	Elective Chemistry-VII	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23 CHE-507	Elective Chemistry-VIII	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23 CHE-	Elective Chemistry-IX	3	3	20	50	70	3 hrs.

		508	Practical	1	2	10	20	30	3 hrs.
Scheme A, B & C	Internship 4 credits	Internship#4 credit after 4 th semester							
THIRD YEAR: SEMESTER-6									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	Externa l Marks	Total Marks	Exam Duration
Scheme A, B & C	CC-6 MCC-11 4 credit	B23 CHE- 601	Chemistry-VI	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	MCC-12 4 credit	B23 CHE- 602	Organic Chemistry-II	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	DSE-4 4 credit Select one Option	Elective Chemistry(Select One option)							
		B23 CHE- 603	Elective Chemistry-X	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23 CHE- 604	Elective Chemistry-XI	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23 CHE- 605	Elective Chemistry- XII	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	DSE-5 4 credit Select one Option	Elective Chemistry (Select One option)							
		B23 CHE- 606	Elective Chemistry- XIII	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.

		B23 CHE- 607	Elective Chemistry- XIV	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23 CHE- 608	Elective Chemistry- XV	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme A only	CC-M6 4 credits	B23 CHE- 609	Minor Chemistry-IV	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.

FOURTH YEAR: SEMESTER-7 (FOR HONOURS/HONOURS WITH RESEARCH IN Chemistry)									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
for Honours in Chemistry/Honours with Research in Chemistry (For Scheme B & C)	CC-H1 4 credit	B23 CHE -701	Physical Chemistry-III	4	4	30	70	100	3 hrs.
	CC-H2 4 credit	B23 CHE -702	Inorganic Chemistry-III	4	4	30	70	100	3 hrs.
	CC-H3 4 credit	B23 CHE -703	Organic Chemistry-III	4	4	30	70	100	3 hrs.
	Select any one option								
	DSE-H1 4 credit Select one Option	B23 CHE -704	Advanced Chemistry-I	4	4	30	70	100	3 hrs.
		B23 CHE -705	Advanced Chemistry-II	4	4	30	70	100	3 hrs.
		B23 CHE -706	Advanced Chemistry-III	4	4	30	70	100	3 hrs.

	PC-H1 4 credit	B23 CHE -707	Practical Chemistry	4	8	30	70	100	6 hrs.
	CC-HM1 4 credit	B23 CHE -708	Advanced Minor Chemistry – I	4	4	30	70	100	3 hrs.
SEMESTER-8 (FOR HONOURS in Chemistry)									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Honours in Chemistry (For Scheme B & C)	CC-H4 4 credit	B23 CHE -801	Physical Chemistry-IV	4	4	30	70	100	3 hrs.
	CC-H5 4 credit	B23 CHE -802	Inorganic Chemistry-IV	4	4	30	70	100	3 hrs.
	CC-H6 4 credit	B23 CHE -803	Organic Chemistry-IV	4	4	30	70	100	3 hrs.
	DSE-H2 4 credit Select one option	Elective (Select any one)							
		B23 CHE -804	Advanced Chemistry-IV	4	4	30	70	100	3 hrs.
		B23 CHE -805	Advanced Chemistry-V	4	4	30	70	100	3 hrs.
		B23 CHE -806	Advanced Chemistry-VI	4	4	30	70	100	3 hrs.
	PC-H2 4 credit	B23 CHE -807	Practical Chemistry	4	8	30	70	100	6 hrs.
	CC-HM2 4 credit	B83 CHE -808	Advanced Minor Chemistry - II	4	4	30	70	100	3 hrs.
OR SEMESTER-8 (FOR HONOURS WITH RESEARCH IN Chemistry)									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration

Honours with Research in Chemistry (For Scheme B & C)	CC-H4 4 credit	B23 CHE -801	Physical Chemistry-IV	4	4	30	70	100	3 hrs.
	CC-H5 4 credit	B23 CHE -802	Inorganic Chemistry-IV	4	4	30	70	100	3 hrs.
	Project/Dissertation 12 credit	B23 CHE -809	Dissertation/project in chemistry	8+4	-	-	-	300	-
	CC-HM2 4 credit	From Available Minor of 4 credits as per NEP							

CC-M3

Session: 2025-26			
Part A - Introduction			
Subject	Chemistry		
Semester	III		
Name of the Course	Minor Chemistry-III		
Course Code	B23-CHE-304		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M3		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able: 1. To learn about the structure of s and p-block elements, their properties and discuss their use in daily life as well as industrial applications. 2. To understand about various laws and theories related to electrochemistry-I and know about their thermodynamic properties. 3. To understand the concepts of thermodynamics. 4. To understand and apply the fundamental concepts and thermodynamic properties of reactions/systems involved in physical/chemical transformations including types of reactions and reactive intermediates. 5.* To understand and apply the laboratory skills to make common chemical products and simple inorganic compounds in the lab and gain practical skills by measuring things like solubility and heat changes in chemical reactions.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75

Max. Marks:70+30* Internal Assessment Marks:20+10* End Term Exam Marks: 50+20*		Time:03+03*
Part B- Contents of the Course		
<u>Instructions for Paper- Setter</u> Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.		
Unit	Topics	Contact Hours
I	s and p-Block Elements Salient features of hydrides, oxides, halides, hydroxides of s-block elements (methods of preparation excluded). Structure, preparation and properties of Diborane and Borazine. Structure of oxyacids of Nitrogen, phosphorous, sulphur and chlorine and comparison of acidic strength of oxyacids. low chemical reactivity of noble gases,	12
II	Electrochemistry-I Electrolytic conduction, factors affecting electrolytic conduction, specific conductance, molar conductance, equivalent conductance and relation among them, their variation with concentration. Application of Kohlrausch's Law in calculation of conductance of weak electrolytes at infinite dilution, Concepts of pH, Buffer solution (Numericals)	11
III	Thermodynamics-I Definition of thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Thermodynamic equilibrium, Concept of heat and work. First law of thermodynamics: statement, concepts of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship.	11
IV	Mechanism of Organic Reactions Curved arrow notation, homolytic and heterolytic bond fission. Types of reagents: electrophiles and nucleophiles. Types of organic reactions: Substitution, Addition, Condensation, Elimination, Rearrangement, Isomerization and Pericyclic reactions. Reactive intermediates: Carbocations, carbanions, free radicals, carbenes (structure & stability).	11

[illegible]

*Applicable for courses having practical component.

CC-M4

Session 2025-26			
Part A- Introduction			
Subject	Chemistry		
Semester	VI		
Name of Course	Minor Chemistry-IV		
Course Code	B23 CHE-609		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of Course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	4.0		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the chemistry of d-block elements. 2. To learn about fundamentals of photochemistry and photophysical processes. 3 To understand the nature of chemical bonding, resonance, and electronic effects, and apply these concepts to predict the reactivity and orientation of aromatic compounds in electrophilic substitution reactions. 4. To understand the classification, structure, and biological roles of key biomolecules such as carbohydrates, proteins, and nucleic acids, and learn how these molecules function in living organisms 5*. Students will gain hands-on experience in classical and instrumental analytical techniques such as conductometry, potentiometry, polarimetry, organic and inorganic synthesis, and photochemical analysis.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
Max marks:70+30* Internal Assessment Marks:20+10*	Examination Time:03+03* Hours		

End Term Exam Marks:50+20*		
Part B- Contents of the Course		
<u>Instructions for Paper-Setter</u> Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1) based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory. Log table and non-programmable calculator is allowed.		
Unit	Topics	Contact Hours
I	Chemistry of d-Block elements Definition of transition elements, General characteristic properties of d-Block elements, Comparison of ionic radii 3d, 4d and 5d series elements, magnetic properties, Stability of various oxidation states and Latimer and Frost diagrams, Structure of some compounds of transition elements-FeCl ₃ , CuCl ₂ and Ni(CO) ₄ .	12
II	Photochemistry Interaction of radiation with matter, difference between thermal and photochemical process, Law of photochemistry: Lambert-Beer Law, Grotthus-Draper Law, Stark Einstein Law (Law of photochemical equivalence), concept of singlet and triplet states, Jablonski diagram – depicting various process occurring in excited states including fluorescence, phosphorescence and non-radiative processes (internal conversion, intersystem crossing).	11
III	Structure and Bonding Localized and delocalized chemical bond, Van der Waals interactions. Concept of resonance and its applications, hyperconjugation, inductive effect, Electromeric effect and their comparison. Benzene and its derivatives: Nomenclature, Aromatic nucleus and side chain, Huckel's rule of aromaticity. Aromatic electrophilic substitution, mechanism of nitration, halogenation and Friedel- Crafts reaction. Energy profile diagrams. Activating and deactivating substituents.	11
IV	Biomolecules: Definition, classification of biomolecules, importance of biomolecules in living organisms. Carbohydrates: Classification, structure and properties of monosaccharides, disaccharides structure and bonding (lactose and sucrose).	11

	Proteins: Amino acids, structure, classification and properties, peptide bond and elementary idea of structure of proteins.	
V*	1. To determine the strength of given acid solution (mono acid only) conductometrically. 2. Identification of carbohydrates (glucose/fructose/sucrose) 3. To determine the molecular weight of organic compound by Rast method. 4. To determine the specific rotation of an optically active substance by polarimeter. 5. To prepare a sample of cuprous chloride. 6. To study the photochemical reaction of benzophenone and isopropyl alcohol. 7. To prepare <i>m</i> -dinitrobenzene from nitrobenzene.	30
Suggested Evaluation Methods		
Internal Assesment:20+10* ➤ Theory ● Class Participation: 5 ● Seminar/Presentation/Assignment/Quiz/Class Test etc: 5 ● Mid Term Exam: 10 ➤ Practicum ● Class Participation: NA ● Seminar/Demonstration/Viva-voce/Lab records etc: 10 ● Mid-Term Exam: NA		End Term Examination: 50+20*
Part C- Learning Resources		
Recommended Books/e-resources/LMS: 1. Mukherji, Singh, Kapoor and Dass, Organic Chemistry Volume II & III, New Age International Pvt. Ltd., New Delhi. 2. Huheey, J.E.; Keiter, E.A., Keiter; R. L.; Medhi, O.K. (2009), Inorganic Chemistry Principles of Structure and Reactivity, Pearson Education. 3. Lee, J.D.; (2010), Concise Inorganic Chemistry, Wiley India. 4. Ahluwalia, V.K., Parashar, R.K. (2011), Organic Reaction Mechanisms, 4th Edition, Narosa Publishing House. 5. Horspool, W.M. (1976) Aspects of Organic Photochemistry, Academic Press. 6. Kapoor, K.L. (2015), A Textbook of Physical Chemistry, Vol 3, 6th edition, McGraw Hill Education. 7. Kuashik, S., Singh, A. (2023), Biomolecules: From Genes to Proteins, First Edition, Berlin, Boston: De Gruyter. 8. Pandey, O.P.; Bajpai, D.N.; Giri S.; A Textbook of Practical Chemistry, S. Chand & Company. 9. Furniss, S.; Hannaford, A.J.; Smith, P.W.G.; and Tatchell A.R. Vogel's Textbook of		

Practical Organic Chemistry, (Pearson Education).

10. David L. Nelson and Michael M. Cox, **Lehninger Principles of Biochemistry**, W.H. Freeman and Company.

*Applicable for courses having Practical component

VOC

Session: 2025-26			
Part A – Introduction			
Subject	Chemistry		
Semester	III, V		
Name of the Course	Chemistry of Fertilizers and Pesticides		
Course Code	B23-VOC-122		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	-----		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Know about fertilizers and nutrients; 2. Understand types of nitrate fertilizers; 3. Understand types of phosphate fertilizers; 4. Get the knowledge about pesticides. 5*. Understand the issues involved in pesticides and fertilizers		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 + 50* Internal Assessment Marks: 15 + 15* End Term Exam Marks:Theory: 35 + 35*		Time: Theory: Three Hours Practicum: Three Hours	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal			

marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.		
Unit	Topics	Contact Hours
I	Methods and time of fertilizer applications, fertilizers and its relations to plant nutrients, Factors effecting optimum fertilizer dose.	8 Hrs
II	Classification and types of fertilizers, Nitrogenous fertilizers: Ammonium nitrate, Urea, Calcium Cyanamide, Ammonium Chloride, Action of as a fertilizers.	7 Hrs
III	Phosphate fertilizers: Normal super phosphate, Triple Super Phosphate, Ammonium Phosphate.	7 Hrs
IV	pesticides: Classification, mode of action, uses and adverse effects of representative pesticides in the following classes: Organochlorines (DDT, Gammaxene); Organophosphates (Malathion); Quinones (Chloranil), Anilides	8 Hrs
V*	- To carryout market survey of potent pesticides with details as follows: - Name of pesticide - Chemical name, class and structure of pesticide - Type of formulation available and Manufacturer's name - Useful information on label of packaging regarding: Toxicity, LD50 ("Lethal Dose, 50%"), Side effects and Antidotes. - To carryout market survey of potent botanical pesticides with details as follows: - Botanical name and family; - Chemical name (active ingredient) and structure of active ingredient; - Type of formulation available and Manufacturer's name; - Useful information on label of packaging regarding: Toxicity, LD50 ("Lethal Dose, 50%"), Side effects and Antidotes. - Preparation of Carbamates (anilides)_ - To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications. - To calculate active ingredient in given sample of pesticide formulations as per BIS specifications. - Preparation of Neem based botanical pesticides. - To study about identification of crops, seeds. - To carry out marked survey for integrated nutrient management.	60 Hrs
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		

Internal Assessment: 15+15*=30 ➤ Theory: 15 ● Class Participation: 02 ● Seminar/presentation/assignment/quiz/class test etc.:03 ● Mid-Term Exam: 10 ➤ Practicum:15 ● Class Participation: 10 ● Seminar/Demonstration/Viva-voce/Lab records etc.: 05 ● Mid-Term Exam: N. A.	End Term Examination:35+35*
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ✓ Gopal Rao: Outlines in Chemical Technology. ✓ Shukla and Pandey: Introduction to Chemical Technology ✓ Perry, A.S.; Yamamoto, I.; Ishaaya, I.; Perry, R.Y.(1998),Insecticides in Agriculture and Environment, Springer-Verlag Berlin Heidelberg. ✓ Kuhr, R.J. ;Derough, H.W.(1976),Carbamate Insecticides: Chemistry, Biochemistry and Toxicology, CRC Press,USA.	

*Applicable for courses having practical component.

VOC

Session: 2025-26			
Part A – Introduction			
Subject	Chemistry		
Semester	III, V		
Name of the Course	Cosmetic Chemistry		
Course Code	B23-VOC-123		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	--		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Get the knowledge of cosmetics; 2. Logically think regarding preparation strategies and uses of cosmetic products; 3. Understand about preparation strategies and uses of cosmetic creams; 4. Get to know about the essential oils preset in nature & their importance towards industrial uses. 5*. learn about practical hands involved in preparation of cosmetic products.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 + 50* Internal Assessment Marks: 15 + 15* End Term Exam Marks:35 + 35*		Time: Theory: Three Hours Practicum: Three Hours	
Part B- Contents of the Course			
Instructions for Paper- Setter			

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.		
Unit	Topics	Contact Hours
I	Cosmetics- Definition, History, Classification, Ingredients, Nomenclature, A general study including preparation and uses of the following: Hair dye, Hair spray, Shampoo, conditioners.	8 Hrs
II	Preparation and uses of Face powder, Lipsticks, Talcum powder, Nail enamel.	7Hrs
III	Preparation and uses of creams (cold, vanishing, and shaving creams), Antiperspirants and Artificial flavours.	7 Hrs
IV	Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, Sandalwood oil, Eucalyptus, Rose oil, Jasmone, Civetone.	8 Hrs
V*	1. Preparation of Talcum powder. 2. Preparation of Shampoo. 3. Preparation of Enamels. 4. Preparation of Hair remover. 5. Preparation of Face cream. 6. Preparation of Nail polish. 7. Preparation of Nail polish remover.	60 Hrs
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		
Internal Assessment: 15+15*=30 ➤ Theory: 15 ● Class Participation: 02 ● Seminar/presentation/assignment/quiz/class test etc.:03 ● Mid-Term Exam: 10 ➤ Practicum:10 ● Class Participation: 05 ● Seminar/Demonstration/Viva-voce/Lab records etc.: 10 ● Mid-Term Exam: N. A.		End Term Examination: 35+35*
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- ✓ E. Stocchi: *Industrial Chemistry*, Vol -I, Ellis Horwood Ltd. UK.
- ✓ P.C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
- ✓ B.K. Sharma: *Industrial Chemistry*, Goel Publishing House, Meerut.
- ✓ Textbook of Cosmetics; M Vimaladevi; CBS Publishers & Distributors; 2015, ISBN 81-239-1103-3
- ✓ TextBook of Cosmetics; Dr Akanksha Garud, Dr PK Sharma, Dr Navneet Garud; Pragati Prakashan; 2012, ISBN 978-93-5006-691-1
- ✓ Pharmaceutics and Cosmetics; Praveen K. Gupta, Sanjeev K. Gupta; Pragati Prakashan; 2011, ISBN 978-81-8398-995-4
- ✓ Chemistry of Cosmetics; R. Kumari; Prestige Publisher, 2018, ISBN 978-81-936512-3-0
- ✓ Formulation Guide For Cosmetics; The Nisshin Oillio Group, Ltd.

*Applicable for courses having practical component.

VOC

Session: 2025-26			
Part A – Introduction			
Subject	Chemistry		
Semester	III,V		
Name of the Course	Business Chemistry		
Course Code	B23-VOC-125		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	--		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the concepts of business; 2. Logically think about role of chemistry in emerging global economies; 3. Get to know about the case-studies of successful business ideas in chemistry; 4. Deeply learn about intellectual property rights and patents. 5*. Understand way to deal with industrial market working principles.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 + 50* Internal Assessment Marks: 15 + 15* End Term Exam Marks:35 + 35*		Time: Theory: Three Hours Practicum: Three Hours	
Part B- Contents of the Course			
Instructions for Paper- Setter			

Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.		
Unit	Topics	Contact Hours
I	Business Basics Key business concepts, Business plans, Market need, Concept of entrepreneurship, different fields explorable as entrepreneurship in chemistry	8 Hrs
II	Chemistry in Industry Current challenges and opportunities for the chemistry-using industries, Role of chemistry in India and global economies, opportunities in Green Chemistry and business	7 Hrs
III	Making money Treasures hidden in Chemistry (project), Case study of Successful business ideas in chemistry, Pharmaceutical Chemistry, Plastic Industry, Nutritional Chemistry, financial aspects of business with case studies	7 Hrs
IV	Intellectual property Concept of intellectual property, Novelty, State of Art, Innovations, Technology Transfer, Geographical Indicators, Traditional Knowledge, Introduction to Patents, Careers in Intellectual property Rights.	8 Hrs
V*	A visit to any one Industry/Plant 1. Pharmaceutical Industry to analyse financial layout of project and markets. 2. Paint Industry to analyse financial layout of project and markets. 3. Milk Plant to analyse financial layout, different milk products and markets. 4. Any two Industry to analyse financial layout of project and markets.	60 Hrs
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		

Internal Assessment: 15+15*=30 ➤ Theory: 15 ● Class Participation: 02 ● Seminar/presentation/assignment/quiz/class test etc.:03 ● Mid-Term Exam: 10 ➤ Practicum:15 ● Class Participation: 05 ● Seminar/Demonstration/Viva-voce/Lab records etc.: 10 ● Mid-Term Exam: N. A.	End Term Examination: 35+35*
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ✓ Lawerence I. Nwaeke, Business Concepts and Perspectives ✓ Titus De Silva, Essential Management Skills for Pharmacy and Business Managers ✓ N.K. Acharya: Textbook on intellectual property rights, Asia Law House (2001).	

*Applicable for courses having practical component.

VOC

Session: 2025-26			
Part A – Introduction			
Subject	Chemistry		
Semester	IV		
Name of the Course	Agriculture chemistry		
Course Code	B23-VOC-222		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1 Thinks about chemistry involved in agriculture 2 Know about chemical composition of soils; 3 Understand impacts of pollutions on soils and its productivity; 4 Critically think regrading sewage effluents. 5*. Practical training of soil analysis		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 + 50* Internal Assessment Marks: 15 +15* End Term Exam Marks:35 + 35*		Time: Theory: Three Hours Practicum: Three Hours	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Note: The examiner is requested to set nine questions in all, selecting two			

questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.		
Unit	Topics	Contact Hours
I	Plants as producers: Photosynthesis, pesticides, herbicide, insecticide, fungicide, storage and preservation of agriculture produce, food processing, use of polymers in agriculture	8 Hrs
II	Soil fertility and soil productivity: urea cycle, Organic and inorganic nitrogen (Haber Bosch Process), nutrient sources – fertilizers and manures; essential plant nutrients - functions and deficiency symptoms. Micronutrients : factors affecting their availability and correction of their deficiencies in plants.	7 Hrs
III	Chemical (elemental) composition of the earth's crust and soils, Chemistry of acid soils; active and potential acidity; lime potential, chemistry of acid soils; sub-soil acidity.	7 Hrs
IV	Nature and sources of pollutants acid rains, oil spills etc.; air, water and soil pollutants - their CPC standards and effect on plants, animals and human beings. Sewage and industrial effluents – their composition and effect on soil properties/health, and plant growth and human beings; soil as sink for waste disposal.	8 Hrs
V*	1. pH of Soil 2. determine carbonate and bicarbonate in soil 3. Determine chloride in the soil sample 4. Determine starch in organic manure 5. Determine nitrate in the soil 6. Determine sulphate in the soil 7. To study Seed germination and viability test.	60Hrs
Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS		
Internal Assessment: 15+15*=30 ➤ Theory: 15 ● Class Participation: 02 ● Seminar/presentation/assignment/quiz/class test etc.:03 ● Mid-Term Exam: 10 ➤ Practicum:15 ● Class Participation: 05 ● Seminar/Demonstration/Viva-voce/Lab records etc.: 10 ● Mid-Term Exam: N. A.		End Term Examination: 70 (35+35*)

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- ✓ Bear RE. 1964. Chemistry of the Soil. Oxford and IBH. Bolt GH & Bruggenwert MGM. 1978. Soil Chemistry. Elsevier. Greenland DJ & Hayes MHB. 1981. Chemistry of Soil Processes. John Wiley & Sons.
- ✓ Brady NC & Weil RR. 2002. The Nature and Properties of Soils. 13 Ed. Pearson Edu.
- ✓ Kabata-Pendias A & Pendias H. 1992. Trace Elements in Soils and Plants. CRC Press.
- ✓ Kannaiyan S, Kumar K & Govindarajan K. 2004. Biofertilizers Technology. Scientific Publ.
- ✓ Leigh JG. 2002. Nitrogen Fixation at the Millennium. Elsevier.
- ✓ Mengel K & Kirkby EA. 1982. Principles of Plant Nutrition. International Potash Institute, Switzerland.
- ✓ Mortvedt JJ, Shuman LM, Cox FR & Welch RM. 1991. Micronutrients in Agriculture. 2 Ed. SSSA, Madison.
- ✓ Pierzinsky GM, Sims TJ & Vance JF. 2002. Soils and Environmental Quality. 2 Ed. CRC Press.
- ✓ Stevenson FJ & Cole MA. 1999. Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients. John Wiley & Sons.
- ✓ Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. Soil Fertility and the Fertilizers. 5 Ed. Prentice Hall of India.
- ✓ Troeh FR & Thompson LM. 2005. Soils and Soil Fertility. Blackwell.

*Applicable for courses having practical component.

VOC

Session: 2025-26			
Part A – Introduction			
Subject	Chemistry		
Semester	VI		
Name of the Course	Green laboratory practices		
Course Code	B23-VOC-321		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC		
Level of the course (As per Annexure-I	0-99		
Pre-requisite for the course (if any)	--		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. learn about green chemistry; 2. describe, how injudicious use of chemicals can have an adverse/potentially damaging effect on humans and the environment. 3. propose ideas for innovative approaches to energy challenges. 4. convert biomass into valuable chemicals through green technologies. 5*. Hands on training towards green chemistry		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	30	60	90
Max. Marks: 50 + 50* Internal Assessment Marks: 15 + 15* End Term Exam Marks:35+ 35*		Time: Theory: Three Hours Practicum: Three Hours	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Note: The examiner is requested to set nine questions in all, selecting two questions from each SECTION and one question (Question No.1 based on entire syllabus will consist of short answer type. All questions carry equal			

marks. The candidate is required to attempt five questions in all selecting one from each SECTION. Question No.1 is compulsory.		
Unit	Topics	Contact Hours
I	Scheme for the traditional as well as green method for the synthesis of ibuprofen. Compare the amount and hazards of waste generated in both Green Methods in Chemistry. Preparation of propene by two methods can be studied (I) Hoffman elimination (II) Dehydration of propanol	7 Hrs
II	Prevention/ minimization of hazardous/ toxic products reducing toxicity. Risk = (function) hazards exposure: (a) Preparation of dibenzalacetone by cross aldol condensation reaction using base catalysed green method (b) Acetylation of primary aromatic amine using the green method. Use of Green solvents and comparison of greenness of solvents: (a) Introduction to water as a solvent for chemical reactions. preparation of Manganese (III) acetylacetonate using green method (b) Advantages and application of solventless processes in organic reactions.	8 Hrs
III	Energy requirements for reactions – alternative sources of energy: use of microwaves and photochemical energy. (a) Photoreduction of benzophenone to benzopinacol in the presence of sunlight. (b) Microwave assisted ammonium formate-mediated Knoevenagel reaction: p-anisaldehyde.	7 Hrs
IV	Importance of using catalytic reagents in preference to stoichiometric reagents; green chemistry, comparison of heterogeneous and homogeneous catalysis, asymmetric catalysis. , Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide	8 Hrs
V*	1. Dehydration of propanol 2. Nitration of salicylic acid using calcium nitrate 3. Photoreduction of benzophenone to benzopinacol in the presence of sunlight 4. Microwave assisted solvent free synthesis of aspirin 5. Synthesis of vitamin D3 using photochemical energy 6. benzil-benzilic acid rearrangement in solvent free condition.	60 Hrs

Suggested Evaluation Methods Short Answer and MCQ Type QUESTIONS	
Internal Assessment: 15+15*=30 > Theory: 15 • Class Participation: 02 • Seminar/presentation/assignment/quiz/class test etc.:03 • Mid-Term Exam: 10 > Practicum:15 • Class Participation: 05 • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: N. A.	End Term Examination: 70 (35+35*)
Part C-Learning Resources	
Recommended Books/e-resources/LMS: Theory: ✓ Anastas, P.T., Warner, J.C. (2014), Green Chemistry, Theory and Practice, Oxford University Press. ✓ Lancaster, M. (2016), Green Chemistry: An Introductory Text, 3rd Ed., RSC Publishing. ✓ Cann, M.C., Connely, M. E. (2000), Real-World cases in Green Chemistry, American Chemical Society, Washington. ✓ Matlack, A.S. (2010), Introduction to Green Chemistry, 2nd Ed., CRC Press. ✓ Alhuwalia, V.K.; Kidwai, M.R. (2012), New Trends in Green chemistry, Kluwer Academic Publishers, Springer. ✓ Sidhwani, I.T; Sharma, R.K. (2020), An Introductory Text on Green Chemistry, Wiley India Pvt Ltd. ✓ Etzkorn, F. A . (2019), Green Chemistry: Principles and Case Studies, Royal Society of Chemistry. Practicals: ✓ Kirchoff, M., Ryan, M.A. (2002), Greener approaches to undergraduate chemistry experiment, American Chemical Society, Washington DC. ✓ Sharma, R.K., Sidhwani, I.T., Chaudhari, M.K. (2013), Green Chemistry Experiments: A monograph, I.K. International Publishing House Pvt Ltd. New Delhi. ✓ Pavia, D.L., Lamponam, G.H., Kriz, G.S.W. (2006), Introduction to organic Laboratory Technique- A Microscale approach, 4th Edition, Brooks-Cole Laboratory Series for Organic chemistry. ✓ Sidhwani, I.T. ; Saini, G.; Chowdhury, S. Wealth from Waste: A green method to produce biodiesel from waste cooking oil and generation of useful products from waste further generated. University of Delhi, Journal of Undergraduate Research and Innovation, Volume 1, Issue 1, February 2015, ISSN: 2395-2334. ✓ Sharma, R. K., Gulati, S., Mehta, S. (2012), Preparation of Gold Nanoparticles Using Tea: A Green Chemistry Experiment, Journal of Chemical Education, 89 (10), 1316-1318.	

*Applicable for courses having practical component.

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A++’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धिवियोगयुक्तहोकरकर्मकरो

(Perform Actions while Stead fasting in the State of Yoga)



Scheme of Examination for Under-Graduate Programmes
Bachelor of Vocation Medical Lab Technology (BVoc.MLT)
according to

Curriculum Framework for Under-Graduate Apprenticeship Embedded Degree Programme (AEDP)
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System) and National Skills
Qualifications Framework (NSQF)

DEPARTMENT OF MICROBIOLOGY
(For the Batches Admitted From 2025-2026)

Program Learning Outcomes (PLOs)

1. Domain Knowledge & Technical Proficiency

- i. Demonstrate core knowledge of Biology and Medical Lab Techniques.
- ii. Demonstrate proficiency in Lab technologies and tools.
- iii. Apply the knowledge and proficiency in medical lab techniques to solve real time problems.

2. Work-Based Learning & Industry Exposure

- i. Gain hands-on experience through on-the-job training in live industrial environments.
- ii. Demonstrate understanding of workplace expectations, professional behavior, and organizational structure.
- iii. Translate classroom concepts into practical deliverables in a professional setting.

3. Critical Thinking & Problem Solving

- i. Analyze complex medical problems and apply logical reasoning and thinking for solutions.
- ii. Employ storage, testing and optimization strategies to improve reliability and efficiency of medical laboratory.

4. Communication and Teamwork

- i. Communicate effectively in both written and oral forms in academic and workplace settings.
- ii. Collaborate in teams and interdisciplinary environments, demonstrating interpersonal skills and conflict resolution.

5. Apprenticeship-Based Learning Outcomes

- i. Reflect measurable growth in workplace competencies, productivity, and workplace readiness through formal apprenticeship assessments.
- ii. Demonstrate the ability to assimilate feedback, maintain logs, and submit detailed training reports for performance evaluation.

Kurukshetra University Kurukshetra
Scheme of Examination for Undergraduate AEDP programmes
Subject: B Voc.Medical Lab Technology

According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships and Choice Based Credit System) and NSQF

S e m	Category	Cour se Type	Course Code	Nomenclature of paper	Credits		Contac t hours	Inter nal mark s	End term Marks	Total Mar ks	Duratio n of exam (Hrs)
					T	P					
1	Skill Education Compone nt	CC-1	B25-MLT-101	Basics of Biochemistry	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-2	B25-MLT-102	Human Anatomy and Physiology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-3	B25-MLT-103	Fundamentals of Microbiology I	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-4	B25-MLT-104	Hematology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		PC-1	B25-MLT-105	Project Work/ Experiential Learning-I		4	8	30	70	100	2
		PC-II	B25-MLT-106	Project Work/Experiential Learning-II		4	8	30	70	100	2
				Total Skill Education Component	8	16					
	General Education Compone nt	SEC 1	B23-SEC-101	Office and Spreadsheet Tools Learning	2		2	15	35	50	1
				Practical		1	2	5	20	25	2
		MDC 1	B23-GEN-103	Cytogenetics	2		2	15	35	50	1
				Practical		1	2	5	20	25	2
		VAC	B25-MLT-	Basic Clinical	2		2	15	35	50	1

		1	107	Laboratory Techniques and Ethics							
		AEC1		To be opted from Pool of AEC	2		2	15	35	50	1
		BC	B25-MLT-108	Basics of Biology*	0	0	4	20	55	75	2
				Total General Education Component	8	2					
				Total	16	18					
Students can opt to exit with Certificate in MLT after completion of 1 semester and 6 credit internship (40credits)											

S e m	Category	Course Type	Course Code	Nomenclature of paper	Credits		Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs)
					T	P					
2	Skill Education Component	CC-5	B25-MLT-201	Enzymes and Metabolism	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-6	B25-MLT-202	Cell Biology and Histology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-7	B25-MLT-203	Fundamentals of Microbiology II	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-8	B25-MLT-204	Medical Laboratory Techniques	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		PC-1II	B25-MLT-205	Project Work/ Experiential Learning-III		4	8	30	70	100	2
		PW-	B25-MLT-	Project		4	8	30	70	100	2

	1V	206	Work/Experiential Learning-IV							
			Total Skill Education Component	8	16					
General Education Component	SEC-2	B23-SEC-222	Bioanalytical Techniques	2		2	15	35	50	1
			Practical		1	2	5	20	25	2
	MDC-2	B23-BCH-204	Biochemistry & Health	2		2	15	35	50	1
			Practical		1	2	5	20	25	2
	VAC-2	B23-VAC-101	Human Values and Ethics	2		2	15	35	50	1
	AEC-2		To be opted from Pool of AEC	2		2	15	35	50	1
			Total General Education Component	8	2					
			Total	16	18					

Note: Mandatory Internship of 6 credits (180hrs) in Hospitals, Diagnostic Laboratories, Pathological labs etc during summer vacation break between 2nd and 3rd Semester. These credits will be counted in 4th semester after evaluation.

Students can opt to exit with Diploma in MLT after completion of 2 semesters and 6 credit internship (74credits)

Sem	Category	Course Type	Course Code	Nomenclature of paper	Credits		Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs)
					T	P					
3	Skill Education Component	CC-9	B25-MLT-301	Clinical Pathology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-10	B25-MLT-302	Hematology and Blood Transfusion	2		2	15	35	50	1
				Practical		2	4	15	35	50	2

		CC-11	B25-MLT-303	Pathogenic Microbiology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-12	B25-MLT-304	Clinical toxicology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		PC-V	B25-MLT-305	Project Work/ Experiential Learning-V		4	8	30	70	100	2
		PC-VI	B25-MLT-306	Project Work/ Experiential Learning-VI		4	8	30	70	100	2
				Total Skill Education Component	8	16					
		SEC-3	B23-SEC-321	Microtomy	2		2	15	35	50	1
				Practical		1	2	5	20	25	2
		MDC 3	B23-BCH-303	Biochemistry of Lifestyle Diseases	2		2	15	35	50	1
				Practical		1	2	5	20	25	2
		VAC3	B23-VAC-102	Environmental Studies	2		2	15	35	50	1
		AEC3		To be opted from Pool of AEC	2		2	15	35	50	1
				Total General Education Component	8	2					
				Total	16	18					

S e m	Category	Course Type	Course Code	Nomenclature of paper	Credits		Contact hours	Internal marks	End term Marks	Total Mark s	Dura tion of exam (Hrs)
					T	P					
4	Skill Education Compone nt	CC-13	B25-MLT-401	Clinical Biochemistry	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-14	B25-MLT-402	Parasitology and Diagnostic Microbiology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-15	B25-MLT-403	Immunology and Serology	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		CC-16	B25-MLT-404	Clinical Laboratory Operation and Management	2		2	15	35	50	1
				Practical		2	4	15	35	50	2
		PC-VII	B25-MLT-405	Project Work/ Experiential Learning-VII		4	8	30	70	100	2
		PW-VIII	B25-MLT-406	Project Work/ Experiential Learning-VIII		4	8	30	70	100	2
				Total Skill Education Component	8	16					
		VAC4	B23-VAC-402	Art of Happiness	2		2	15	35	50	1
		AEC4		To be opted from Pool of AEC	2		2	15	35	50	1
		INT	B25-MLT-407	Internship*		6	-	75	75	150	2
				Total General Education	4	6					

				Component							
				Total	12	22					
S e m		Course Type	Course Code	Nomenclature of paper	Credits		Contact hours	Internal marks	End term Marks	Total Mark s	Dura tion of exam (Hrs)
	Category				T	P					
5	Skill Education Compone nt	CC-17	B25-MLT- 501	Apprenticeship	-	22	550	275	275	550	3
6	Skill Education Compone nt	CC-18	B25-MLT- 601	Apprenticeship	-	22	500	275	275	550	3
		Total			-	44					

CC-1

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	I		
Name of the Course	Basics of Biochemistry		
Course Code	B25-MLT-101		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC		
Level of the course (As per Annex- ure-I	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Demonstrate understanding of MLT scope and apply core chemical concepts (atomic structure, acids-bases, functional groups) in laboratory settings. 2. Interpret the biological roles and diagnostic relevance of carbohydrates and lipids. 3. Explain amino acids, proteins and the molecular functions of DNA/RNA in heredity and diagnostics. 4. Correlate biomolecular structures with physiological functions and diagnostic outcomes in clinical practice. ----- 5.* Understand and apply basic biochemical laboratory techniques for analysis of biomolecules.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	

Part B- Contents of the Course		
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.		
Unit	Topics	Contact hours
I	Introduction, aim and scope of MLT, Elementary knowledge of chemistry :- atomic weight, molecular weight, equivalent weight, acid, bases. Elementary knowledge of organic chemistry : (a) Organic compounds (b) Aliphatic and aromatic compounds (c) Alcohols, Aldehydes, Ketones, Amines, Esters, Phenol etc.	7
II	Carbohydrates : Structure, classification and their functions in biological system. Lipids : General structure of fatty acids and classification of lipids.	8
III	Amino acids : Common structural features, Functions and classification of amino acids; essential amino acids. Proteins : Classification, structural organization and functions of proteins.	8
IV	Nucleic acids : Structure, function and types of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), Nucleotides, Nucleosides, Nitrogen bases and role of Nucleic acids. Porphyrins : A brief account of Porphyrins.	7
V*	Practical: • Preparation of solutions; Normal, Molar, Percent solutions • Qualitative analysis of carbohydrates-identification of carbohydrate, reducing sugar, monosaccharide, disaccharide (sucrose), polysaccharide • Qualitative analysis of amino acids- Identification of proteins, amino acids, aromatic amino acids, Arginine, Histidine, methionine • Qualitative analysis of fats- Identification, triglycerides, cholesterol • Isolation of nucleic acids	60
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam:7		End Term Examination:70 ➤ Theory-35 ➤ Practical-35

➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger Principles of Biochemistry</i> (7th ed.). W.H. Freeman. ● Satyanarayana, U., & Chakrapani, U. (2020). <i>Biochemistry</i> (5th ed.). Elsevier. ● Voet, D., & Voet, J. G. (2011). <i>Biochemistry</i> (4th ed.). Wiley. ● Murray, R. K., Bender, D. A., Botham, K. M., Kennelly, P. J., Rodwell, V. W., & Weil, P. A. (2018). <i>Harper's Illustrated Biochemistry</i> (31st ed.). McGraw Hill. ● Berg, J. M., Tymoczko, J. L., & Gatto, G. J. (2015). <i>Biochemistry</i> (8th ed.). W.H. Freeman. ● Miesfeld, R. L., & McEvoy, M. M. (2021). <i>Biochemistry</i> (2nd ed.). W.W. Norton. ● Devlin, T. M. (Ed.). (2010). <i>Textbook of Biochemistry with Clinical Correlations</i> (7th ed.). Wiley. ● Rawn, J. D. (1989). <i>Biochemistry</i>. Harper & Row. ● Metzler, D. E. (2001). <i>Biochemistry: The Chemical Reactions of Living Cells</i> (2nd ed.). Academic Press. ● Plummer, D. T. (2001). <i>An Introduction to Practical Biochemistry</i> (3rd ed.). Tata McGraw-Hill	

CC-2

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	I		
Name of the Course	Human Anatomy and Physiology		
Course Code	B25-MLT-102		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC		
Level of the course (As per Annex- ure-I	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the structural organization of the human body at cellular, tissue, organ, and system levels 2. Describe the anatomy and physiology of major human organ systems and their interrelationships in maintaining homeostasis. 3. Perform basic hematological and physiological experiments with accuracy and reliability. 4. Identify bones, tissues, and organs using models, charts, and microscopic slides. 5. Interpret physiological parameters (e.g., blood pressure, blood groups, lung function, urine analysis) in the context of clinical laboratory practice.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			

Instructions for Paper- Setter

The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of **multiple-choice type** (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..

Unit	Topics	Contact hours
I	General Anatomy & Cell Biology: Introduction to Anatomy and Physiology: Definitions, Terminology, Anatomical positions and planes. Cell: Basic Structure and function of cell organelles, cell cycle, mitosis, meiosis. Tissues: Epithelial, connective, muscular, and nervous tissues – types, characteristics, functions. Membranes and glands – types and physiological roles.	7
II	Skeletal, Muscular & Nervous Systems: Skeletal system: Classification of bones, structure of long bone, types of joints, axial & appendicular skeleton overview. Muscular system: Types of muscles, physiology of muscle contraction, neuromuscular junction. Nervous system: Organization (CNS, PNS, ANS), structure of neuron, reflex arc, brain & spinal cord (basic anatomy & functions).	8
III	Circulatory, Respiratory & Digestive Systems: Cardiovascular system: Structure of heart, blood vessels, cardiac cycle, blood pressure, Blood & Lymph: Composition, plasma proteins, hemopoiesis, blood groups, coagulation, Respiratory system: Anatomy of respiratory tract, mechanism of breathing, exchange & transport of gases. Digestive system: Anatomy of GIT, digestion & absorption of carbohydrates, proteins, and fats.	8
IV	Excretory, Endocrine & Reproductive Systems: Excretory system: Structure of nephron, urine formation, Endocrine system: Major endocrine glands (pituitary, thyroid, parathyroid, adrenal, pancreas, gonads), hormones & functions. Reproductive system: Male and female reproductive organs, menstrual cycle, gametogenesis, fertilization & pregnancy.	7
V*	Practical: ● Study of compound microscope and its parts. ● Preparation and observation of human epithelial tissue slides. ● Preparation and observation of connective tissue slides. ● Identification of skeletal muscle, cardiac muscle, and smooth muscle under microscope. ● Identification of neuron and nervous tissue under microscope. ● Study of human skeleton: Identification of bones (long bones, skull, vertebrae, ribs, pelvis). ● Demonstration of different types of joints.	60

	● Demonstration of lung capacity and spirometry experiment. ● Urine analysis: Physical and chemical examination (pH, protein, sugar).	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Tortora, G. J., & Derrickson, B. H. (2017). <i>Principles of anatomy and physiology</i> (15th ed.). Wiley. ● Guyton, A. C., & Hall, J. E. (2020). <i>Guyton and Hall textbook of medical physiology</i> (14th ed.). Elsevier. ● Marieb, E. N., & Hoehn, K. (2018). <i>Human anatomy & physiology</i> (11th ed.). Pearson. ● Chaurasia, B. D. (2016). <i>Human anatomy</i> (Vols. 1–3, 7th ed.). CBS Publishers & Distributors. ● Hall, J. E. (2016). <i>Guyton and Hall review of medical physiology</i> (13th ed.). Elsevier. ● Ross, M. H., & Pawlina, W. (2015). <i>Histology: A text and atlas with correlated cell and molecular biology</i> (7th ed.). Wolters Kluwer. ● Singh, I. (2018). <i>Textbook of anatomy for medical students</i> (2nd ed.). Jaypee Brothers Medical Publishers. ● Jain, A. K. (2019). <i>Textbook of physiology</i> (Vols. 1–2, 8th ed.). Avichal Publishing Company.		

CC-3

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Medical Laboratory Technology		
Semester	I		
Name of the Course	Fundamentals of Microbiology – 1		
Course Code	B25-MLT-103		
Course Type:	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	---		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To know the basics of microbiology and knowledge about the contributions of microbiologists. 2. To learn about basics of microscopy 3. To study growth parameters and designing of cultural media for microbial growth. 4. Provide knowledge about the isolation of pure culture and various sterilization techniques.		
CLO5 is based on practical component	5*. Handling of the different instruments used and to know about the isolation of pure microbial cultures and sterilization techniques.		
Credits	Theory	Practical	Total
	02	02	04
Contact Hours	02	04	06
Max. Marks: 100 Internal Assessment Marks: 30 (Theory 15 + Practical 15) End Term Exam Marks:70(Theory 35 + Practical 35)		Exam duration: Theory: 1 Hour Practical: 2 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			

Unit	Topics	Contact Hours
I	Introduction: Introduction to Laboratory, Basic laboratory principles, Organization of clinical laboratory and role of medical laboratory technician Safety measures and biomedical waste management rules in Medical Laboratory, Introduction to Medical Microbiology, Discovery of microorganisms. Contribution of Robert Koch, Antonie Van Leeuwenhoek, Louis Pasteur, Bordet, Paul Ehrlich, Alexander Flemming, Elie Metchnikoff, Needham, Tyndall Janssen, Joseph Lister, Karl Landsteiner etc. Scope & relevance and safety measures of Medical Microbiology.	1 hour/ week
II	Microscopy and Micrometry: Microscopy: Study of compound microscope-magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care of microscope and common difficulties. Study of phase contrast, interference, fluorescent, polarising and electron microscope. Calibration of ocular micrometer and measurement of microorganisms.	
III	Cultural Media: Liquid and solid media, container for media distribution of media in tubes, bottles and Petri dishes. Common ingredients of cultural media, synthetic media, peptone water, nutrient agar and broth, chocolate and blood agar, malt extract and broth, milk agar etc. Nutrition of Bacteria: various phases of growth, typical growth curve, Nutrition of microbes and physical condition required for growth. Effect of Carbon, Nitrogen, Growth factors, Vitamins, Temperature, pH, Osmotic Pressure, Oxygen and Carbon Di Oxide on microbial growth.	
IV	Sterilization and Disinfection: Physical agents- Sunlight, Temperature less than 100°C, Temperature at 100°C, steam at atmospheric pressure and steam under pressure, irradiation, filtration. Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide. Pure culture isolation and preservation: Streaking, serial dilution and plating methods, cultivation, maintenance and preservation/stocking of pure cultures, cultivation of aerobic and anaerobic bacteria	
V*	PRACTICALS - Basic rules for specimen collection and handling, transportation of specimen, sorting of biological waste and safety regulations. - Study of Principle and Working of : - Microscopes (all types) - Distillation apparatus - Centrifuge - Balance - De-ionizer - pH meter - Autoclave - Incubator - Oven - Colony Counter - Muffle Furnace - Refrigerator - Preparation of different cultural media for cultivation of microbes - Effect of different cultural parameters on microbial growth - Study of sterilization through different physical and chemical agents	1 hours/ week

	6	Isolation of pure culture of microorganisms through different Techniques	
	7	Preservation of Microbial cultures	
Suggested Evaluation Methods			
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 05 ➤ Practicum • Class Participation: 05 • Seminar/Demonstration/Viva-voce/Lab records etc.: 5 • Mid-Term Exam: 05			End Term Examination: Theory: 35 (Written exam) Practical: 35 (Semi-nar/Demonstration/Viva-voce/Lab records etc)
PartC- Learning Resources			
Recommended Books/e-resources/LMS: 1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)• 2. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication• 3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. • 4. Elsevier Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. • 9th edition. McGraw Hill Higher Education 5. Text Book of Microbiology, Baveja.			

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	I		
Name of the Course	Haematology		
Course Code	B25-MLT-104		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the composition, functions, and formation of blood, including coagulation and morphology. 2. Explain the use, action, and handling of anticoagulants and clinical blood samples. 3. Perform haemoglobin estimation and interpret haemoglobin variations and red cell indices. 4. Apply quality assurance measures in haematology and ensure accurate lab practices. ----- 5.* Perform blood collection, component separation, cell identification, and haemoglobin estimation using standard methods.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks: 30 (Theory 15 + Practical 15) End Term Exam Marks:70(Theory 35 + Practical 35)		Exam duration: Theory: 1 Hours Practical: 2 hours	

Part B- Contents of the Course

Instructions for Paper- Setter

The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of **multiple-choice type** (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..

Unit	Topics	Contact hours 2hrs /week
I	Introduction to Haematology; Scope and importance of haematology; Laboratory organization and safety measures; Transportation and preservation of clinical materials; Composition and functions of blood; Formation of blood and blood morphology; Physiology of coagulation of blood.	
II	Various anticoagulants and their uses; Composition, amount and mode of action of anticoagulants; Merits and demerits of different anticoagulants; Collection and preservation of blood for haematological investigations; Storage-related changes in blood samples.	
III	Normal and absolute values in haematology; Quality assurance and quality control in haematology; Haemoglobinometry; Various methods of haemoglobin estimation; Errors and standardization of instruments for Hb estimation; Physiological variations in haemoglobin.	
IV	Haemoglobin synthesis, functions and degradation; Haemoglobin pigments (e.g., methemoglobin, carboxyhemoglobin) and their clinical significance; Identification of abnormal haemoglobins; Calculation and interpretation of red cell indices (MCV, MCH, MCHC).	
V*	Practicals: ● Collection of blood sample-from artery, vein, capillary ● Separation of RBC ● Studying morphology of normal and abnormal	

	blood cells and their identifications; ● Separation of serum from blood ● Separation of plasma from blood ● Preparation of different types of vials. ● Estimation of Hb by Sahli's method ● Estimation of Hb by cyanmethhaemoglobin method	
Suggested Evaluation Methods		
Internal Assessment:15 ➤ Theory-15 ● Class Participation: 5 ● Seminar/presentation/assignment/quiz/class test etc.:5 ● Mid-Term Exam:5 ➤ Practicum -15 ● Seminar/Demonstration/Viva-voce/Lab records etc.: 15	End Term Examination:70 ➤ Theory-35 ➤ Practical-35	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Hoffbrand, A. V., Moss, P. A. H., & Pettit, J. E. (2016). <i>Essential Haematology</i> (7th ed.). Wiley-Blackwell. ● Rodak, B. F., Fritsma, G. A., & Doig, K. (2020). <i>Hematology: Clinical Principles and Applications</i> (6th ed.). Elsevier. ● Bain, B. J. (2020). <i>Blood Cells: A Practical Guide</i> (5th ed.). Wiley-Blackwell. ● Turgeon, M. L. (2012). <i>Clinical Hematology: Theory and Procedures</i> (5th ed.). Lippincott Williams & Wilkins. ● Lewis, S. M., Bain, B. J., & Bates, I. (2016). <i>Dacie and Lewis Practical Haematology</i> (12th ed.). Elsevier. ● Kaushansky, K., Lichtman, M. A., Prechal, J. T., Levi, M. M., & Burns, L. J. (2018). <i>Williams Hematology</i> (9th ed.). McGraw-Hill. ● McKenzie, S. B., & Williams, J. L. (2015). <i>Clinical Laboratory Hematology</i> (3rd ed.). Pearson. ● Clinical and Laboratory Standards Institute. (2021). <i>Reference and Selected Procedures for the Erythrocyte Sedimentation Rate</i>. CLSI Document H2-A6. ● Harmening, D. M. (2018). <i>Clinical Hematology and Fundamentals of Hemostasis</i> (6th ed.). F.A. Davis Company. ● Greer, J. P., Arber, D. A., Glader, B., List, A. F., Means, R. T., Paraskevas, F., & Rodgers, G. M. (2013). <i>Wintrobe's Clinical Hematology</i> (13th ed.). Lippincott Williams & Wilkins		

SEC

Session: 2025-26			
Part A - Introduction			
Subject	Medical Lab Technology		
Semester	1		
Name of the Course	Office and Spreadsheet Tools Learning		
Course Code	B23-SEC-101		
Course Type:	SEC-1		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. understand the basic concepts of operating systems 2. do the basic editing and formatting in a document 3. create basic spread-sheets for different purposes 4. create basic presentations for different applications 5*. to understand the working of operating system and various office tools practically.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks:75(50(T)+25(P)) Internal Assessment Marks:20(15(T)+5(P)) End Term Exam Marks: 55(35(T)+20(P))		Time: 1 Hrs.(T), 3Hrs.(P)	
Part B-Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			

Unit	Topics	Contact Hours
I	Operating System - Definition, Functions, Types of Operating System, Basics of Popular Operating Systems, The User Interface, Exploring Computer, Icons, taskbar, desktop, Using Menu and Menu- selection, managing files and folders, Control panel – display properties, add/remove software and hardware, Common utilities.	4
II	Word Processing - Introduction to Word Processing, Menus, Creating, Editing & Formatting Document, Spell Checking, Printing, Views, Tables, Word Art, Mail Merge, Macros, Inserting hyperlinks, Searching for text, Modifying page setup, Applying document themes, Applying document style sets, Inserting headers and footers.	7
III	Spread Sheet: Elements of Electronics Spread Sheet, Applications, Creating and Opening of Spread Sheet, Menus, Manipulation of cells: Enter texts numbers and dates, Cell Height and Widths, Copying of cells, Mathematical, Statistical and Financial function, Drawing different types of charts, Sort and Filter Data.	7
IV	Presentation Software: Creating, Modifying and enhancing a presentation, Type of presentation views, Using sound, Animation, Working with Objects, Printing.	7
V*	Practical: Operating System: - Starting with basics of Operating Systems and its functionalities Word Processing: - Create and format word documents. - Use tables, word Art and other features in your documents. - Use macros to simplify the tasks in a document. - Use mail merge to write once for many. Spread Sheet: - Use spreadsheet for basic data handling - Apply formulas to sheet for automation. - Use Charts & Shapes for better visualization of the data. - Use sorting and filtering of the data Presentation Software: - Prepare and format presentations. - Apply slide transitions, animations and sequencing for slides. - Apply different formatting and insert options to make presentation better. - Applying sound and animation.	25
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 4 - Seminar/presentation/assignment/quiz/class test etc.: 4 - Mid-Term Exam: 7 ➤ Practicum - Class Participation: 2		End Term Examination: A three hour exam for both theory and practicum.

- Seminar/Demonstration/Viva-voce/Lab records etc.: 3
- Mid-Term Exam: NA

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Help files from Apache Open Office, <https://wiki.openoffice.org/wiki/Documentation>
- Channelle Andy, “Beginning OpenOffice 3: From Novice to Professional”, aPress Publications
- Beginning OpenOffice 3: From Novice to Professional, Andichannele, Apress.
- Microsoft Office 2016 Step by Step: MS Office 2016 Step by Step, By Joan Lambert, Curtis Frye
- Computer Fundamentals - By Pradeep K. Sinha, Priti Sinha, BPB Publications, 6th Edition
- Getting Started with LibreOffice 5.0, Friends of OpenDocuments Inc.,
[Http://friendsofopendocument.com](http://friendsofopendocument.com)
- Documentation from LibreOffice, <https://documentation.libreoffice.org/en/english-documentation/>

Session: 2025-26

Part A - Introduction

Session: 2025-26			
Part A - Introduction			
Subject	Medical Lab Technology		
Semester	1		
Name of the Course	CYTOGENETICS		
Course Code	B23-GEN-103		
Course Type:	MDC-1		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the basic characteristics and types of living beings 2. exhibit knowledge of organization of cell, organs and body 3. demonstrate the basics of mole concept and applications in lab 4. understand the role of biomolecules in life ----- 5. Applicable for courses having practical component.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks: 75 Internal Assessment Marks: 20 (15T+5P) End Term Exam Marks: 55 (35T+20P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			
Unit	Topics		Contact hours
I	Cell: Cell as a unit of structure and function. Organization of plant and animal cells. Nucleus: Structure, nuclear pore complex, nucleolus, sex chromatin (Barr body).		8
II	Chromosomes: Structure and morphology of chromosomes, chemical organization, karyotype study. Cell Cycle: Different Phases of Cell cycle, Brief account of Mitosis and Meiosis		8
III	Linkage: History, coupling and repulsion hypothesis, chromosomal theory of linkage, linkage groups and significance of linkage. Crossing Over: Introduction, mechanism and its significance.		7
IV	Structural changes in chromosomes: Deficiencies, duplications, inversions and translocations; their consequences. Numerical changes in chromosomes: Aneuploidy, euploidy, their types and applications		7

V	PRACTICAL 1.To study the structure and functioning of a compound microscope. 2. Karyotype studies of Normal male and female Human from micro photographs 3. Preparation of Idiograms 4. Identification of chromosomal disorders with the help of karyotype. 5. Study of different stages of mitosis and meiosis from permanent slides. 6. To study different mitotic stages in root tips of Allium cepa. 7. To work out the genetics of a cross from the given F-2 harvest.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 4 - Seminar/presentation/assignment/quiz/class test etc.:4 - Mid-Term Exam: 7 ➤ Practicum NA - Class Participation: 5 - Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam:		End Term Examination: Theory: 35 Written Exam Practicum: 20 demonstration/viva-voce/Lab records
PartC-Learning Resources		
Recommended Books/e-resources/LMS: - Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th Ed. Sinauer Associates, Inc. • Publishers Sunderland, Massachusetts U.S.A. - De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia - Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons In. - Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cumming - Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman and Co. - Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India		

Session: 2025-26			
PartA - Introduction			
Subject	Medical Lab Technology		
Semester	1		
Name of the Course	Basic Clinical Laboratory Techniques and Ethics		
Course Code	B25-MLT-107		
Course Type:	VAC-1		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (ifany)			
CourseLearningOutcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the role, organization, and safety measures of clinical laboratories. 2. Perform basic laboratory techniques and handle instruments correctly. 3. Collect, process, and analyze clinical specimens for routine tests. 4. Apply professional ethics, confidentiality, and communication skills in lab practice. ----- 5. Prepare accurate reports and follow quality control in laboratory work.-.		
Credits	Theory	Practical	Total
	2	0	0
Contact Hours	2	0	2
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35		Time: T-1 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			
Unit	Topics		Con- tact hours
I	Introduction to Clinical Laboratory Science. Overview of Medical Laboratory Technology (role in healthcare, scope). Organization of a clinical laboratory (sections: Hematology, Biochemistry, Microbiology, Pathology). Laboratory infrastructure and basic equipment (centrifuge, microscope, pipettes, autoclave, balances). Laboratory hazards and safety (biological, chemical, fire, radiation). First aid and emergency procedures in labs		8
II	Basic Clinical Laboratory Techniques: Specimen collection, labeling, transport, and storage. Preparation of solutions, buffers, and reagents. Calibration and maintenance of laboratory instruments. Microscopy: principle, types, and applications. Common laboratory techniques: centrifugation, filtration, sterilization, dilution, and staining. Quality control basics in laboratory testing.		8

III	Clinical Laboratory Practices. Blood collection methods: venipuncture, capillary puncture. Urine, stool, and sputum sample collection – guidelines and precautions. Hematology basics: preparation of blood smears, Hb estimation, hematocrit, ESR. Clinical Biochemistry basics: blood glucose, urea, creatinine, and lipid profile (introductory level). Clinical Microbiology basics: aseptic techniques, culture media preparation, inoculation methods. Documentation and record keeping in labs.	7
IV	Professional Ethics and Communication in Laboratory. Code of ethics for medical laboratory professionals. Patient confidentiality and informed consent.. Professional conduct and teamwork in healthcare. Handling medico-legal samples responsibly. Communication skills: interacting with patients, doctors, and healthcare staff. Importance of accuracy, honesty, and accountability in lab reporting	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam: 7		End Term Examination: Theory: 35 Written Exam
Part C- Learning Resources		
Recommended Books/e-resources/LMS: • Cheesbrough, M. (2010). <i>District Laboratory Practice in Tropical Countries (Part 1 & 2)</i> (2nd ed.). Cambridge University Press. • McKenzie, S. B., & Williams, J. L. (2019). <i>Clinical Laboratory Hematology</i> (4th ed.). Pearson Education. • Henry, J. B. (2017). <i>Henry's Clinical Diagnosis and Management by Laboratory Methods</i> (23rd ed.). Elsevier. • Mundt, L. A., & Shanahan, K. (2015). <i>Graff's Textbook of Urinalysis and Body Fluids</i> (2nd ed.). Lippincott Williams & Wilkins. • Mahajan, B. K., & Gupta, M. C. (2018). <i>Textbook of Preventive and Social Medicine</i> (5th ed.). Jaypee Brothers Medical Publishers. • Turgeon, M. L. (2018). <i>Clinical Hematology: Theory and Procedures</i> (6th ed.). Wolters Kluwer. • Collee, J. G., Fraser, A. G., Marmion, B. P., & Simmons, A. (2014). <i>Mackie & McCartney Practical Medical Microbiology</i> (14th ed.). Churchill Livingstone/Elsevier. • Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2018). <i>Clinical Chemistry: Principles, Techniques, and Correlations</i> (8th ed.). Wolters Kluwer. • Kanagasabapathi, B., & Arumugam, S. (2019). <i>Fundamentals of Medical Laboratory Technology</i>. CBS Publishers. • WHO. (2011). <i>Laboratory Quality Management System: Handbook</i>. World Health Organization.		

BC

Session: 2025-26			
Part A - Introduction			
Subject	Medical Lab Technology		
Semester	1		
Name of the Course	Basics of Biology		
Course Code	B25-MLT-108		
Course Type:	BC		
Level of the course (As per Annexure-I)	0-99		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the basic characteristics and types of living beings 2. exhibit knowledge of organization of cell, organs and body 3. demonstrate the basics of mole concept and applications in lab 4. understand the basics of organic compounds ----- 5. Applicable for courses having practical component.		
Credits	Theory	Practical	Total
	0	0	0
Contact Hours	2	2	4
Max. Marks: 75 Internal Assessment Marks:20 End Term Exam Marks: 55			Time: T-2 hrs
Part B- Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of FIFTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 2 hour.			
Unit	Topics		Con- tact hours
I	Living and Non-living Organisms, Microbial World, and Human Biology Characteristics of living and non-living organisms; differences with examples. Cell as the basic unit of life; Prokaryotic and Eukaryotic cells – key differences and examples. Introduction to microbes: bacteria, viruses, fungi, protozoa, and helminths – morphology, structure, basic classification, and their relevance in human health and disease. Concept of pathogens vs. normal flora; importance in laboratory diagnosis		8
II	Overview of organization: cell, tissue, organ, organ system, and organism: Structure and function of cell organelles – nucleus, mitochondria, endoplasmic reticulum (smooth and rough), lysosomes, Golgi bodies, ribosomes, plasma membrane. Introduction to human blood components – RBCs, WBCs, platelets, and plasma.		8

	Overview of human organ systems relevant to lab testing – circulatory, immune, excretory, and digestive systems. Introduction to basic laboratory practices: sample types (blood, urine, stool), personal protective equipment (PPE), biosafety basics, and microscope handling	
III	Concept of Matter- Structure of Atom, Mole, Buffer: Atomic structure: protons, neutrons, electrons; atomic number and mass number. Introduction to chemical bonding: ionic and covalent bonds (concept only). Mole concept and basic idea of chemical equations (no numerical problems). Acids, bases, salts – definitions and examples relevant to human body fluids. pH scale: concept, pH of biological fluids (blood, urine), introduction to buffers.	7
IV	Solutions and basics of organic compound: Solutions and concentrations: concepts of solute, solvent, solution, molarity, and normality (basic understanding only). Introduction to organic compounds: characteristics, functional groups (alcohols, carboxylic acids, amines, aldehydes, ketones); relevance in biological systems. Basics of isomerism – structural and geometric (overview only)	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory: 20 • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10		End Term Examination: Theory: 55 Written Exam
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Tortora, G. J., Funke, B. R., & Case, C. L. (2020). <i>Microbiology: An introduction</i> (13th ed.). Pearson. • Marieb, E. N., & Hoehn, K. (2018). <i>Human anatomy & physiology</i> (11th ed.). Pearson. • Nelson, D. L., Cox, M. M., Lehninger, A. L., & Cox, M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman. • Brown, T. L., LeMay, H. E., Bursten, B. E., Murphy, C. J., & Woodward, P. (2017). <i>Chemistry: The central science</i> (14th ed.). Pearson. • McMurry, J., & Castellion, M. E. (2016). <i>Fundamentals of general, organic, and biological chemistry</i> (7th ed.). Pearson. • Cheesbrough, M. (2006). <i>District laboratory practice in tropical countries</i> (Part 1). Cambridge University Press. • Boyer, R. (2012). <i>Concepts in biochemistry</i> (3rd ed.). Wiley. • Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2015). <i>Molecular biology of the cell</i> (6th ed.). Garland Science. • Banerjee, P. K. (2005). <i>Introduction to human physiology</i>. S. Chand Publishing. • Killeen, A. A. (2008). <i>Laboratory techniques in biochemistry and molecular biology</i>. Springer.		

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Enzyme and Metabolism		
Course Code	B25-MLT-201		
Course Type:	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Demonstrate understanding of enzymes, their types, cofactors, and active sites. 2. Explain the catalytic role of enzymes and the basic theories of enzyme action. 3. Identify and analyze factors affecting enzyme activity, regulation, and inhibition. 4. Interpret the clinical significance of enzymes and isoenzymes in diagnosis. 5. Understand and apply basic experimental techniques to study enzyme activity and metabolism.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			
Unit	Topics		Contact hours
I	Introduction to Enzymes : Definition and importance of enzymes., General characteristics of enzymes. Apoenzyme, holo-enzyme, cofactors, prosthetic group, coenzymes, Nomenclature and classification of enzymes.		7

II	Enzyme Catalysis: Enzymes as catalysts. Simple theories of enzyme action (lock & key, induced fit). Factors affecting enzyme activity: enzyme concentration, substrate concentration, pH, temperature. Simple concept of enzyme kinetics.	8
III	Enzyme Regulation and Inhibition: Enzyme inhibition – reversible (competitive, non-competitive) and irreversible. Enzyme regulation – allosteric enzymes. Isoenzymes – examples and clinical importance (LDH, CK, etc.)..	8
IV	Basics of Bioenergetics and Metabolism: Concept of energy in metabolism (ATP as energy currency). Bioenergetics – basic idea of free energy and biological oxidation. Introduction to metabolism: catabolism and anabolism. Overview of carbohydrate, protein, and fat metabolism.	7
V*	Practical: ● Demonstration of enzyme activity using starch and amylase. ● Effect of pH on enzyme activity. ● Effect of temperature on enzyme activity. ● Effect of enzyme concentration on enzyme activity (demonstration). ● Effect of substrate concentration on enzyme activity (demonstration). ● Demonstration of enzyme inhibition using simple models (e.g., fluoride on amylase). ● Estimation of blood glucose (as application of enzyme – glucose oxidase method). ● Estimation of achromatic point ● Estimation of serum/salivary amylase (demonstration).	60
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Nelson, D. L., Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W. H. Freeman and Company. ● Berg, J. M., Tymoczko, J. L., Gatto, G. J., & Stryer, L. (2019). <i>Biochemistry</i> (9th ed.). W. H. Freeman and Company. ● Voet, D., Voet, J. G., & Pratt, C. W. (2016). <i>Fundamentals of biochemistry: Life at the molecular level</i> (5th ed.). Wiley.		

- Satyanarayana, U., & Chakrapani, U. (2021). *Biochemistry* (5th ed.). Elsevier India.
- Jain, J. L., Jain, S., & Jain, N. (2016). *Fundamentals of biochemistry* (7th ed.). S. Chand Publishing.
- Champe, P. C., Harvey, R. A., & Ferrier, D. R. (2019). *Lippincott's illustrated reviews: Biochemistry* (8th ed.). Wolters Kluwer.
- Garrett, R. H., & Grisham, C. M. (2016). *Biochemistry* (6th ed.). Cengage Learning.
- Conn, E. E., & Stumpf, P. K. (2009). *Outlines of biochemistry* (5th ed.). Wiley.
- Campbell, M. K., & Farrell, S. O. (2018). *Biochemistry* (9th ed.). Cengage Learning.
- Murray, R. K., Bender, D. A., Botham, K. M., Kennelly, P. J., Rodwell, V. W., & Weil, P. A. (2018). *Harper's illustrated biochemistry* (31st ed.). McGraw Hill.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Cell Biology and Histology		
Course Code	B25-MLT-202		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Demonstrate understanding of the structure and functions of prokaryotic and eukaryotic cells. 2. Explain the organization and role of major cell organelles in cellular activities. 3. Describe the process of cell division (mitosis and meiosis) and its biological significance. 4. Identify and classify basic tissue types (epithelial, connective, muscular, and nervous) through microscopic study. 5. Apply basic histological techniques, including preparation and staining of slides, for diagnostic purposes.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			

Unit	Topics	Contact hours
I	Introduction to Cell Biology: Definition of cell, cell theory, prokaryotic vs. eukaryotic cells. Overview of cell structure and function. Plasma membrane structure and function (elementary). Basic concept of cytoplasm and organelles.	7
II	Cell Organelles and Functions : Nucleus, mitochondria, endoplasmic reticulum, Golgi apparatus, lysosomes, ribosomes – structure and basic functions. Simple concept of cell communication. Introduction to cytoskeleton and its role.	8
III	Importance of cell division in growth, repair, and reproduction: Mitosis Stages: Prophase, Metaphase, Anaphase, Telophase, Cytokinesis, Significance in tissue renewal and asexual reproduction Meiosis: Meiosis I: Prophase I, Metaphase I, Anaphase I, Telophase I, Meiosis II: Prophase II, Metaphase II, Anaphase II, Telophase II. Importance in gamete formation and genetic diversity	8
IV	Histology Basics : Definition and importance of histology. Types of tissues – epithelial, connective, muscular, nervous (structure and basic function). Simple introduction to staining techniques (H&E stain). Clinical relevance of tissue studies in diagnosis.	7
V*	Practical: • Demonstrate mitochondria in living cells using Janus Green B stain. • Identify and study stages of mitosis in onion root tip cells. • Perform Hematoxylin & Eosin (H&E) staining and observe stained tissue section. • Prepare a temporary mount of human cheek cells and study under microscope. • Prepare a temporary mount of onion peel cells and observe under microscope. • Prepare and stain simple epithelial tissue (cheek cell / onion epidermis). • Stain cells using methylene blue/iodine and identify nucleus and cytoplasm. • Study different types of tissues (epithelial, connective, muscle, nervous) under microscope. • Study plasmolysis and deplasmolysis in plant cells using salt solution. • Study stages of meiosis from prepared slides.	60
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2019). <i>Essential cell biology</i> (5th ed.). Garland Science. ● Bhatia, B. S. (2012). <i>Elementary cytology and genetics</i>. S. Chand Publishing. ● Darnell, J., Lodish, H., & Baltimore, D. (1990). <i>Molecular cell biology</i>. W. H. Freeman. ● Gupta, P. K. (2010). <i>Cytology, genetics and molecular biology</i>. Rastogi Publications. ● Junqueira, L. C., & Carneiro, J. (2015). <i>Basic histology: Text & atlas</i> (14th ed.). McGraw Hill Education. ● Karp, G. (2018). <i>Cell and molecular biology: Concepts and experiments</i> (8th ed.). Wiley. ● Khurana, I. (2014). <i>Textbook of medical physiology</i>. Elsevier India. ● Ross, M. H., & Pawlina, W. (2015). <i>Histology: A text and atlas</i> (7th ed.). Wolters Kluwer. ● Silverthorn, D. U. (2018). <i>Human physiology: An integrated approach</i> (8th ed.). Pearson.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Fundamentals of Microbiology II		
Course Code	B25-MLT-203		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Demonstrate understanding of microbial structure, growth, and factors influencing growth. • Explain methods of sterilization, disinfection, and aseptic handling in the microbiology laboratory. • Identify types of culture media and describe their diagnostic applications. • Apply basic microbiological techniques such as streaking, staining, and culture handling. • Recognize the role of bacteria, fungi, and viruses of medical importance in health and disease.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour..			

Unit	Topics	Contact hours
I	Morphology and Classification of Bacteria: Size, shape, and arrangement of bacteria. Bacterial cell structure: cell wall, capsule, flagella, pili, cytoplasm, spores. Elementary classification of bacteria (cocci, bacilli, spirilla, vibrios; Gram-positive vs Gram-negative). Endospores – properties and significance.	7
II	Staining Techniques: Principles of staining. Simple and negative staining. Differential staining: Gram staining, Acid-fast staining. Special stains: spore stain, capsule stain, flagella stain. Difference between dye and stains	8
III	Cultivation and Control of Microorganisms: Cultivation of aerobic and anaerobic organisms. Enrichment, selective and differential media (MacConkey agar, Mannitol salt agar, Sabouraud's agar). Control of microbes: antibiotics (basic mode of action), antiseptics, disinfectants. Antibiotic sensitivity testing (disc diffusion method).	8
IV	Microorganisms in Health and Disease : Normal flora of human body (skin, gut, respiratory, urogenital tract). Opportunistic vs pathogenic microbes. Brief introduction to medically important bacteria: <i>Staphylococcus</i> , <i>Streptococcus</i> , <i>E. coli</i> , <i>Salmonella</i> .	7
V*	Practical: • Perform negative staining of bacteria. • Perform spore staining. • Perform capsule staining. • Perform acid-fast staining. • Demonstrate motility of bacteria (hanging drop / wet mount). • Perform catalase test. • Perform oxidase test. • Perform IMViC tests (elementary demonstration). • Demonstrate antibiotic sensitivity by disc diffusion method (Kirby–Bauer). • Demonstrate microbial contamination in water/milk by simple plate count.	60

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Ananthanarayan, R., & Paniker, C. K. J. (2017). <i>Textbook of microbiology</i> (10th ed.). Universities Press. ● Black, J. G., & Black, L. J. (2018). <i>Microbiology: Principles and explorations</i> (10th ed.). Wiley. ● Cappuccino, J. G., & Welsh, C. T. (2017). <i>Microbiology: A laboratory manual</i> (11th ed.). Pearson. ● Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., & Stahl, D. A. (2018). <i>Brock biology of microorganisms</i> (15th ed.). Pearson. ● Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. (2016). <i>Microbiology: An application based approach</i>. Tata McGraw-Hill. ● Prescott, L. M., Harley, J. P., & Klein, D. A. (2014). <i>Microbiology</i> (9th ed.). McGraw Hill Education. ● Rajan, S. (2016). <i>Textbook of medical laboratory technology</i>. Jaypee Brothers Medical Publishers. ● Sharma, P. D. (2016). <i>Microbiology</i>. Rastogi Publications. ● Tortora, G. J., Funke, B. R., & Case, C. L. (2018). <i>Microbiology: An introduction</i> (13th ed.). Pearson. ● Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2017). <i>Prescott's microbiology</i> (10th ed.). McGraw Hill.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Medical Laboratory Techniques		
Course Code	B25-MLT-204		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Identify and safely operate basic medical laboratory instruments and glassware. • Perform simple hematological tests such as hemoglobin estimation, hematocrit, and blood cell counts. • Apply fundamental clinical biochemistry methods for estimation of glucose, urea, and proteins. • Conduct routine urine analysis including physical, chemical, and microscopic examination. • Demonstrate safe collection, handling, and disposal of clinical specimens in compliance with laboratory safety standards.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			

Unit	Topics	Contact hours
I	Introduction to Medical Laboratory: Role of medical laboratory in healthcare. Different sections of a clinical laboratory (hematology, clinical biochemistry, microbiology, histopathology, serology). Commonly used laboratory glassware and equipment (micropipettes, centrifuge, hot air oven, autoclave, microscope). Laboratory safety rules and biomedical waste disposal.	7
II	Basic Hematology Techniques : Composition and functions of blood. Collection and preservation of blood samples (EDTA, heparin, sodium citrate). Hemoglobin estimation (principle and methods). Total RBC count, WBC count, Platelet count	8
III	Basic Clinical Biochemistry Techniques : Collection and handling of serum/plasma samples. Estimation of blood glucose (glucose oxidase/peroxidase method); Estimation of urea and creatinine. Estimation of serum proteins (Biuret method). Concept of quality control in clinical biochemistry.	8
IV	Basic Clinical Microbiology and Urine Analysis: Collection, transport, and storage of clinical specimens (urine, sputum, blood, swabs). Routine urine examination (physical, chemical, and microscopic). Detection of proteins, glucose, ketone bodies in urine. Stool examination (macroscopic and microscopic). Introduction to serological tests (Widal, VDRL, Rapid card tests).	7
V*	Practical: • Identification and proper use of laboratory glassware and equipment (micropipette, centrifuge, hot air oven, autoclave, microscope). • Demonstration of safe handling of biological samples and biomedical waste disposal. • Collection of blood sample by finger prick and preparation of peripheral smear. • Estimation of hemoglobin using Sahli's/acid hematin method. • Determination of packed cell volume (hematocrit). • Total RBC count using hemocytometer. • Total WBC count using hemocytometer. • Estimation of blood glucose by glucose oxidase/peroxidase method. • Routine urine analysis – physical and chemical examination (pH, glucose, protein, ketone bodies). • Microscopic examination of urine sediment for cells and crystals.	60
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Cheesbrough, M. (2017). <i>District laboratory practice in tropical countries</i> (2nd ed., Part 1 & 2). Cambridge University Press. ● Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2018). <i>Clinical chemistry: Principles, techniques, and correlations</i> (8th ed.). Wolters Kluwer. ● Mahon, C. R., Lehman, D. C., & Manuselis, G. (2019). <i>Textbook of diagnostic microbiology</i> (6th ed.). Elsevier. ● Bain, B. J., Bates, I., Laffan, M. A., & Lewis, S. M. (2017). <i>Dacie and Lewis practical haematology</i> (12th ed.). Elsevier. ● McPherson, R. A., & Pincus, M. R. (2022). <i>Henry's clinical diagnosis and management by laboratory methods</i> (24th ed.). Elsevier. ● Arora, D. R., & Arora, B. B. (2021). <i>Medical microbiology</i> (6th ed.). CBS Publishers & Distributors. ● Godkar, P. B., & Godkar, D. P. (2014). <i>Textbook of medical laboratory technology</i> (2nd ed.). Bhalani Publishing House. ● Praveen, A., & Ramakrishnan, S. (2016). <i>Clinical biochemistry for medical students</i>. Wolters Kluwer India. ● Ochei, J., & Kolhatkar, A. (2000). <i>Medical laboratory science: Theory and practice</i>. Tata McGraw-Hill. ● Pambuccian, S. E., & Barkan, G. A. (2020). <i>Clinical laboratory management</i>. Springer.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Bioanalytical Techniques		
Course Code	B23-SEC-222		
Course Type:	SEC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Understand the basic chemistry and properties of water; physiological buffers. • Demonstrate the knowledge of the general principles, components and applications of centrifuges. • Learn the principles and applications of chromatographic techniques in isolation, quantification and characterization of biomolecules. • Know the general principles, components and applications of spectrophotometer. • Develop the skills to verify and apply the basic principles of spectroscopy; separation of amino acids by thin layer/ paper chromatograph.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks: 75 Internal Assessment Marks:20 (15T+5P) End Term Exam Marks: 55 (35T+20P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			

Unit	Topics	Contact hours
I	Water and Buffers: Structure, hydrogen bonding, solvent properties, and ionization, Weak acids and bases, ionization of weak acids, titration of weak acid by a strong base, pH, buffers, Henderson-Hasselbalch equation and physiological buffers. Measurement of pH: Principles and composition of reference electrodes, glass electrode and combined electrode	7
II	Centrifugation: Basic principle of centrifugation techniques, sedimentation rate, Svedberg unit / sedimentation coefficient. Preparative ultracentrifuge, Differential centrifugation, density gradient centrifugation, rate zonal, isopycnic, equilibrium centrifugation. Analytical ultracentrifuge method.	8
III	Chromatographic techniques- General principles and applications of adsorption, ion-exchange, molecular-sieve, thin layer & paper chromatography.	8
IV	UV-Visible Spectroscopic techniques: Beer-Lambert law, light absorption and its transmittance, extinction coefficient, a brief account of instrumentation and applications of visible and UV spectroscopic techniques (structure elucidation excluded).	7
V*	Practical: • Determination of pKa of acetic acid and glycine. • Verification of Beer- Lambert's Law. • Estimation of Amino acid by Ninhydrin method. • Estimation of Protein by Biuret method. • separation of amino acids/ sugars by thin layer chromatography/paper chromatography	15
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory- • Class Participation: • Seminar/presentation/assignment/quiz/class test etc.: • Mid-Term Exam: ➤ Practicum - • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.:		End Term Examination: ➤ Theory ➤ Practical
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Principles & Techniques of Biochemistry & Molecular Biology, 7th edition, by Keith Wilson and John Walker (2018).
- Biophysical Chemistry: Principles and Techniques, by A. Upadhyay, K. Upadhyay and N. Nath. (2016). Himalaya Publishing House, Delhi.
- Introductory Practical Biochemistry by S.K. Sawhney and Randhir Singh (2014). Narosa Publishing House, New Delhi.
- An introduction to Practical Biochemistry, 3rd Edition, by David Plummer (2017). Tata McGraw Hill
- Modern Experimental Biochemistry, 3rd edition, by R. Boyer (2002) Addison-Wesley Longman.
- Biochemical Methods, 3rd edition, by Sadasivam & Manickam (2018) New Age International (P) Ltd.

Part A - Introduction			
Subject	Biochemistry		
Semester	2		
Name of the Course	Biochemistry and Health		
Course Code	B23-BCH-204		
Course Type: (CC/MCC/MDC/CC- M/DSECNOC/DSE/PC/AECNA C)	MDC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	Students appeared in B.Sc. P ^t semester		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Exhibit the knowledge of the importance of biochemistry with reference to health. 2. Learn the biochemical functions and role of major and minor nutrients. 3. Know the relationship between biochemistry, exercise and energy metabolism. 4. Understand the Biochemistry of Aging and effect of environmental toxins and pollutants on human health.		
	5*. An understanding of quantitatively analyze the sample for vitamin, minerals and lactose.		
Credits	Theory	Practical	Total
	2	1	3

Contact Hours	30	15	45
Max. Marks: 75 Internal Assessment Marks: 20 (15T+5P) End Term Exam Marks: 55 (35T+20P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics	Contact Hours	
I	Overview of Health: Components of health (physical, mental and emotional), importance of air, water and food in health and relevance of studying Biochemistry in maintaining good health.	7	
II	Nutritional Biochemistry and Health: Macronutrients and micronutrients: roles and biochemical functions of macronutrients and micronutrients in human health.	8	
III	Biochemistry and Exercise Physiology: Energy metabolism during exercise; Biochemical adaptations to physical activity; and complications related to sedentary life style, Sports nutrition and performance-enhancing substances.	7	
IV	Biochemistry of Aging: Biochemical changes associated with aging; impact on hormones, muscle and nervous system. Impact of environmental toxins and pollutants on human health.	8	
V*	1. Estimation of carbohydrate in milk. 2. Estimation of protein in milk. 3. Estimation of fats in milk. 4. Estimation of sugar in blood — before and after exercise	15	

Suggested Evaluation Methods

Internal Assessment: ➤

Theory

- Class Participation:
- Seminar/presentation/assignment/quiz/class test etc.:
- Mid-Term Exam:

➤ Practicum

- Class Participation:
- Seminar/Demonstration/Viva-voce/Lab records etc.:
- Mid-Term Exam:

End Term Examination:

Written theory examination will be conducted as per scheme.

Evaluation of the practical skill will be done by an external examiner.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley & Sons, Inc. (New York).
2. Nutrition for health, fitness and sport (2013); Williams. M.H, Anderson, D.E, Rawson, E.S. McGraw Hill international edition.
3. Krause's Food and Nutrition Care process. (2012); Mahan, L.K Strings, S.E, Raymond, J. Elsevier's Publications.
4. Principles of Nutritional Assessment (2005) Rosalind Gibson. Oxford University Press.
5. Essentials of Biochemistry, 5th edition by Satyanarayana and Chakrapani. (2019) Elsevier, India.
6. Introductory Practical Biochemistry by S.K. Sawhney & R. Singh (2014). Narosa Publishers
7. Practical Biochemistry by David Plummer (2001). Tata Mc-Graw Hill
8. Biochemical Methods, 3rd edition, by Sadasivam & Manickam (2018) New Age International (P) Ltd.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	II		
Name of the Course	Human Values and Ethics		
Course Code	B-VAC-101		
Course Type:	VAC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • The Need, Content and Process for Value Education. • The Human Values and Ethics • The theories of Integrated Personality and Well-being • The Professional Ethics and Global Citizenship		
Credits	Theory	Practical	Total
	2	0	2
Contact Hours	2	0	2
Max. Marks: 50 Internal Assessment Marks:15 End Term Exam Marks: 35		Time: T-1 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours
I	Course Introduction - Need, Content and Process for Value Education. Understanding the need, content and process for Value Education. (Students should be aware of the difference among skills, values and ethics and their respective needs in life.). Classification of Value Education: understanding Personal Values, Social Values, Moral Values & Spiritual Values; Understanding the difference between ideology and values. Understanding Harmony with self, Society and Nature. Practical: Debate and discussion on the need and nature of value		7

	education; Students should be encouraged to find and analyze suitable case studies to Understand various types of values	
II	Human Values and Ethics • Meaning and nature of human values; Significance of human values in life; • Relation between values and ethics. • Relevance of Human values: Integrity Empathy, Loksangrah, Brahmvihara. • Theory of Naya (Jainism), Deontology, Virtue Ethics, Utilitarianism • Practical: Students should be divided in small groups and should be motivated to reflect upon their values. Teacher should make an environment to make them realize that everyone has a set of values arisen from their family, social, cultural, religious, and political contexts, some of which correspond to more “human” and “universal” frameworks. This exercise is to encourage students to articulate their values and put them into conversation with values from other contexts	8
III	Integrated Personality and Well-being • Understanding the relationship among: Self, Identity and Personality. • Understanding Integrated Personality – with the three gunas theory of Sankhya, the four • Antah-karanas (inner instruments) in Yoga, and Panchkosha (five sheaths) in Upanishad. • Approaching comprehensive understanding of well-being and its relation to Happiness. • Practical: Bhramadhyana Dhyana, Chakra Dhyana, Preksha Dhyana, Sakshi Bhava Dhyana, Vipassana, Yog Nidra, Partipakshabhava (yogic way of cognitive restructuring).	8
IV	Professional Ethics and Global Citizenship • Nature, characteristics and scope of professional ethics; Types of Professional Ethics • Professional Values: Trusteeship, Inclusiveness, Commitment, Sustainability, Accountability, Transparency, Impartiality. • Values for Global Citizenship: Equality, Justice, and Human Dignity. • Nature and need of competency based education; Types of Competencies, Core • Competencies: communication, teamwork, planning and achieving goals, Functional • Competencies: analytical thinking, knowledge sharing and learning, decision making, partnership building	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory- • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam:7 ➤ Practicum - • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.:		End Term Examination: ➤ 35 Marks
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Gaur, R. R., Sangal, R., & Bagaria, G. P. (2009). *A foundation course in human values and professional ethics*. Excel Books.
- Kiran, D. R. (2014). *Professional ethics and human values*. McGraw Hill Education (India).
- National Institute of Open Schooling. (n.d.). *Happiness and well-being* (Module V: Health and well-being). NIOS.
- Salagame, K. K. K. (2016). Meaning and well-being: Indian perspectives. *Journal of Constructivist Psychology*, 29(3), 267–274.
- McAdams, D. P., Trzesniewski, K., Lilgendahl, J., Benet-Martínez, V., & Robins, R. W. (2021). Self and identity in personality psychology. *Personality Science*, 2, Article e6035.
- Kumar, S. K. K. (2003). An Indian conception of well-being. In J. Henry (Ed.), *European positive psychology proceedings 2002* (pp. 27–34). Leicester, UK: British Psychological Society.
- Vignoles, V. L. (2017). Identity: Personal and social. In K. Deaux & M. Snyder (Eds.), *Oxford handbook of personality and social psychology* (2nd ed., pp. 289–316). Oxford University Press.
- 王, S.-C. (2020). Competency definitions, development and assessment: A brief review. *International Journal of Academic Research in Progressive Education and Development*, 9(3), 95–114.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Clinical Pathology		
Course Code	B25-MLT-301		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the principles and scope of clinical pathology in medical diagnostics. 2. Analyze urine, stool, and body fluids for normal and abnormal constituents. 3. Correlate biochemical and microscopic findings with clinical conditions. 4. Perform basic clinical pathology laboratory tests with accuracy. 5. Interpret pathological changes in relation to disease diagnosis.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour			
Unit	Topics		Contact hours
I	Introduction to Clinical Pathology : Definition, scope, and importance of clinical pathology in laboratory medicine. Basic principles of specimen		7

	collection, preservation, transport, and processing. Anticoagulants: types, uses, and effects on samples. Laboratory safety guidelines, biomedical waste disposal, and ethical considerations. Role of laboratory technicians in clinical decision-making.	
II	Urine Examination: Collection, preservation, and handling of urine samples., Physical examination: volume, color, clarity, odor, and specific gravity. Chemical examination: protein, glucose, ketone bodies, bile salts, bile pigments, blood, and urobilinogen. Microscopic examination: RBCs, WBCs, epithelial cells, casts, crystals, bacteria, and parasites	8
III	Stool Examination : Techniques of stool collection and preservation (formalin, polyvinyl alcohol fixative). Macroscopic analysis: color, consistency, presence of blood, mucus, pus, and adult helminths. Microscopic examination: saline and iodine wet mount for cysts and ova, concentration techniques (formol-ether sedimentation, zinc sulfate floatation). Staining techniques: Modified Ziehl–Neelsen stain for <i>Cryptosporidium</i> and <i>Cyclospora</i> . Occult blood testing and fecal fat estimation.	8
IV	Body Fluids : Collection and preservation of CSF, pleural, peritoneal, synovial, and pericardial fluids. CSF analysis: physical examination cell count biochemical analysis. Synovial fluid: viscosity test, mucin clot test, and crystal analysis Pleural/ascitic fluid: differentiation of transudate vs. exudate using Rivalta’s test and biochemical markers.	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Henry, J. B. (2017). <i>Henry’s clinical diagnosis and management by laboratory methods</i> (23rd ed.). Elsevier. 2. McPherson, R. A., & Pincus, M. R. (2021). <i>Henry’s clinical diagnosis and management by laboratory methods</i> (24th ed.). Elsevier. 3. Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2018). <i>Clinical chemistry: Principles, techniques, and correlations</i> (8th ed.). Wolters Kluwer. 4. Burtis, C. A., Brunis, D. E., & Tietz, N. W. (2018). <i>Tietz fundamentals of clinical chemistry and molecular diagnostics</i> (8th ed.). Elsevier. 5. Strasinger, S. K., & Di Lorenzo, M. S. (2019). <i>Urinalysis and body fluids</i> (6th ed.). F.A. Davis. 6. Rodak, B. F., Keohane, E. M., & Fritsma, G. A. (2020). <i>Hematology: Clinical principles and appli-</i>		

cations (6th ed.). Elsevier.

7. McKenzie, S. B., & Williams, J. L. (2022). *Clinical laboratory hematology* (4th ed.). Pearson.
8. Mundt, L. A., & Shanahan, K. (2020). *Graff's textbook of urinalysis and body fluids* (3rd ed.). Wolters Kluwer.
9. Cheesbrough, M. (2017). *District laboratory practice in tropical countries* (2nd ed.). Cambridge University Press.
10. Brunzel, N. A. (2018). *Fundamentals of urine and body fluid analysis* (4th ed.). Elsevier..

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Hematology and Blood Transfusion		
Course Code	B25-MLT-302		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Describe the composition and functions of blood and its formed elements. 2. Perform hematological tests including hemoglobin estimation, ESR, and differential counts. 3. Interpret peripheral blood smears and hematological findings in disease. 4. Apply principles of blood grouping, cross-matching, and safe transfusion practices. 5. Recognize hematological disorders and correlate them with diagnostic results.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours

I	Introduction to Hematology : Composition and functions of blood, Collection of blood: methods, anticoagulants, and storage, Normal values and variations in blood parameters	7
II	Hematological Techniques : Hemoglobin estimation (cyanmethemoglobin, Sahli's method, automated methods). Hematocrit (micro & macro methods). Total leukocyte count (TLC) and differential leukocyte count (DLC) Platelet count and reticulocyte count	8
III	Hemostasis and Coagulation Studies : Blood coagulation pathways (intrinsic and extrinsic). Bleeding time (BT), clotting time (CT), prothrombin time (PT),. Coagulopathies: hemophilia, DIC, vitamin K deficiency. Anticoagulants and fibrinolytic system	8
IV	Blood Grouping and Transfusion Medicine : ABO and Rh blood group systems – principles and techniques. Cross-matching and compatibility testing. Blood transfusion reactions – causes and management. Screening of donor blood for infectious diseases (HIV, HBV, HCV, syphilis, malaria). Blood bank organization and regulations	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - Hoffbrand, A. V., & Moss, P. A. H. (2019). <i>Essential haematology</i> (8th ed.). Wiley-Blackwell. - Greer, J. P., Arber, D. A., Glader, B. E., List, A. F., Means, R. T., Paraskevas, F., Rodgers, G. M., & Foerster, J. (2018). <i>Wintrobe's clinical hematology</i> (14th ed.). Wolters Kluwer. - Bain, B. J. (2017). <i>Blood cells: A practical guide</i> (5th ed.). Wiley-Blackwell. - Harmening, D. M. (2018). <i>Modern blood banking and transfusion practices</i> (7th ed.). F.A. Davis. - McKenzie, S. B., & Williams, J. L. (2022). <i>Clinical laboratory hematology</i> (4th ed.). Pearson. - Lichtman, M. A., Kipps, T. J., Kaushansky, K., Prchal, J. T., & Levi, M. (2016). <i>Williams hematology</i> (9th ed.). McGraw-Hill. - Rodak, B. F., Keohane, E. M., & Fritsma, G. A. (2020). <i>Hematology: Clinical principles and applications</i> (6th ed.). Elsevier. - Dacie, J. V., & Lewis, S. M. (2017). <i>Practical haematology</i> (12th ed.). Elsevier. - Hillyer, C. D., Silberstein, L. E., Ness, P. M., Anderson, K. C., & Roback, J. D. (2019). <i>Blood banking and transfusion medicine: Basic principles and practice</i> (3rd ed.). Elsevier. - Hoffbrand, A. V., Higgs, D. R., Keeling, D. M., & Mehta, A. B. (2023). <i>Postgraduate haematology</i> (8th ed.). Wiley-Blackwell.		

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Pathogenic Microbiology		
Course Code	B25-MLT-303		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the pathogenic mechanisms of bacteria, viruses, fungi, and parasites. 2. Perform culture, staining, and identification of medically important pathogens. 3. Interpret results of diagnostic microbiological tests. 4. Apply biosafety and aseptic techniques in handling pathogenic microbes. 5. Correlate microbial infections with their clinical presentations and diagnostic approaches.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour			
Unit	Topics		Contact hours
I	Introduction to Pathogenic Microbiology : Normal microbial flora of the human body. Opportunistic vs true pathogens. Pathogenesis: virulence		7

	factors, toxins, enzymes. Principles of host–pathogen interactions	
II	Bacterial Pathogens : Cocci: <i>Staphylococcus</i> , <i>Streptococcus</i> , <i>Neisseria</i> . Bacilli: <i>Corynebacterium</i> , <i>Mycobacterium</i> , <i>Bacillus</i> , <i>Clostridium</i> . Enterobacteriaceae: <i>Escherichia coli</i> , <i>Salmonella</i> , <i>Shigella</i> , <i>Klebsiella</i> , <i>Proteus</i> . <i>Vibrio</i> , <i>Pseudomonas</i> , <i>Haemophilus</i>	8
III	Viral Pathogens : General properties of viruses and viral replication. DNA viruses: Herpesvirus, Hepatitis B virus, Adenovirus. RNA viruses: Influenza virus, HIV, Hepatitis C, Rabies virus. Laboratory diagnosis of viral infections	8
IV	Fungal and Parasitic Pathogens : Medically important fungi: <i>Candida</i> , <i>Cryptococcus</i> , <i>Aspergillus</i> , <i>Dermatophytes</i> Protozoa: <i>Entamoeba histolytica</i> , <i>Giardia</i> , <i>Plasmodium</i> , <i>Leishmania</i> , <i>Trypanosoma</i> . Helminths: <i>Ascaris</i> , <i>Taenia</i> , <i>Hookworm</i> , <i>Schistosoma</i> . Diagnostic methods in medical parasitology and mycology	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2020). <i>Medical microbiology</i> (9th ed.). Elsevier. ● Brooks, G. F., Carroll, K. C., Butel, J. S., Morse, S. A., & Mietzner, T. A. (2021). <i>Jawetz, Melnick, & Adelberg's medical microbiology</i> (28th ed.). McGraw-Hill. ● Greenwood, D., Barer, M. R., Slack, R. C. B., & Irving, W. L. (2019). <i>Medical microbiology</i> (19th ed.). Elsevier. ● Ryan, K. J., & Ray, C. G. (2020). <i>Sherris medical microbiology</i> (8th ed.). McGraw-Hill. ● Tortora, G. J., Funke, B. R., & Case, C. L. (2021). <i>Microbiology: An introduction</i> (13th ed.). Pearson. ● Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., & Stahl, D. A. (2020). <i>Brock biology of microorganisms</i> (16th ed.). Pearson. ● Prescott, L. M., Harley, J. P., & Klein, D. A. (2019). <i>Prescott's microbiology</i> (11th ed.). McGraw-Hill. ● Goering, R. V., Dockrell, H. M., Zuckerman, M., Chiodini, P. L., & Roitt, I. (2018). <i>Mims' medical microbiology and immunology</i> (6th ed.). Elsevier. ● Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2019). <i>Prescott's principles of microbiology</i> (3rd ed.). McGraw-Hill. ● Koneman, E. W., Allen, S. D., Janda, W. M., Schreckenberger, P. C., & Winn, W. C. (2017). <i>Koneman's color atlas and textbook of diagnostic microbiology</i> (7th ed.). Wolters Kluwer.		

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Clinical Toxicology		
Course Code	B25-MLT-304		
Course Type:	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Describe principles of toxicology and classifications of poisons. 2. Identify common toxic agents and their effects on human systems. 3. Perform basic laboratory investigations for detection of poisons. 4. Apply toxicological knowledge in medico-legal and clinical cases. 5. Correlate toxicological findings with diagnosis and management of poisoning.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours
I	Introduction to Toxicology: Definition, scope, and significance of		7

	toxicology. Classification of poisons (corrosives, irritants, neurotoxic, cardiotoxic, nephrotoxic, hepatotoxic). Routes of entry, absorption, metabolism, and excretion of poisons. General principles of management of poisoning cases	
II	Common Poisons and Their Clinical Features : Inorganic poisons: arsenic, mercury, lead. Organic poisons: alcohols, cyanide, organophosphates, carbamates. Plant poisons: oleander, datura, aconite. Snake and insect venom	8
III	Laboratory Diagnosis of Poisoning : Specimen collection in poisoning cases (blood, urine, gastric lavage, viscera). Screening tests for common poisons. Chromatographic and spectrophotometric techniques. Role of forensic toxicology laboratory	8
IV	Antidotes and Management of Poisoning : Specific antidotes for common poisons (BAL, EDTA, atropine, naloxone, flumazenil). Supportive therapy: oxygenation, fluid replacement, ventilatory support. Role of gastric lavage, activated charcoal, and diuresis. Medicolegal importance of poisoning cases	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Klaassen, C. D. (Ed.). (2018). <i>Casarett & Doull's toxicology: The basic science of poisons</i> (9th ed.). McGraw-Hill. ● Hayes, A. W., & Kruger, C. L. (2019). <i>Hayes' principles and methods of toxicology</i> (7th ed.). CRC Press. ● Gupta, R. C. (2019). <i>Veterinary toxicology: Basic and clinical principles</i> (3rd ed.). Academic Press. ● Timbrell, J. (2021). <i>Introduction to toxicology</i> (4th ed.). CRC Press. ● Hodgson, E. (2018). <i>A textbook of modern toxicology</i> (5th ed.). Wiley-Blackwell. ● Barceloux, D. G. (2018). <i>Medical toxicology: Diagnosis and treatment of human poisoning</i> (3rd ed.). Wiley-Blackwell. ● Ballantyne, B., Marrs, T. C., & Syversen, T. (2021). <i>General and applied toxicology</i> (3rd ed.). Wiley-Blackwell. ● Hoffman, R. S., Howland, M. A., Lewin, N. A., Nelson, L. S., & Goldfrank, L. R. (2019). <i>Goldfrank's toxicologic emergencies</i> (11th ed.). McGraw-Hill.		

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	MICROTOMY		
Course Code	B23-SEC-321		
Course Type:	SEC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Students will have a thorough understanding of modern developments in microtomy. • Learners will be able to process animal samples for permanent slide preparation. • Students will gain knowledge regarding various biological stains. • Students will be able to localize histochemical components such as proteins, lipids, and nucleic acids. • Students will gain practical exposure to microtomy.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks: 75 Internal Assessment Marks: 15+5 End Term Exam Marks: 35+20		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours
I	Microtomy: Introduction, definition, history and applications in biological sciences		8

	Types of microtomes: Rotary microtome, Sledge microtome, and Cryomicrotome	
II	Collection and transportation of samples/specimens for histological examination. Basic concepts of fixation: Various types of fixatives used in microtomy. Process of fixation. Embedding and block formation	8
III	Section cutting: Paraffin section cutting. Stretching: Spreading the sections and attachment to the glass slides. Staining – Principle and procedure. Preparation of stains and solvents	7
IV	General staining procedures for paraffin-embedded tissue. Nuclear stains and cytoplasmic stains. Haematoxylin and Eosin staining. Mercury Bromophenol Blue staining. Toulidine Blue staining. Commonly used mountants in microtomy	7
V	Practical 1. Collection and labeling of histological samples/specimens 2. Demonstration of various parts and types of microtome 3. Preparation of various fixatives – Bouin's fluid, Corney's fluid, 10% Neutral formalin, Normal saline 4. Processing of tissue by manual method 5. Embedding and casting of block, section cutting, and stretching 6. Performing and practicing staining: Haematoxylin and Eosin staining, Mercury Bromophenol Blue staining Toulidine Blue staining 7. Study of permanent slides of different tissues	30

Suggested Evaluation Methods

Internal Assessment: ➤ Theory- ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum - ● Class Participation:NA ● Seminar/Demonstration/Viva-voce/Lab records etc.:5	End Term Examination: 55 ➤ Theory-35 ➤ Practical-20

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Seligman, M. E. P. (2002). *Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment*. Free Press.
- Selin, H., & Davey, G. (2012). *Happiness across cultures*. Springer.
- Lama, H. H., & Cutler, H. C. (2009). *The art of happiness: A handbook of living* (10th anniversary ed.). Riverhead Books.
- Clark, A. E., Flèche, S., Layard, R., Powdthavee, N., & Ward, G. (2019). *The origins of happiness*. Princeton University Press.
- Yew-Kwang, N. (2022). *Happiness: Concept, measurement and promotion*. Springer.

Part A - Introduction				
Subject		Medical Lab Technology		
Semester		III		
Name of the Course		BIOCHEMISTRY OF LIFESTYLE DISEASES		
Course Code		B23-BCH-303		
Course Type:		MDC		
Level of the course (As per Annex-ure-I)		200-299		
Pre-requisite for the course (if any)		Students appeared in B.Sc. 2 nd semester		
Course Learning Outcomes(CLO):		After completing this course, the learner will be able to: • Demonstrate the knowledge of various types of lifestyle diseases; corelation among lifestyle and metabolic disorders. • Give an insight on Diabetes and cancer (lifestyle factors, exercise and management. • Know about the diet and lifestyle interventions in management of heart diseases • Understand and analyse the relationship of sedentary life-style and metabolism and significance of physical exercise in maintaining good health. • An understanding of qualitative analysis of normal and abnormal constituents of urine, quantitative analysis of constituents of blood.		
Credits		Theory	Practical	Total
		2	1	3
Contact Hours		2	2	4
Max. Marks: 75 Internal Assessment Marks: 15+5 End Term Exam Marks: 35+20			Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course				
Instructions for Paper- Setter				
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.				
Unit	Topics			Contact hours

I	Overview of lifestyle diseases: Impact of lifestyle diseases on public health, economy and society. Obesity and metabolic syndrome: Molecular mechanisms linking lifestyle factors (diet, physical activity) to metabolic disorders.	8
II	Diabetes: Role of diet, exercise, and other lifestyle factors in diabetes management. Cancer: Lifestyle factors influencing cancer development; Diet and lifestyle interventions in management of cancer.	8
III	Heart diseases and atherosclerosis development: Diet and lifestyle interventions in management of these diseases.	7
IV	Modern Lifestyle and Exercise: Impact of physical inactivity on metabolism and health; Biochemical changes induced by exercise and physical activity; Exercise prescription and its role in preventing lifestyle diseases.	7
V	Practical 1. Qualitative analysis of sugar in urine. 2. Monitoring blood pressure (systolic and diastolic) using sphygmomanometer. 3. Estimation of hemoglobin. 4. Monitoring oxygen level and heart rate during and after exercise.	30

Suggested Evaluation Methods

Internal Assessment: ➤ Theory- • Class Participation: • Seminar/presentation/assignment/quiz/class test etc.: • Mid-Term Exam: ➤ Practicum - • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: • Mid term exam	End Term Examination: Written theory examination will be conducted as per scheme. Evaluation of the practical skill will be done by an external examiner.

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- **Teitz Textbook of Clinical Chemistry**, 6th edition, Carl A. Burtis and Edward R. Ashwood, W. B. (2017). Saunders Company.
- **Harper's Biochemistry**, by R.K. Murray, P.A. Hayes, D.K. Granner, P.A. Mayes and V.W. Rodwell (2003). Prentice Hall International.
- **Textbook of Biochemistry with Clinical Correlations**, 5th edition, by T.M. Devlin (2002). Wiley-Liss.
- **Biochemistry**, 4th edition, by U. Satyanarayana (2013). Books and Allied (P) Ltd.
- **Textbook of Biochemistry and Human Biology**, 3rd edition, Talwar G.P., Srivastava L.M. and Moudgil K.D. (2002). Prentice-Hall of India Private Limited, New Delhi, India.
- **Introductory Practical Biochemistry**, by S.K. Sawhney & R. Singh (2014). Narosa Publishers.
- **Biochemical Methods**, 3rd edition, by Sadasivam & Manickam (2018). New Age International (P) Ltd.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	III		
Name of the Course	Environmental Studies		
Course Code	B23-VAC-201		
Course Type:	VAC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: After completing this course, the learner will be able to: 1. Understand the concept of environmental studies, sustainable development and ecosystem. 2. Learn about the various natural resources and about biodiversity and its conservation. 3. Know about the types of pollution, solid waste management, global environmental issues and environmental laws. 4. Understand the concept of population growth and its impacts on environment and disaster management.		
Credits	Theory	Practical	Total
	2	NA	2
Contact Hours	2	NA	2
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35		Time: T-1 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour			
Unit	Topics		Contact hours
I	Introduction to environmental studies: Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development. Ecosystems: Definition, structure and function of ecosystem; Energy flow in an ecosystem: food		6

	chains, food webs, Major ecosystems types: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (lakes, rivers, oceans).	
II	Natural resources: Renewable and Non- renewable Resources Land resources: Land degradation and soil erosion. Forest resources: Importance of forests, deforestation: causes and impacts on environment. Water resources: Use and over- exploitation of surface and ground water. Energy resources: Renewable and non- renewable energy sources. Biodiversity and Conservation: Definition and its types, Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation o biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational values.	9
III	Environmental pollution Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution. Solid waste management: Sources, methods of disposal: Landfill, incineration and composting. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environmental Policies & Practices Environmental laws: Environment (Protection) Act, 1986, Air (Prevention & Control of Pollution) Act, 1981, Water (Prevention and control of Pollution) Act, 1974.	8
IV	Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected person. Disaster management: floods, earthquake, cyclones, landslides and drought. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation	7
Suggested Evaluation Methods		
Internal Assessment:15 marks ➤ Theory ☐ ● Class Participation: 4 marks ☐ ● Seminar/presentation/assignment/quiz/class test etc.: 4marks ☐ ● Mid-Term Exam: 7 marks		End Term Examination: Theory: 35 marks (Written exam)
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Kaushik, A & Kaushik, C.P. 2022. Perspectives in Environmental Studies. New Age International Pvt Ltd, New Delhi. 2. Bharucha, E. 2021. A Textbook of Environmental Studies for Undergraduate Courses, Orient Blackswan Pvt Ltd. 3. Goswami, P., Mandal, J. & Singh, S. 2022. A Textbook on Environmental Studies, Ashok book stall, Assam. 4. Joshi, P.C. & Joshi, N. 2009. A Text Book of Environmental Science. APH Publishing Corporation.		

5. Basu, M. & Xavier Savarimuthu, S.J. 2017. Fundamentals of Environmental Studies. Cambridge University Press.
6. Singh, R.P. & Islam, Z. 2012. Environmental Studies. Concept Publishing Company.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	IV		
Name of the Course	Clinical Biochemistry		
Course Code	B25-MLT-401		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain biochemical principles underlying normal and pathological processes in the human body. 2. Demonstrate competence in qualitative and quantitative biochemical analysis of blood, urine, and other body fluids. 3. Interpret biochemical test results in the context of clinical diagnosis (e.g., liver, kidney, pancreatic, cardiac function tests). 4. Apply knowledge of enzymology, endocrinology, and clinical biochemistry in disease correlation. 5. Maintain accuracy, precision, and quality control in biochemical laboratory testing.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			

Unit	Topics	Contact hours
I	Introduction & Basics: Scope and applications of clinical biochemistry in diagnostics. Collection of blood and body fluid samples – methods, precautions. Anticoagulants: EDTA, heparin, fluoride, citrate – uses and limitations. Serum vs. plasma: preparation and differences. Quality control in biochemical analysis: internal vs. external QC	7
II	Carbohydrate Metabolism & Disorders : Principles of glucose estimation methods (glucose oxidase, O-toluidine). Normal and abnormal blood glucose levels (FBS, PPBS, RBS). Glucose tolerance test (GTT) – procedure, interpretation, clinical relevance. Diabetes mellitus: biochemical basis, diagnostic criteria, complication	8
III	Protein & Lipid Metabolism : Plasma proteins – normal values, electrophoresis, clinical significance. Albumin, globulin, and A/G ratio in disease conditions. Non-protein nitrogenous substances: urea, uric acid, creatinine – renal function tests. Lipid profile: serum cholesterol, triglycerides, HDL, LDL, VLDL. Role of lipid profile in cardiovascular risk assessment	8
IV	Liver & Enzyme Function Tests: Liver function tests: bilirubin (direct & indirect), SGOT, SGPT, ALP. Enzymes in clinical diagnosis: amylase in pancreatitis, CK-MB in cardiac injury, LDH in tissue damage. Clinical interpretation of abnormal enzyme values. Case correlations: diabetes, jaundice, renal failure	7
V	Practical 1. Perform estimation of blood glucose using GOD-POD method and compare with glucose oxidase strips. 2. Estimate serum cholesterol and interpret clinical relevance. 3. Determine serum total protein and albumin by Biuret method. 4. Assess liver function through estimation of serum bilirubin and SGOT/SGPT levels. 5. Estimate kidney function markers: serum creatinine and blood urea. 6. Measure serum electrolytes (Na^+, K^+, Cl^-) using flame photometry. 7. Determine serum calcium and phosphorus levels. 8. Carry out lipid profile (triglycerides, HDL, LDL, VLDL) analysis. 9. Practice preparation and standardization of buffers and reagents. 10. Operate semi-automated biochemistry analyzer and interpret generated reports.	
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Burtis, C. A., Ashwood, E. R., & Bruns, D. E. (2012). <i>Tietz Textbook of Clinical Chemistry and Molecular Diagnostics</i> (5th ed.). Elsevier. 2. Kaplan, L. A., & Pesce, A. J. (2010). <i>Clinical Chemistry: Theory, Analysis, Correlation</i> (5th ed.). Mosby. 3. Devlin, T. M. (2010). <i>Textbook of Biochemistry with Clinical Correlations</i> (7th ed.). Wiley. 4. Murray, R. K., Bender, D., Botham, K. M., Kennelly, P. J., Rodwell, V. W., & Weil, P. A. (2018). <i>Harper's Illustrated Biochemistry</i> (31st ed.). McGraw-Hill. 5. Gaw, A., Murphy, M. J., Cowan, R. A., O'Reilly, D. S. J., & Stewart, M. J. (2013). <i>Clinical Biochemistry: An Illustrated Colour Text</i> (5th ed.). Churchill Livingstone. 6. Varley, H., Gowenlock, A. H., & Bell, M. (2012). <i>Varley's Practical Clinical Biochemistry</i> (6th ed.). CBS Publishers. 7. Marshall, W. J., & Lapsley, M. (2014). <i>Clinical Biochemistry: Metabolic and Clinical Aspects</i> (3rd ed.). Churchill Livingstone. 8. Price, C. P., Christenson, R. H., & Lamb, E. J. (2017). <i>Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics</i> (8th ed.). Elsevier. 9. Bissell, M. G. (2014). <i>Clinical Chemistry: Principles, Techniques, and Correlations</i> (7th ed.). Wolters Kluwer. 10. Henry, J. B. (2011). <i>Clinical Diagnosis and Management by Laboratory Methods</i> (22nd ed.). Saunders.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	IV		
Name of the Course	Parasitology and Diagnostic Microbiology		
Course Code	B25-MLT-402		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Identify and classify medically important parasites, bacteria, fungi, and viruses relevant to clinical diagnosis. 2. Perform diagnostic procedures such as stool, urine, and blood examination for parasites. 3. Apply culture, staining, and biochemical methods for pathogen detection. 4. Correlate laboratory findings with parasitic and microbial diseases. 5. Implement biosafety measures and proper specimen handling in parasitology and microbiology laboratories.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours

I	Introduction : Scope of medical parasitology and diagnostic microbiology. Types of parasites: protozoa, helminths, ectoparasites – definitions and examples. Collection, preservation, and transport of stool, urine, and blood samples. Safety measures in handling parasitological specimens	7
II	Protozoan Infections : – Life cycle, pathogenesis, diagnostic tests of Amoebiasis: <i>Entamoeba histolytica</i> Giardiasis: <i>Giardia lamblia</i> , Trichomoniasis: <i>Trichomonas vaginalis</i> , Malaria: <i>Plasmodium species</i> , Kala-azar: <i>Leishmania donovani</i> .	8
III	Helminths & Others : Roundworms <i>Ascaris lumbricoides</i> . Hookworm, <i>Enterobius vermicularis</i> , Tapeworms: <i>Taenia saginata</i> , <i>Taenia solium</i> , Filaria: <i>Wuchereria bancrofti</i> . Ectoparasites: lice, mites, scabies – morphology and diagnosis	8
IV	Diagnostic Microbiology :Clinical sample collection (urine, sputum, pus, throat swabs, CSF, blood). Culture techniques: streak plate, spread plate, selective/differential media. Common diagnostic media: blood agar, MacConkey agar, Sabouraud's agar. Staining methods: Gram stain, Ziehl–Neelsen stain (AFB), Lactophenol cotton blue (fungi). Interpretation of culture and microscopy results	7
V	Practical: 1. Prepare and examine stool samples for ova, cysts, and parasites by saline and iodine mount. 2. Perform concentration techniques for stool examination (formalin-ether and zinc sulfate flotation). 3. Identify malaria parasites in stained blood smears. 4. Prepare and stain thin and thick smears for detection of protozoa and helminths. 5. Demonstrate collection, transport, and processing of stool, urine, and blood samples for parasitology. 6. Identify medically important helminths and protozoa using permanent slides. 7. Perform culture techniques for intestinal protozoa and helminths. 8. Use rapid diagnostic tests (RDTs) for detection of malaria and other parasitic infections. 9. Prepare reports of common parasitic infestations from clinical specimens. 10. Maintain parasite culture and preservation of samples for diagnostic use.	
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Garcia, L. S. (2016). <i>Diagnostic Medical Parasitology</i> (6th ed.). ASM Press. 2. Chiodini, P. L., Moody, A. H., & Manser, D. W. (2014). <i>Atlas of Medical Helminthology and Protozoology</i> (4th ed.). Churchill Livingstone. 3. Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2020). <i>Medical Microbiology</i> (9th ed.). Elsevier. 4. Winn, W. C., Allen, S. D., Janda, W. M., Koneman, E. W., Procop, G. W., Schreckenberger, P. C., & Woods, G. L. (2006). <i>Koneman's Color Atlas and Textbook of Diagnostic Microbiology</i> (6th ed.). Lippincott Williams & Wilkins. 5. Ash, L. R., & Orihel, T. C. (2007). <i>Atlas of Human Parasitology</i> (5th ed.). American Society of Clinical Pathologists Press. 6. Cox, F. E. G. (2017). <i>Modern Parasitology</i> (2nd ed.). Wiley-Blackwell. 7. Greenwood, D., Barer, M., Slack, R., & Irving, W. (2017). <i>Medical Microbiology</i> (19th ed.). Churchill Livingstone. 8. Garcia, L. S., & Bruckner, D. A. (2016). <i>Diagnostic Parasitology for Medical Laboratory Technologists</i> (2nd ed.). Elsevier. 9. Parija, S. C. (2014). <i>Textbook of Medical Parasitology: Protozoology and Helminthology</i> (4th ed.). CBS Publishers. 10. Cheesbrough, M. (2006). <i>District Laboratory Practice in Tropical Countries: Part 1 & 2</i>. Cambridge University Press.	

Part A - Introduction				
Subject		Medical Lab Technology		
Semester		IV		
Name of the Course		Immunology and Serology		
Course Code		B25-MLT-403		
Course Type:		CC		
Level of the course (As per Annexure-I)		100-199		
Pre-requisite for the course (if any)				
Course Learning Outcomes(CLO):		After completing this course, the learner will be able to: 1. Explain the structure, function, and regulation of the immune system. 2. Differentiate between innate and adaptive immune responses and their clinical relevance. 3. Perform immunological and serological tests such as agglutination, precipitation, ELISA, and immunofluorescence. 4. Interpret serological test results in the diagnosis of infectious and autoimmune diseases. 5. Apply immunology principles in transfusion medicine, vaccination, and immunodiagnostics.		
Credits		Theory	Practical	Total
		2	2	4
Contact Hours		2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)			Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course				
Instructions for Paper- Setter The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.				
Unit	Topics			Contact hours

I	Introduction to Immunology: Concept of innate and adaptive immunity, Primary and secondary immune responses, Antigens: types, properties, determinants, Antibodies: structure, classes (IgG, IgM, IgA, IgE, IgD), Cells of the immune system: T cells, B cells, macrophages, NK cells	7
II	Antigen–Antibody Reactions: Precipitation reactions (ring test, gel diffusion). Agglutination reactions (slide and tube methods, latex agglutination). Complement system: components, functions, pathways (classical, alternative). Neutralization tests and opsonization. ELISA principle and applications in diagnostics	8
III	Hypersensitivity & Immunodeficiency: Type I: anaphylaxis and allergy, Type II: cytotoxic reactions (transfusion reactions), Type III: immune complex diseases, Type IV: delayed type (tuberculin test). Immunodeficiency: HIV/AIDS – pathogenesis and diagnosis	8
IV	Clinical Serology & Diagnostics : VDRL test for syphilis. Widal test for typhoid fever. ASO titer, CRP, RA test – clinical relevance. Rapid card tests: HIV, HBsAg, HCV, Dengue, Malaria. Quality control and interpretation of serological results	7
V	Practical: 1. Perform Widal test for diagnosis of enteric fever. 2. Carry out VDRL test for syphilis detection. 3. Perform Latex agglutination tests for CRP and RF detection. 4. Conduct ELISA for detection of infectious diseases (e.g., HIV, Hepatitis B). 5. Perform blood grouping and Rh typing using slide/tube/gel methods. 6. Practice antigen-antibody precipitation techniques in agar gel. 7. Demonstrate immunodiffusion and immunoelectrophoresis. 8. Perform rapid card tests for detection of HBsAg, HIV, and HCV. 9. Demonstrate complement fixation test (simulation/observation-based if facilities limited). 10. Maintain proper documentation and interpretation of serological test reports.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10		End Term Examination:70 ➤ Theory-35 ➤ Practical-35

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Abbas, A. K., Lichtman, A. H., & Pillai, S. (2019). *Cellular and Molecular Immunology* (9th ed.). Elsevier.
2. Male, D., Brostoff, J., Roth, D. B., & Roitt, I. (2017). *Immunology* (9th ed.). Elsevier.
3. Owen, J. A., Punt, J., & Stranford, S. A. (2018). *Kuby Immunology* (8th ed.). W. H. Freeman.
4. Delves, P. J., Martin, S. J., Burton, D. R., & Roitt, I. M. (2017). *Roitt's Essential Immunology* (13th ed.). Wiley-Blackwell.
5. Kindt, T. J., Goldsby, R. A., Osborne, B. A., & Kuby, J. (2013). *Kuby Immunology* (7th ed.). W. H. Freeman.
6. Abbas, A. K., & Lichtman, A. H. (2014). *Basic Immunology: Functions and Disorders of the Immune System* (5th ed.). Elsevier.
7. Brostoff, J., Male, D., & Roth, D. B. (2013). *Clinical Immunology* (5th ed.). Elsevier.
8. Paul, W. E. (2013). *Fundamental Immunology* (7th ed.). Lippincott Williams & Wilkins.
9. Barrett, A. J., & Bollard, C. M. (2017). *Immunology and Immunotherapy of Cancer* (2nd ed.). Elsevier.
10. Murphy, K., & Weaver, C. (2016). *Janeway's Immunobiology* (9th ed.). Garland Science.

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	IV		
Name of the Course	Clinical Laboratory Operation and Management		
Course Code	B25-MLT-404		
Course Type:	CC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain principles of laboratory organization, workflow, and management. 2. Apply quality assurance, quality control, and accreditation guidelines in laboratory operations. 3. Demonstrate knowledge of biosafety, biomedical waste management, and legal/ethical issues in clinical labs. 4. Utilize laboratory information systems and modern record-keeping practices. 5. Develop teamwork, communication, and managerial skills for effective clinical laboratory functioning.		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
Max. Marks: 100 Internal Assessment Marks:30 (15T+15P) End Term Exam Marks: 70 (35T+35P)		Time: T-1 hrs P-2 hrs	
Part B- Contents of the Course			
Instructions for Paper- Setter			
The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour			
Unit	Topics		Contact hours

I	Laboratory Organization : Types of laboratories: primary health center lab, hospital lab, reference lab. Role of medical laboratory technician in diagnostics. Laboratory infrastructure: sections (clinical chemistry, hematology, microbiology, histopathology). Biosafety levels (BSL-1 to BSL-4) and their applications	7
II	Quality Management: Internal quality control (IQC): Levey–Jennings charts, Westgard rules. External quality assessment schemes (EQAS). Calibration of balances, pipettes, centrifuges, spectrophotometers. SOPs: importance and implementation in labs. Documentation: log books, QC charts, lab reports	8
III	Laboratory Administration: Record keeping: patient registers, test reports, storage. Workload management: prioritization of emergency vs. routine tests. Staff scheduling and training. Inventory management: reagents, consumables, glassware, and kits. Purchase and supply chain system in laboratories	8
IV	Ethics, Regulations, and Management : Biomedical waste management rules: segregation, collection, disposal. Legal and ethical aspects: patient confidentiality, informed consent, errors and reporting. Laboratory accreditation systems: NABL, ISO. Professional ethics and good laboratory practices (GLP). Teamwork, communication, and leadership in lab settings	7
V	Practical: 1. Maintain laboratory registers and records for clinical reporting. 2. Prepare laboratory SOPs (Standard Operating Procedures) for biochemical, microbiological, and hematological tests. 3. Demonstrate quality control (internal and external QC) in clinical chemistry. 4. Perform calibration of pipettes, balances, and spectrophotometers. 5. Manage inventory and stock registers for laboratory consumables. 6. Demonstrate sample collection, labeling, barcoding, and report dispatch procedures. 7. Practice biomedical waste segregation according to color coding. 8. Perform laboratory audit exercise (mock audit for quality compliance). 9. Demonstrate safety protocols for handling infectious samples (PPE, biosafety cabinet, spill management). 10. Prepare a mock NABL documentation file for laboratory accreditation.	
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory-15 ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7 ➤ Practicum -15 ● Class Participation:5 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10	End Term Examination:70 ➤ Theory-35 ➤ Practical-35
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. McKenzie, S. B., & Williams, J. L. (2019). <i>Clinical Laboratory Hematology</i> (4th ed.). Pearson. 2. Lundberg, G. D. (2014). <i>Managing the Clinical Laboratory</i> (2nd ed.). ASCP Press. 3. Harmening, D. M. (2018). <i>Clinical Laboratory Management</i> (2nd ed.). F. A. Davis. 4. Da Rin, G., & Zerah, S. (2018). <i>Management of Medical Laboratories: A Guide</i> (2nd ed.). Springer. 5. Ward-Cook, K., Lehman, C. A., & Wilson, M. L. (2014). <i>Laboratory Administration for Pathologists</i> (2nd ed.). CAP Press. 6. WHO. (2011). <i>Laboratory Quality Management System: Handbook</i>. World Health Organization. 7. Cheesbrough, M. (2010). <i>District Laboratory Practice in Tropical Countries: Part 1 & 2</i>. Cambridge University Press. 8. Strasz, R. H., & Bennett, B. D. (2017). <i>Laboratory Management: Principles and Processes</i> (3rd ed.). Pearson. 9. Quirk, R., & Forthofer, R. (2015). <i>Quality in Laboratory Medicine</i> (2nd ed.). Springer. 10. Rodney, G., & Kaplan, L. (2013). <i>Accreditation and Quality Assurance in Clinical Laboratories</i>. Springer.	

Part A - Introduction			
Subject	Medical Lab Technology		
Semester	IV		
Name of the Course	Art of Happiness		
Course Code	B23-VAC-402		
Course Type:	VAC		
Level of the course (As per Annex-ure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • Get awareness regarding nature, sources and factors affecting happiness. • Understand the role of culture in happiness and relationship happiness and money • Develop insight about happiness as a intrinsic value, age relationship with happiness and ways to increase happiness • Know about key indicators and index of happiness and status of happiness in INDIA.		
Credits	Theory	Practical	Total
	2	0	2
Contact Hours	2	0	2
Max. Marks: 50 Internal Assessment Marks:15 End Term Exam Marks: 35		Time: T-1 hrs	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The question paper will consist of THIRTY-FIVE questions of one mark each, and the candidate will be required to attempt all questions. The questions will be of multiple-choice type (MCQ) and uniformly spread over the entire syllabus. The questions shall be distributed proportionally among the four units, ensuring balanced coverage of each unit. The duration of the exam will be of 1 hour.			
Unit	Topics		Contact hours
I	Happiness: Definition and Nature, Sources of Happiness, Factors Affecting Happiness.		7
II	Culture and Happiness, Eastern and Western Approaches to Happiness,		7

	Relationship Between Happiness and Money	
III	Happiness as Intrinsic value Age and Happiness, Ways to Increase Happiness	7
IV	Measuring Happiness: Key indicators, Happiness index, Happiness in India	7
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory- ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.:4 ● Mid-Term Exam:7		End Term Examination: ➤ 50 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ● Seligman, M. E. P. (2002). <i>Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment</i>. Free Press. ● Selin, H., & Davey, G. (2012). <i>Happiness across cultures</i>. Springer. ● Lama, H. H., & Cutler, H. C. (2009). <i>The art of happiness: A handbook of living</i> (10th anniversary ed.). Riverhead Books. ● Clark, A. E., Flèche, S., Layard, R., Powdthavee, N., & Ward, G. (2019). <i>The origins of happiness</i>. Princeton University Press. ● Yew-Kwang, N. (2022). <i>Happiness: Concept, measurement and promotion</i>. Springer.		

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A++’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धिं व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Modified Scheme of Examination (5th and 6th Semester) for Under-
Graduate Programmes
Bachelor of Vocation (B.Voc.) (SOFTWARE DEVELOPMENT):
SCHEME D
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based
Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

Kurukshetra University Kurukshetra
Modified Scheme of Examination (5th and 6th Semester) for Undergraduate programmes
Subject: B.Voc. (Software Development)
According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships, and Choice Based Credit System)

Sem	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T + P
5	CC-A5	B23-CSD-501	Software Engineering	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-B5	B23- CSD-502	Back-end Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-C5	B23- CSD -503	Computer Graphics	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M5(V)	To be taken from VOC Pool							
6	CC-A6	B23- CSD -601	Programming using Python	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-B6	B23- CSD -602	Advanced Web Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-C6	B23- CSD -603	Mobile App Development	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M6	B23- CSD -604	Introduction to Design Thinking	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M7(V)	To be taken from VOC Pool							

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समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (5th & 6th Semester) for Under-Graduate Programmes
Bachelor of Vocation (B.Voc.(Software Development))
Scheme D
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	B.Voc.(Software Development)		
Semester	V		
Name of the Course	Software Engineering		
Course Code	B23-CSD-501		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Knowledge of any Programming language		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn the various models for software development. 2. understand how to analyze software. 3. plan a software design and the risks associated with software. 4. test and validate software 5*. Implement the various tools and techniques used in software engineering.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction: Program vs. Software, Software Engineering, Programming paradigms, Software Crisis – problem and causes, Phases in Software development: Requirement Analysis, Software Design, Coding, Testing, Maintenance, Software Development Process Models: Waterfall, Prototype, Evolutionary and Spiral models, Role of Metrics.	11
II	Feasibility Study, Software Requirement Analysis and Specifications: SRS, Need for SRS, Characteristics of an SRS, Components of an SRS, Problem Analysis, Information gathering tools, Requirement specification, validation and metrics. Structured Analysis and Tools: Data Flow Diagram, Data Dictionary, Decision table, Decision trees, Structured English, Entity-Relationship diagrams	11
III	Software Project Planning: Cost estimation: COCOMO model, Project scheduling, Staffing, and personnel planning, team structure, Software configuration management, Quality assurance plans, Project monitoring plans, Risk Management. Software Design: Design fundamentals, problem partitioning, and abstraction, design methodology, Cohesion & Coupling.	12
IV	Software testing strategies: unit testing, integration testing, Validation testing, System testing, Alpha and Beta testing. Software Maintenance: Type of maintenance, Management of Maintenance, Maintenance Process, maintenance characteristics.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Development of 0-level DFD • Development of 1 level DFD • Development of 2-level DFD • data dictionary, • E-R diagram for Student Teacher Relationship • E-R diagram for Library Management, • Draw an ER Diagram for the Hospital Management System. • ER diagram for (ANY 5) • Student Result Management System • Library management system • Inventory control system • Accounting system • Fast food billing system • Bank loan system • Blood bank system • Railway reservation system • Automatic teller machine • Video library management system • Hotel management system • Hostel management system	30

	• E-ticking • Share online trading • Hostel management system • Resource management system • Court case management system	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Pressman R. S., “Software Engineering – A Practitioner’s Approach”, Tata McGraw Hill. • Jalote P., “An Integrated Approach to Software Engineering”, Narosa. • Sommerville, “Software Engineering”, Addison Wesley. • Fairley R., “Software Engineering Concepts”, Tata McGraw Hill. • James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons.		

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	B.Voc.(Software Development)		
Semester	V		
Name of the Course	Back-end Development		
Course Code	B23-CSD-502		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basics of Web-Development and DBMS		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the principles of back-end development. 2. Gain proficiency in back-end programming languages and frameworks. 3. Learn to design and manage databases. 4. Develop skills to create and use back-end applications. 5*. to equip with the knowledge of back-end programming.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.			

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to back-end Development: Overview of backend, Client-server architecture, Introduction to web servers and database Programming Languages and Tools: Introduction to server-side languages (e.g., Node.js), Syntax and semantics of chosen server-side language	11
II	Programming Languages: Version control with Git, Introduction to IDEs (Integrated Development Environments) of chosen language, Writing and executing basic server-side scripts Performance Optimization and Security: Caching strategies, Query optimization	11
III	Database Management: Introduction to databases and DBMS (SQL and NoSQL), Designing a database schema, CRUD operations (Create, Read, Update, Delete), Connecting applications to a database	11
IV	Server-Side Frameworks: Overview of popular server-side frameworks (e.g., Express.js), Building a simple application using a framework. API Development: RESTful API concepts, Designing and documenting APIs, Authentication and authorization basics Web security best practices (SQL injection, XSS, CSRF)	12
V*	The following activities be carried out/ discussed in the lab during the initial period of the semester. Programming Lab: • Introduction to Backend Technologies: Objective: Familiarize students with backend technologies and tools. ○ Setup development environment (e.g., IDE, Git). ○ Create a simple “Hello World” backend application in Node.js. • Working with Databases (SQL): Objective: Learn basic SQL operations and database interactions. ○ Set up MySQL/PostgreSQL database. ○ Perform CRUD operations using SQL queries (Create, Read, Update, Delete). • Working with NoSQL Databases: Objective: Introduce students to NoSQL databases. ○ Set up MongoDB database. ○ Implement CRUD operations using NoSQL commands. • Building RESTful APIs: Objective: Develop skills in designing and implementing RESTful APIs. ○ Create endpoints for CRUD operations.	30

	○ Implement basic authentication and authorization. • Web Frameworks (Choose one: Node.js or Express.js): Objective: Gain practical experience with backend frameworks. ○ Setup Node.js/Express.js project. ○ Implement a simple web application (Express.js or Node.js). • Integrating Frontend and Backend: Objective: Understand frontend-backend interaction. ○ Create API endpoints to serve JSON data. ○ Develop a frontend (HTML/CSS/JavaScript) to consume backend API. • Data Validation and Error Handling: Objective: Learn techniques for validating input data and handling errors. ○ Implement input validation using middleware (Express.js) or Node.js forms. ○ Handle errors and exceptions gracefully. • Security Best Practices: Objective: Implement security measures in backend applications. ○ Implement HTTPS/SSL configuration. ○ Prevent common security vulnerabilities (e.g., SQL injection, XSS).	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • "Node.js Design Patterns" by Mario Casciaro and Luciano Mammino • "Learning PHP, MySQL & JavaScript" by Robin Nixon • Online documentation and tutorials for the chosen programming language and frameworks • "Clean Code: A Handbook of Agile Software Craftsmanship" by Robert C. Martin • "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems" by Martin Kleppmann • "SQL Cookbook: Query Solutions and Techniques for Database Developers" by Anthony Molinaro • "High-Performance Browser Networking: What every web developer should know about networking and web performance" by Ilya Grigorik		

*Applicable for courses having practical component.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2024-25			
Part A - Introduction			
Subject	B.Voc.(Software Development)		
Semester	V		
Name of the Course	Computer Graphics		
Course Code	B23-CSD-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of computer		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the concepts of computer graphics 2. learn and implement point, line, and circle drawing algorithms. 3. acquire knowledge of two-dimensional transformations and line clipping algorithms. 4. understand 3-D graphics concepts and acquire skills for designing 3-D graphics 5*. to design programs based on theoretical concepts of Computer Graphics.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions in all, selecting one question from each unit. The first question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			

Part B- Contents of the Course		
Unit	Topics	Contact Hours
I	Introduction: History of Computer Graphics (CG), Applications of Computer Graphics, Components of interactive graphics systems Display devices: Refresh CRT, Color CRT, Plasma Panel displays LCD Panels, Raster-scan System, Random scan System, Graphic software, Input/Output Devices, Tablets	11
II	Output Primitives: Points and Lines, Line Drawing Algorithms: DDA algorithm, Bresenham's algorithm, Circle drawing Algorithms: Polynomial Method, Bresenham's algorithm. Parametric representation of Cubic Curves, Bezier Curves	11
III	2D Transformation: Use of Homogeneous Coordinates Systems, Composite Transformation: Translation, Scaling, Rotation, Mirror Reflection, Rotation about an Arbitrary Point. Clipping and Windowing, Clipping Operations. Line Clipping Algorithms: The Mid-Point subdivision method, Cohen-Sutherland Line Clipping Algorithms, Polygon Clipping, Sutherland Hodgeman Algorithms, Text Clipping.	12
IV	3-D Graphics: 3-D object representations, 3-D Transformations: Translation, Rotation, Scaling, Projections, Hidden surface elimination: Back face removal, Depth Buffer algorithm, Scan-line algorithm, Depth sort algorithm, Shading.	11
V*	The following activities be carried out/ discussed in the lab during the semester. Programming Lab: • Implement DDA line drawing algorithm for all types of slope. • Implement Bresenham's line drawing algorithm for all types of slopes. • Implement Bresenham's Circle drawing algorithm. • Implement Bresenham's Ellipse drawing algorithm. • Implement various 2-D transformations on objects like lines, rectangles, etc. • Implement to clip a line using the Mid-Point subdivision algorithm • Implement to clip a line using Cohen-Sutherland algorithm • Implement 3-D transformations on objects.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks:

	70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Donald Hearn, M. Pauline Baker, Computer Graphics, Pearson Education. • J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Pearson Education. • Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill. • Rogers, David F., Procedural Elements of Computer Graphics, McGraw Hill. • Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2024-25			
Part A - Introduction			
Subject	B.Voc.(Software Development)		
Semester	VI		
Name of the Course	Programming using Python		
Course Code	B23-CSD-601		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Knowledge of any Computer Programming Language		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the basic concepts of Python programming 2. learn various data structures used in Python programming. 3. develop the simple programs of Python using arrays and functions. 4. illustrate the process of data file manipulations using python 5* develop the programs using Python.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			
Unit	Topics		Contact Hours

I	Introduction to Python: Python Interpreter, Python as calculator, Python shell, Indentation, identifier and keywords, literals, strings, Operators: Arithmetic, Relational, Logical, comparison, Bitwise, Assignment, Identity operator and Membership operator; Input & output statements; Control statements: Branching, looping, Conditional statement, Exit function	11
II	String Manipulations: Subscript operator, indexing, slicing a string, other functions on strings, string module. Strings and number system: Format functions, converting strings to numbers & Vice Versa. List, Tuples, Sets, Dictionaries: Basic list operators, replacing, inserting, removing an element, searching, Sorting lists, dictionary literals, adding & removing keys, accessing & replacing values, traversing dictionaries.	11
III	Array in Python, Design with Functions: hiding redundancy, complexity, arguments & return values; Formal/Actual arguments, named arguments, program structure and design, Recursive functions, scope & Global statements, Importing modules, Math modules & Random modules.	11
IV	Exception Handling: Exceptions, except clause, try and finally clause, user-defined exceptions. File Handling: Manipulating files & directories, OS & SYS modules, Reading, writing text & numbers from/to file. Graphics: “Turtle” module, drawing colors, shapes, digital images, image file formats.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • WAP to find the roots of a quadratic equation. • WAP to accept a number ‘n’ and (a). Check if ‘n’ is prime (b). Generate all prime numbers till ‘n’ (c). Generate first ‘n’ prime numbers (d). This program may be done using functions. • WAP that accepts a character and performs the following: (a). print whether the character is a letter, numeric digit, or special character (b). if the character is a letter, print whether the letter is uppercase or lowercase (c). if the character is a numeric digit, print its name in the text (e.g., if the input is 9, the output is NINE) • WAP to perform the following operations on a string (a). Find the frequency of a character in a string. (b). Replace a character by another character in a string. (c). Remove the first occurrence of a character from a string. (d). Remove all occurrences of a character from a string. • WAP to swap the first n characters of two strings. • Write a function that accepts two strings and returns the indices of all the occurrences of the second string in the first string as a list. If the second string is not present in the first string, then it should return -1. • WAP to create a list of the cubes of only the even integers appearing in the input list (may have elements of other types also) using the following: (a). 'for' loop (b). list comprehension	30

	- WAP to read a file and (a). Print the total number of characters, words, and lines in the file. (b). Calculate the frequency of each character in the file. Use a variable of dictionary type to maintain the count. (c). Print the words in reverse order. (d). Copy even lines of the file to a file named 'File1' and odd lines to another file named 'File2'. - Write a function that prints a dictionary where the keys are numbers between 1 and 5 and the values are cubes of the keys. - Consider a tuple t1= (1, 2, 5, 7, 9, 2, 4, 6, 8, 10). WAP to perform the following operations: (a). Print half the values of the tuple in one line and the other half in the next line. (b). Print another tuple whose values are even numbers in the given tuple. (c). Concatenate a tuple t2= (11,13,15) with t1. (d). Return maximum and minimum values from this tuple - WAP to accept a name from a user. Raise and handle the appropriate exception(s) if the text entered by the user contains digits and/or special characters.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.: 10 - Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - Sheetal Taneja, Naveen Kumar, Python Programming: A Modular approach, 5th Impression, Pearson. - Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press. - Mark Lutz, Learning Python (available online at pdf derive). - Gutttag John V, Introduction to Computation and Programming Using Python with Application to Understanding Data, PHI. - Charles Diorbach, Introduction to Computer Science using Python, Wiley. - Balaguruswamy E., Introduction to Computing and Problem Solving using Python, 2nd edition, McGraw Hill Education, 2018. - Brown, Martin C., Python: The Complete Reference, 2nd edition, McGraw Hill Education, 2018. * Applicable for courses having practical components.		

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2024-25			
Part A - Introduction			
Subject	B.Voc.(Software Development)		
Semester	VI		
Name of the Course	Advanced Web Development		
Course Code	B23-CSD-602		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Basics of Web Development		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. gain proficiency in advanced web development frameworks and tools. 2. understand the principles of responsive design and progressive web apps. 3. learn best practices for database management and full-stack development. 4. know about optimization and devops. 5* To work on real-world projects and develop a comprehensive web application.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.			

Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Advanced Front-End Development: Advanced HTML5 & CSS3: Semantic HTML, CSS Grid and Flexbox, CSS Preprocessors (Sass/LESS) JavaScript ES6+: Advanced JavaScript concepts (Promises, Async/Await), ES6+ features (Arrow functions, Template literals, Destructuring)	11
II	Front-End Frameworks: Introduction to React, Angular, Component-based architecture, State management with Redux Advanced Back-End Development: Server-Side Programming: Express.js, GraphQL, Middleware, and Authentication (JWT, OAuth)	11
III	Database Management: Advanced SQL concepts, NoSQL databases (Firestore), ORMs (Sequelize) Full-Stack Development: Integrating Front-End and Back-End: Building a full-stack application, Handling asynchronous operations, Real-time applications with WebSockets	11
IV	Performance Optimization: Code splitting and lazy loading, Caching strategies, Optimizing images and assets Deployment and DevOps: Deployment Strategies: CI/CD pipelines, Containerization with Docker, Deployment platforms (Heroku, AWS, Netlify) DevOps and Monitoring: Infrastructure as code (Terraform, Ansible), Monitoring and logging (Prometheus, Grafana)	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Front-End Projects: Develop a responsive web application using React/Angular. • Back-End Projects: Build and deploy a RESTful API using Node.js and Express.js. • Full-Stack Projects: Create a full-stack application integrating front-end and back-end. • Optimization Projects: Implement performance optimization techniques on existing projects. • Deployment Projects: Set up a CI/CD pipeline and deploy a web application to a cloud platform.	30
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 5		End Term Examination: A three-hour

• Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • "JavaScript: The Good Parts" by Douglas Crockford • "You Don't Know JS" by Kyle Simpson • "Learning React" by Alex Banks and Eve Porcello	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2024-25			
Part A - Introduction			
Subject	B.Voc.(Software Development)		
Semester	VI		
Name of the Course	Mobile App Development		
Course Code	B23-CSD-603		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Basics of programming (preferably in Python/JavaScript) and object-oriented concepts		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of Dart programming and Flutter architecture 2. Design responsive and interactive UI using widgets in Flutter 3. Manage app state and handle user input efficiently 4. Build functional Android applications with navigation, data, and API integration 5. *Deploy Flutter apps to emulator/device and understand app packaging		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.			

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Dart and Flutter: Overview of mobile development platforms, Need for cross-platform development, Introduction to Flutter and Dart, Dart basics – variables, data types, control structures, functions, Introduction to OOP in Dart – classes, constructors, inheritance, Flutter architecture – widgets, build() method, hot reload, Flutter development setup – IDEs (VS Code, Android Studio), emulators	11
II	UI Design with Flutter Widgets: Flutter widget tree and widget lifecycle, Stateless vs Stateful widgets, Layout widgets – Container, Column, Row, Stack, ListView, Text and Image widgets, Button and Icon widgets, Input and Form widgets – TextField, Checkbox, Switch, Form validation, Styling – themes, fonts, colors	11
III	Navigation and State Management: Navigation in Flutter – routes, Navigator class, Bottom navigation bar, tabbed navigation, Passing data between screens, State management – setState, lifting state up, Introduction to Provider package for state management, Dialogs, SnackBars, and user interactions	11
IV	Data Persistence and API Integration: Reading/writing local data using SharedPreferences, SQLite basics using sqflite package, Fetching data from REST APIs using http package, JSON parsing and model classes, Displaying dynamic data in ListViews, Handling async operations with Future and async/await, Introduction to Firebase integration (Authentication or Realtime DB)	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Problem Solving and Search Algorithms - Set up Flutter environment and run first “Hello World” app - Implement a basic app using stateless and stateful widgets - Build a personal profile UI with image, text, and icons - Create a multi-page app using navigation and routes - Handle user input and form validation - Use state management to build a counter or to-do list app - Store and retrieve data using SharedPreferences - Integrate a public REST API and display data in ListView - Build a login form with basic UI and local validation - Mini project: Create a complete mobile application such as a note-taking app, quiz app, or weather app	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory Class Participation: 5		End-Term Examination: A three-hour

• Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Marco L. Napoli – <i>Beginning Flutter: A Hands-On Guide to App Development</i>, Wiley • Alberto Miola – <i>Flutter for Beginners</i>, Packt Publishing • Carmine Zaccagnino – <i>Flutter Projects</i>, Packt Publishing • Barry Burd – <i>Flutter & Dart for Dummies</i>, Wiley • Matt Galloway – <i>Programming Flutter</i>, O'Reilly • Google Flutter Documentation – flutter.dev/docs	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2024-25, Syllabus: 2024-25			
Part A - Introduction			
Subject	B.Voc.(Software Development)		
Semester	VI		
Name of the Course	Introduction to Design Thinking		
Course Code	B23-CSD-604		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	None		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the foundations and key stages of the design thinking process. 2. Apply empathy and user research techniques to discover real-world problems. 3. Ideate, prototype, and test solutions using structured tools and methods. 4. Use design thinking for software product and interface innovation. 5. *Practically Work collaboratively on problem-solving through a human-centered lens.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.			

The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Foundations of Design Thinking: Introduction to design thinking – definition, scope, and applications, Need for innovation in technology and business, Principles of human-centered design, 5-step process – Empathize, Define, Ideate, Prototype, Test, Comparison with traditional problem-solving models	11
II	Empathize and Define: Understanding the user – empathy maps, observation techniques, User interviews and field research, Persona development and journey maps, Problem definition using “Point of View” (POV), Creating “How Might We” (HMW) statements	11
III	Ideation Techniques: Brainstorming rules and environment, Idea generation techniques – SCAMPER, Mind mapping, 6 Thinking Hats, Affinity mapping, Concept sketching, Idea selection using impact-feasibility matrix	11
IV	Prototyping and Testing: Low- and high-fidelity prototyping – tools and materials, Storyboarding and wireframing for software applications, Gathering feedback through user testing, Iterative improvement and refining ideas, Case studies of design thinking in software products (e.g., Uber, Airbnb, IDEO)	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Create an empathy map based on a real or fictional user interview • Develop a persona and user journey map for a common software app • Define a problem statement using the POV and HMW frameworks • Conduct a brainstorming session using mind maps and SCAMPER • Sketch a wireframe of a proposed software or app solution • Create a low-fidelity paper prototype • Test the prototype with peers and collect feedback • Iterate on the prototype and document the changes made • Present the final solution using a storyboard or digital wireframe (Figma, Balsamiq) • Mini-project: End-to-end design thinking process for a real-world tech problem (e.g., digital attendance system, food	30

	ordering app)	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Tim Brown – <i>Change by Design</i>, Harvard Business Review Press • Jeanne Liedtka and Tim Ogilvie – <i>Designing for Growth: A Design Thinking Toolkit for Managers</i>, Columbia Business School Publishing • Vijay Kumar – <i>101 Design Methods</i>, Wiley • Jake Knapp – <i>Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days</i>, Simon & Schuster • Kelley & Kelley – <i>Creative Confidence: Unleashing the Creative Potential Within Us All</i>, Crown Business.		

*Applicable for courses having practical component.

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A++’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धिं व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Scheme of Examination (5th and 6th Semester) for Under-Graduate Programmes

Bachelor of Computer Applications (BCA) (ARTIFICIAL INTELLIGENCE) : SCHEME D

according to

Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

Kurukshetra University Kurukshetra
Scheme of Examination (5th and 6th Semester) for Undergraduate programmes
Subject: BCA (Artificial Intelligence)
According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships, and Choice Based Credit System)

Sem	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T + P
5	CC-A5	B23-CAL-501	Machine Learning Fundamentals	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-B5	B23-CAL-502	Python Programming for Machine Learning	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-C5	B23-CAL-503	Computer Graphics	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M5(V)	To be taken from VOC Pool							
	SEC-4	Internship @ 4 Credits							
6	CC-A6	B23-CAL-601	Introduction to Neural Networks	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-B6	B23-CAL-602	Python Programming for Deep Learning	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-C6	B23-CAL-603	Data Mining and Warehousing	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M6	B23-CAL-604	Design Thinking and Product Innovation	3	3	20	50	70	3

			Practical	1	2	10	20	30	3
	CC-M7(V)	To be taken from VOC Pool							



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समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (5th & 6th Semester) for Under-Graduate Programmes
Bachelor of Computer Applications (BCA) (Artificial Intelligence)
Scheme D
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA(Artificial Intelligence)		
Semester	V		
Name of the Course	Machine Learning Fundamentals		
Course Code	B23-CAL-501		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As perAnnexure-I	300-399		
Pre-requisite for the course (if any)	Knowledge of Basic AI		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the key concepts, types, and workflow of machine learning. 2. Implement supervised and unsupervised learning algorithms using Python. 3. Apply model evaluation techniques to assess performance. 4. Solve real-world classification and clustering problems using machine learning. 5*. Implement the various machine learning models.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter			
The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			
Unit	Topics		Contact Hours
I	Introduction to Machine Learning: Definition and scope of machine learning, types of machine learning – supervised, unsupervised, reinforcement learning, real-world		11

	applications of machine learning, machine learning pipeline, features and labels, training and testing datasets, model building and evaluation process	
II	Supervised Learning Algorithms: Linear regression, logistic regression, decision trees, k-nearest neighbors (k-NN), support vector machines (SVM), naïve Bayes classifier, model evaluation metrics – confusion matrix, accuracy, precision, recall, F1-score, cross-validation	11
III	Unsupervised Learning Algorithms: Clustering – k-means, hierarchical clustering, DBSCAN, dimensionality reduction using PCA, evaluation of clustering results, association rule mining – support, confidence, lift, Apriori algorithm, market basket analysis	11
IV	Model Optimization and Real-World Applications: Data preprocessing – normalization, standardization, encoding categorical variables, overfitting and underfitting, regularization – L1 and L2, feature selection techniques, ensemble methods – bagging, boosting, random forest, real-world use cases – spam detection, credit scoring, customer segmentation	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Implement linear regression on a dataset and evaluate model performance • Apply logistic regression to binary classification problems • Use k-NN and Decision Trees for classification tasks • Build and evaluate clustering models using k-means and hierarchical clustering • Perform data preprocessing techniques including encoding and scaling • Apply PCA for dimensionality reduction and visualize clusters • Conduct market basket analysis using Apriori algorithm • Train and evaluate ensemble models such as Random Forest and AdaBoost	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Tom M. Mitchell – *Machine Learning*
- Aurélien Géron – *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*
- Ethem Alpaydin – *Introduction to Machine Learning*
- Peter Flach – *Machine Learning: The Art and Science of Algorithms That Make Sense of Data*
- Sebastian Raschka and Vahid Mirjalili – *Python Machine Learning*
- Andreas C. Müller and Sarah Guido – *Introduction to Machine Learning with Python*

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Artificial Intelligence)		
Semester	V		
Name of the Course	Python Programming for Machine Learning		
Course Code	B23-CAL-502		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Knowledge of basics of Python.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Perform numerical operations using NumPy essential for deep learning computations. 2. Manipulate and preprocess structured data using Pandas for training deep learning models. 3. Visualize data and model metrics using Matplotlib and Plotly. 4. Apply machine learning techniques using scikit-learn to prepare for deep learning workflows. 5*. Implement the various tools and techniques used in machine learning.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	NumPy Introduction to NumPy, array creation, indexing and slicing, reshaping arrays, broadcasting, mathematical operations on arrays, statistical operations, random number generation, linear algebra using NumPy	11
II	Pandas Introduction to Pandas, Series and DataFrames, reading and writing data from CSV and Excel, filtering and selection, handling missing values, grouping and aggregation, merging and joining datasets, feature extraction, time-series analysis	11
III	Matplotlib and Plotly Basics of data visualization, line plots, bar plots, scatter plots, histograms, pie charts, customizing plots (title, labels, colors, legends), subplots, introduction to Plotly, interactive plots, 3D visualizations, dynamic plots for model metrics	11
IV	scikit-learn Introduction to machine learning, supervised vs unsupervised learning, data preprocessing (scaling, encoding, splitting), building models using Linear Regression, Decision Tree, k-Nearest Neighbors, Support Vector Machines, model evaluation using accuracy, confusion matrix, precision, recall	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • NumPy: Create and reshape arrays, perform element-wise and matrix operations, simulate random data, apply statistical functions • Pandas: Load datasets, clean missing values, filter rows and columns, merge datasets, perform group-by and aggregation • Matplotlib and Plotly: Plot charts for data distribution, customize visualizations, build interactive charts, visualize training performance over epochs • scikit-learn: Preprocess data, train machine learning models, evaluate model performance, implement basic classification and regression problems	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Wes McKinney – *Python for Data Analysis*
- Jake VanderPlas – *Python Data Science Handbook*
- Aurélien Géron – *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*
- Joel Grus – *Data Science from Scratch*
- Mark Summerfield – *Programming in Python 3*
- François Chollet – *Deep Learning with Python*

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Artificial Intelligence)		
Semester	V		
Name of the Course	Computer Graphics		
Course Code	B23-CAL-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of computer		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. understand the concepts of computer graphics 2. learn and implement point, line, and circle drawing algorithms. 3. acquire knowledge of two-dimensional transformations and line clipping algorithms. 4. understand 3-D graphics concepts and acquire skills for designing 3-D graphics 5*. to design programs based on theoretical concepts of Computer Graphics.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
<u>Instructions for Paper-Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. The candidate must attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			

Part B- Contents of the Course		
Unit	Topics	Contact Hours
I	Introduction: History of Computer Graphics (CG), Applications of Computer Graphics, Components of interactive graphics systems Display devices: Refresh CRT, Color CRT, Plasma Panel displays LCD Panels, Raster-scan System, Random scan System, Graphic software, Input/Output Devices, Tablets	11
II	Output Primitives: Points and Lines, Line Drawing Algorithms: DDA algorithm, Bresenham's algorithm, Circle drawing Algorithms: Polynomial Method, Bresenham's algorithm. Parametric representation of Cubic Curves, Bezier Curves	11
III	2D Transformation: Use of Homogeneous Coordinates Systems, Composite Transformation: Translation, Scaling, Rotation, Mirror Reflection, Rotation about an Arbitrary Point. Clipping and Windowing, Clipping Operations. Line Clipping Algorithms: The Mid-Point subdivision method, Cohen-Sutherland Line Clipping Algorithms, Polygon Clipping, Sutherland Hodgeman Algorithms, Text Clipping.	12
IV	3-D Graphics: 3-D object representations, 3-D Transformations: Translation, Rotation, Scaling, Projections, Hidden surface elimination: Back face removal, Depth Buffer algorithm, Scan-line algorithm, Depth sort algorithm, Shading.	11
V*	The following activities be carried out/ discussed in the lab during the semester. Programming Lab: • Implement DDA line drawing algorithm for all types of slope. • Implement Bresenham's line drawing algorithm for all types of slopes. • Implement Bresenham's Circle drawing algorithm. • Implement Bresenham's Ellipse drawing algorithm. • Implement various 2-D transformations on objects like lines, rectangles, etc. • Implement to clip a line using the Mid-Point subdivision algorithm • Implement to clip a line using Cohen-Sutherland algorithm • Implement 3-D transformations on objects.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks:

	70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Donald Hearn, M. Pauline Baker, Computer Graphics, Pearson Education. • J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Pearson Education. • Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill. • Rogers, David F., Procedural Elements of Computer Graphics, McGraw Hill. • Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Artificial Intelligence)		
Semester	VI		
Name of the Course	Introduction to Neural Networks		
Course Code	B23-CAL-601		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basics of Machine Learning		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of artificial neural networks and their biological inspiration 2. Explain perceptron learning and activation functions used in neural networks 3. Apply training techniques like forward and backward propagation in multilayer networks 4. Implement and analyze neural network models using real-world datasets 5. * Practicals based on Machine Learning		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.			

The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.
The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Neural Networks: Biological neuron vs artificial neuron, neural network structure, types of neural networks – feedforward, recurrent, convolutional, single-layer perceptron, limitations of perceptron, applications of neural networks in real-world scenarios	11
II	Activation and Loss Functions, Perceptron Learning: Step function, sigmoid, tanh, ReLU, softmax, mean squared error, cross-entropy loss, learning rate, weight initialization, perceptron learning algorithm, logic gates using perceptron, linear vs non-linear separability	11
III	Multilayer Neural Networks and Backpropagation: Structure of multilayer perceptrons, forward propagation, backward propagation algorithm, gradient descent, stochastic and mini-batch gradient descent, overfitting and regularization, dropout and batch normalization	11
IV	Applications and Trends in Neural Networks: Image classification, speech recognition, natural language processing basics, introduction to convolutional neural networks (CNN), introduction to recurrent neural networks (RNN), transfer learning, trends in deep learning and neural network research	12
V*	The following activities be carried out/ discussed in the lab during the initial period of the semester. Programming Lab: • Simulate a single-layer perceptron for AND, OR, XOR gates • Visualize and apply different activation functions • Implement forward and backward propagation manually using NumPy • Train a multilayer perceptron for image classification using Keras • Plot accuracy and loss over epochs • Demonstrate overfitting and use dropout for regularization • Use a pretrained neural network for classification using transfer learning • Analyze neural network performance using confusion matrix and accuracy metrics	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: A three-hour exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Simon Haykin – <i>Neural Networks and Learning Machines</i> • Michael Nielsen – <i>Neural Networks and Deep Learning</i> • François Chollet – <i>Deep Learning with Python</i> • Aurélien Géron – <i>Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow</i> • Charu C. Aggarwal – <i>Neural Networks and Deep Learning: A Textbook</i> • Satish Kumar – <i>Neural Networks: A Classroom Approach</i>	

*Applicable for courses having practical component.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Artificial Intelligence)		
Semester	VI		
Name of the Course	Python Programming for Deep Learning		
Course Code	B23-CAL-602		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of Python Programming		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Build and train deep learning models using TensorFlow for real-world applications 2. Develop neural networks using Keras and tune hyperparameters 3. Apply OpenCV for preprocessing and visualizing image data in deep learning workflows 4. Integrate Python tools to automate and visualize deep learning pipelines 5. * Implement Practicals based on Deep Learning		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			
Unit	Topics		Contact Hours
I	TensorFlow: Introduction to TensorFlow, computational graphs, tensors and tensor operations, constants and variables, gradient computation using GradientTape, building simple neural networks using low-level		11

	TensorFlow, TensorBoard for visualizing training, saving and restoring models	
II	Keras: Keras architecture and workflow, sequential and functional APIs, defining dense and dropout layers, compiling models with optimizers and loss functions, training and validating models, evaluation metrics, callbacks – early stopping, model checkpointing, model serialization and loading	11
III	OpenCV for Deep Learning: Introduction to OpenCV, loading and displaying images, resizing and cropping, color space conversion, filtering and blurring, edge detection, contour detection, image thresholding, preprocessing image data for CNNs, drawing and annotating images, integrating OpenCV with deep learning pipelines	12
IV	Integration and Applications: Image classification using CNNs, sentiment analysis using text data, object detection using pretrained models, real-time image recognition using webcam feed, transfer learning – VGG16, MobileNet, ResNet, automation of data pipelines using Python, deployment basics of deep learning models	11
V*	Practicum: - Students are advised to do laboratory/practical practice not limited to but including the following types of problems: - Build and train a basic neural network using TensorFlow - Visualize training progress using TensorBoard - Construct and tune deep learning models using Keras (with dropout, callbacks) - Train a CNN on MNIST or CIFAR-10 using Keras - Use OpenCV to read, preprocess, and transform image data - Detect and annotate image features using OpenCV filters and contours - Perform transfer learning with pretrained networks like VGG16 or MobileNet - Integrate real-time webcam feed with a trained image classifier	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 5 - Seminar/presentation/assignment/quiz/class test etc.: 5 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: NA - Seminar/Demonstration/Viva-voce/Lab records etc.: 10 - Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- François Chollet – *Deep Learning with Python*
- Aurélien Géron – *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*
- Adrian Rosebrock – *Deep Learning for Computer Vision with Python*
- Ian Goodfellow, Yoshua Bengio and Aaron Courville – *Deep Learning*
- Michael Nielsen – *Neural Networks and Deep Learning*
- Sebastian Raschka and Vahid Mirjalili – *Python Machine Learning*

* Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Artificial Intelligence)		
Semester	VI		
Name of the Course	Data Mining and Warehousing		
Course Code	B23-CAL-603		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basics of Databases, Python Programming, Probability & Statistics, Introduction to AI		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the architecture and components of data warehousing and data mining systems. 2. Apply preprocessing and transformation techniques to prepare data for mining. 3. Use classification, clustering, and association algorithms to discover patterns. 4. Design and query data warehouses using OLAP operations. 5. *Implement data mining techniques using Python and visualization libraries.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions in all, selecting one question from each unit. The first question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			

Part B- Contents of the Course		
Unit	Topics	Contact Hours
I	Introduction to Data Warehousing and Data Preprocessing: Introduction to data warehousing – characteristics, benefits, and architecture, Data Marts, ETL process, OLAP vs OLTP, OLAP operations – roll-up, drill-down, slice, dice, pivot, Data cube and dimensional modeling – star and snowflake schemas, Data preprocessing – cleaning, integration, transformation, reduction, normalization techniques.	11
II	Introduction to Data Mining and Association Analysis: Introduction to data mining – goals, functions, KDD process, Types of data – structured, unstructured, Data mining architecture, Frequent pattern mining – Apriori algorithm, FP-Growth algorithm, Evaluation of association rules – support, confidence, lift, Applications – market basket analysis, recommendation engines.	11
III	Classification and Prediction Techniques: Classification vs prediction, Decision tree classifiers (ID3, C4.5), Naïve Bayes classification, K-nearest neighbor, Rule-based classification, Model evaluation – confusion matrix, accuracy, precision, recall, F1-score, ROC curve, Cross-validation, Overfitting and pruning.	11
IV	Clustering, Trends and Applications in AI: Clustering – introduction and applications, Partitioning methods – K-means, K-medoids, Hierarchical clustering – agglomerative and divisive, Cluster evaluation methods – silhouette score, DB index, Applications of data mining in AI – fraud detection, healthcare, customer segmentation, Web mining, text mining, privacy and ethical issues in data mining.	12
V*	The following activities be carried out/ discussed in the lab during the semester. Programming Lab: • Creating and querying a star schema and snowflake schema using SQL • Performing data preprocessing – cleaning, normalization, transformation using Python • Implementing Apriori algorithm using Python or ML libraries • Implementing FP-Growth for frequent itemset generation • Building and evaluating a decision tree classifier using Scikit-learn • Applying Naïve Bayes for classification problems • Performing K-means clustering on sample datasets • Visualizing clusters using Matplotlib/Seaborn • Performing OLAP operations using Python-based tools or SQL queries • Mini Project: Applying a complete data mining pipeline (pre-processing, mining, visualization) to a real dataset	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Jiawei Han, Micheline Kamber and Jian Pei – <i>Data Mining: Concepts and Techniques</i>, Morgan Kaufmann • Margaret H. Dunham – <i>Data Mining: Introductory and Advanced Topics</i>, Pearson • Alex Berson and Stephen J. Smith – <i>Data Warehousing, Data Mining & OLAP</i>, McGraw-Hill • Arun K. Pujari – <i>Data Mining Techniques</i>, Universities Press • Pang-Ning Tan, Michael Steinbach and Vipin Kumar – <i>Introduction to Data Mining</i>, Pearson • Ian Witten, Eibe Frank, Mark A. Hall – <i>Data Mining: Practical Machine Learning Tools and Techniques</i>, Morgan Kaufmann.	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Artificial Intelligence)		
Semester	VI		
Name of the Course	Design Thinking and Product Innovation		
Course Code	B23-CAL-604		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic understanding of software development and AI applications		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand and apply the five stages of design thinking in AI problem-solving. 2. Identify real-world problems and define user-centric product goals. 3. Create and test prototypes for AI-based products using iterative feedback. 4. Apply innovation frameworks to bring AI product ideas to market. 5. *Implement Practical aspects of innovations.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.			

Practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Foundations of Design Thinking: Definition and significance of design thinking, Human-centered design principles, Five phases of design thinking – empathize, define, ideate, prototype, test, Need for design thinking in AI product development, Overview of product innovation, Introduction to innovation frameworks – Lean Startup, Agile, MVP	11
II	Empathy, Problem Definition and Ideation: Empathy research – interviews, surveys, observation techniques, Persona development, User journey maps, Defining meaningful problem statements – “How Might We” framework, Brainstorming techniques – SCAMPER, reverse thinking, Affinity mapping and idea clustering, Mapping AI capabilities to user problems	11
III	Prototyping and Testing for AI Products: Types of prototypes – low-fidelity, high-fidelity, Wireframing tools (Figma, Balsamiq), Storyboarding and user flows, User testing – methods and metrics, Feedback loops and iterations, Aligning AI model outputs with UX goals, Examples of AI-powered product mock-ups (e.g., chatbot UI, recommendation UI)	11
IV	Innovation and Real-World AI Product Development: AI product lifecycle – from concept to deployment, Go-to-market strategy, Risk assessment and feasibility study, Innovation in AI domains – healthcare, education, fintech, social good, Introduction to AI ethics – fairness, transparency, bias, Case studies – successful AI product innovation journeys (e.g., Siri, Google Lens, ChatGPT)	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Conduct empathy interviews and create personas for an AI product idea • Create a user journey map for an AI-driven solution • Define problem statements using the “How Might We” method • Brainstorm AI solution features and cluster ideas using affinity mapping • Develop low-fidelity wireframes using pen-and-paper or Figma • Build a clickable prototype/mock UI for an AI-based product • Collect user feedback through usability testing • Present product idea using elevator pitch and lean canvas • Map AI model input-output flow with UX design • Mini project: End-to-end product concept (empathy to proto-	30

	type) of an AI-based application (e.g., AI tutor, sentiment analyzer)	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Tim Brown – <i>Change by Design</i>, Harvard Business Press • Jeanne Liedtka and Tim Ogilvie – <i>Designing for Growth: A Design Thinking Toolkit for Managers</i>, Columbia Business School Publishing • Jake Knapp – <i>Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days</i>, Simon & Schuster • Tom Kelley and David Kelley – <i>Creative Confidence</i>, Crown Business • Vijay Kumar – <i>101 Design Methods: A Structured Approach for Driving Innovation</i>, Wiley • Barry O'Reilly – <i>Lean Enterprise: How High Performance Organizations Innovate at Scale</i>, O'Reilly Media.		

*Applicable for courses having practical components.

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A++’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धिं व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Modified Scheme of Examination (5th and 6th Semester) for Under-
Graduate Programmes
**Bachelor of Computer Applications (BCA) (CLOUD TECHNOLOGY
& INFORMATION SECURITY): SCHEME D**
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based
Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

Kurukshetra University Kurukshetra
Modified Scheme of Examination (5th and 6th Semester) for Undergraduate programmes
Subject: BCA (Cloud Technology & Information Security)
According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships, and Choice Based Credit System)

Sem	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T + P
5	CC-A5	B23-CTS-501	Cloud Service Models	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-B5	B23-CTS-502	Cloud Infrastructure and Virtualization	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-C5	B23-CTS-503	Network Security and Cryptography	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M5(V)	To be taken from VOC Pool							
	SEC-4	Internship @ 4 Credits							
6	CC-A6	B23-CTS-601	Ethical Hacking and Penetration Testing	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-B6	B23-CTS-602	Cyber Forensics and Incident Response	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-C6	B23-CTS-603	Cloud Deployment and Automation	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M6	B23-CTS-604	Basics of Blockchain	3	3	20	50	70	3

			Practical	1	2	10	20	30	3
	CC-M7(V)	To be taken from VOC Pool							



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समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (5th & 6th Semester) for Under-Graduate Programmes
Bachelor of Computer Applications (BCA) (Cloud Technology and Information Security)
Scheme D
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA(CTIS)		
Semester	V		
Name of the Course	Cloud Service Models		
Course Code	B23-CTS-501		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Knowledge of Basics of Cloud Computing		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand and compare the key characteristics of IaaS, PaaS, and SaaS. 2. Apply cloud service models for development, deployment, and scaling of applications. 3. Demonstrate the use of cloud platforms for storage, compute, and software services. 4. Analyze pricing, security, and adoption factors for cloud-based solutions. 5*. Implement a basic project combining multiple service models.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Cloud Service Models: Cloud computing service models – overview and need, Characteristics of IaaS, PaaS, and SaaS, Comparison among service models, Service model architecture and abstraction layers, Deployment responsibilities of cloud providers and consumers, Service model selection criteria based on business needs.	11
II	Infrastructure as a Service (IaaS): Definition and scope of IaaS, Virtual machines: creation, management, and provisioning, Storage services and networking in IaaS, IaaS providers: AWS EC2, Azure VMs, Google Compute Engine, Elasticity and scaling, Security measures and shared responsibility model.	11
III	Platform as a Service (PaaS): Concept and components of PaaS, Application development and runtime environments, Deployment pipelines and DevOps in PaaS, PaaS providers: AWS Elastic Beanstalk, Google App Engine, Azure App Services, Auto-scaling, performance, and integration features, Security challenges and PaaS limitations.	11
IV	Software as a Service (SaaS) and Case Studies: SaaS model overview and architecture, Benefits and limitations of SaaS, SaaS product lifecycle, SaaS providers: Microsoft 365, Salesforce, Google Workspace, Pricing models: subscription-based, usage-based, Multitenancy and customization, Case studies on model adoption in business and public sectors, Cloud vendor lock-in and interoperability.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Create and manage a virtual machine instance on AWS EC2 • Deploy a static/dynamic website using Google App Engine • Use Azure App Services to build and deploy a sample web app • Upload and access files using cloud object storage (e.g., S3) • Build a mini SaaS application using Firebase or Heroku • Monitor cloud resources using dashboards and metrics tools • Estimate pricing for IaaS and PaaS using cloud provider calculators • Integrate cloud database services like RDS or Firestore • Set up and test auto-scaling in AWS or Azure • Mini project involving a combination of IaaS + PaaS + SaaS components	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi – <i>Mastering Cloud Computing</i>, McGraw-Hill • Gautam Shroff – <i>Enterprise Cloud Computing</i>, Cambridge University Press • Michael J. Kavis – <i>Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)</i>, Wiley • Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter – <i>Cloud Computing: A Practical Approach</i>, McGraw-Hill • Thomas Erl, Zaigham Mahmood, and Ricardo Puttini – <i>Cloud Computing: Concepts, Technology & Architecture</i>, Prentice Hall.	

*Applicable for courses having practical components.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (CTIS)		
Semester	V		
Name of the Course	Cloud Infrastructure and Virtualization		
Course Code	B23-CTS-502		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	None		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the architecture and components of cloud infrastructure. 2. Explain different types of virtualization and hypervisors. 3. Configure and manage virtual machines, virtual storage, and virtual networks. 4. Use infrastructure management tools to monitor and optimize virtual resources. 5. *Apply cloud infrastructure concepts in real-world use cases and labs.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:75(50(T)+25(P)) Internal Assessment Marks:20(15(T)+5(P)) End Term Exam Marks: 55(35(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.			

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Cloud Infrastructure: Overview of cloud infrastructure components: compute, storage, networking, Principles of scalable and distributed computing, Data centers: architecture, power, cooling, and racks, Resource pooling and abstraction, Multi-tenancy and elasticity, Introduction to Infrastructure as a Service (IaaS), Cloud delivery and deployment models.	11
II	Virtualization Concepts: Definition and need for virtualization, Types of virtualization: hardware, OS, storage, network, Hypervisors: Type 1 (bare-metal) and Type 2 (hosted), Comparison of leading hypervisors: VMware ESXi, Microsoft Hyper-V, KVM, VirtualBox, VM lifecycle management, Benefits and limitations of virtualization in cloud environments.	11
III	Virtual Machines, Storage, and Networking: Creating and managing virtual machines (VMs), VM snapshots, cloning, and templates, Virtual storage types – block, object, and file storage, Storage virtualization, Virtual network components: virtual switches, routers, firewalls, VLANs, SDN (Software Defined Networking) basics, Network Function Virtualization (NFV) overview.	12
IV	Infrastructure Management and Automation: Infrastructure monitoring tools (e.g., Nagios, Zabbix), Resource allocation and optimization, High availability and failover strategies, Backup and disaster recovery in virtualized environments, Containerization vs. virtualization (Docker vs. VMs), Infrastructure provisioning tools – Vagrant, Terraform (intro), Cloud-native infrastructure – introduction to Kubernetes.	11
V*	The following activities be carried out/ discussed in the lab during the initial period of the semester. Programming Lab: • Installing and configuring VirtualBox or VMware Workstation • Creating and managing virtual machines (Linux and Windows) • Setting up virtual networks and shared folders between VMs • Creating VM snapshots and performing rollbacks • Installing and configuring KVM on a Linux system • Simulating SDN using Mininet or Open vSwitch • Managing cloud resources using AWS Free Tier (EC2, EBS, VPC) • Using basic Docker commands to create and run containers	30

	• Using monitoring tools (Nagios/Zabbix) to track VM health • Mini project: Design a virtual cloud lab with compute, storage, and network	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Barrie Sosinsky – <i>Cloud Computing Bible</i>, Wiley • Danielle Ruest and Nelson Ruest – <i>Virtualization: A Beginner's Guide</i>, McGraw-Hill • Thomas Erl, Ricardo Puttini, and Zaigham Mahmood – <i>Cloud Computing: Concepts, Technology & Architecture</i>, Prentice Hall • David Marshall, Wade A. Reynolds, and Dave McCrory – <i>Advanced Server Virtualization</i>, Auerbach Publications • James E. Smith and Ravi Nair – <i>Virtual Machines: Versatile Platforms for Systems and Processes</i>, Elsevier.		

*Applicable for courses having practical component.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (CTIS)		
Semester	V		
Name of the Course	Network Security & Cryptography		
Course Code	B23-CTS-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic of Computer Networks		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the concepts of network security, threats, and attack surfaces. 2. Understand and apply various cryptographic techniques for secure communication. 3. Evaluate and configure secure network protocols and services. 4. Analyze security solutions such as firewalls, VPNs, and IDS/IPS. 5. *Demonstrate use of encryption, hashing, and security tools in practical settings.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u>			
The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			
Unit	Topics		Contact Hours
I	Introduction to Network Security: Overview of network security, Security services – confidentiality, integrity, authentication, availability, Security attacks – active vs. passive, spoofing, sniffing, replay, DoS, Network security model and		11

	architecture, Security goals and principles, Introduction to threat modeling, OSI and TCP/IP security issues.	
II	Cryptography Fundamentals: Concepts of cryptography – plaintext, ciphertext, keys, Encryption techniques – symmetric and asymmetric, Classical ciphers – Caesar, Vigenère, transposition, Modern symmetric encryption – DES, AES, Block and stream ciphers, Asymmetric cryptography – RSA algorithm, Key exchange protocols – Diffie-Hellman, Applications of cryptography in networks.	12
III	Network Security Protocols and Applications: Authentication protocols – Kerberos, PAP, CHAP, Digital signatures and certificates, Public Key Infrastructure (PKI), IP Security (IPSec) – architecture, modes, and AH/ESP, Transport Layer Security – SSL/TLS, Secure Email – PGP and S/MIME, Virtual Private Networks (VPN), Network authentication using certificates.	11
IV	Network Security Technologies and Tools: Firewalls – types, architecture, packet filtering, proxy firewalls, Intrusion Detection Systems (IDS) and Intrusion Prevention Systems (IPS), Honeypots and network traps, Web security – HTTPS, secure cookies, browser-based attacks and protection, Wireless security – WEP, WPA, WPA2, Incident response and digital forensics basics.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Simulating sniffing attacks using Wireshark and detecting patterns • Implementing Caesar cipher, transposition cipher, and RSA in Python • Generating digital signatures and verifying certificates using OpenSSL • Setting up and analyzing VPN communication using OpenVPN • Configuring and testing iptables firewall rules in Linux • Setting up a basic IDS (e.g., Snort) and monitoring traffic • Capturing and analyzing SSL/TLS handshake using Wireshark • Encrypting and decrypting files using symmetric key tools • Secure email demonstration using PGP/GPG • Mini project: Simulate a secure communication system using cryptographic primitives	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- William Stallings – *Cryptography and Network Security: Principles and Practice*, Pearson
- Behrouz A. Forouzan and Debdeep Mukhopadhyay – *Cryptography and Network Security*, McGraw-Hill
- Charlie Kaufman, Radia Perlman, and Mike Speciner – *Network Security: Private Communication in a Public World*, Pearson
- Atul Kahate – *Cryptography and Network Security*, McGraw-Hill
- Mark Ciampa – *Security+ Guide to Network Security Fundamentals*, Cengage Learning.

* Applicable for courses having practical components.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (CTIS)		
Semester	VI		
Name of the Course	Ethical Hacking and Penetration Testing		
Course Code	B23-CTS-601		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	None		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand ethical hacking practices, methodologies, and professional ethics. 2. Identify vulnerabilities in systems, applications, and networks. 3. Perform footprinting, scanning, and enumeration of systems. 4. Use penetration testing tools and techniques to assess system security. 5. *Recommend practical solutions and generate professional vulnerability assessment reports.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Instructions for Paper-Setter The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions in all, selecting one question from each unit. The first question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			

Part B- Contents of the Course		
Unit	Topics	Contact Hours
I	Introduction to Ethical Hacking and Cyber Laws: Introduction to ethical hacking – roles and responsibilities, Types of hackers – white hat, black hat, gray hat, Hacking phases – reconnaissance, scanning, gaining access, maintaining access, clearing tracks, Overview of penetration testing, Legal aspects – IT Act 2000, GDPR, cybercrime and digital forensics overview, Code of ethics and professional responsibilities.	11
II	Footprinting, Scanning, and Enumeration: Footprinting techniques – WHOIS, DNS interrogation, Google hacking, Network scanning – TCP/UDP scanning, ping sweep, port scanning, Enumeration techniques – SNMP, NetBIOS, LDAP enumeration, Banner grabbing, OS fingerprinting, Vulnerability scanning using tools like Nmap, Nessus.	11
III	System Hacking and Exploitation Techniques: Password cracking techniques – dictionary, brute force, rainbow tables, Privilege escalation methods, Keyloggers, spyware, Trojans, and rootkits, Malware types and behaviors, Exploiting common vulnerabilities – buffer overflow, SQL injection, Cross-site scripting (XSS), Cross-site request forgery (CSRF), Post-exploitation techniques and covering tracks.	12
IV	Web, Wireless, and Network Penetration Testing: Web application security testing – OWASP Top 10, Wireless hacking – WEP/WPA attacks, rogue access points, ARP poisoning, Man-in-the-Middle (MITM) attacks, Social engineering techniques – phishing, baiting, physical attacks, Penetration testing phases – planning, discovery, attack, reporting, Writing professional security assessment reports and recommendations.	11
V*	The following activities be carried out/ discussed in the lab during the semester. • Performing footprinting using tools like WHOIS, Nslookup, and Maltego • Network scanning using Nmap and identifying open ports and services • Vulnerability scanning using Nessus or OpenVAS • Performing enumeration using NetBIOS and SNMP tools • Password cracking using John the Ripper, Hydra, or Hashcat • Creating and analyzing malware (in a controlled environment) • Exploiting web application vulnerabilities using DVWA • Simulating Wi-Fi attacks using Aircrack-ng and Wireshark • Conducting phishing simulations using SET or Gophish • Mini project: Conduct and document a penetration test on a virtual lab	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10		End Term Examination: A three-hour exam for both

➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Patrick Engebretson – <i>The Basics of Hacking and Penetration Testing</i>, Syngress • Georgia Weidman – <i>Penetration Testing: A Hands-On Introduction to Hacking</i>, No Starch Press • William Stallings – <i>Network Security Essentials: Applications and Standards</i>, Pearson • Michael T. Simpson, Kent Backman, and James Corley – <i>Hands-On Ethical Hacking and Network Defense</i>, Cengage • EC-Council – <i>Ethical Hacking and Countermeasures: Attack Phases</i>, Cengage Learning.	

*Applicable for courses having practical components.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (CTIS)		
Semester	VI		
Name of the Course	Cyber Forensics and Incident Response		
Course Code	B23-CTS-602		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	None		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand digital forensics concepts and apply forensic investigation techniques. 2. Perform data acquisition, preservation, and analysis while maintaining integrity. 3. Handle and respond to various types of cybersecurity incidents. 4. Use forensic tools to examine files, systems, and networks for evidence. 5. *Prepare legally acceptable practical based forensic reports and maintain chain of custody.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.			

Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Cyber Forensics: Definition, objectives and scope of cyber/digital forensics, Types of cybercrimes and attack vectors, Forensic process and principles: identification, preservation, analysis, documentation and presentation, Legal issues and cyber laws (IT Act 2000), Rules of evidence and admissibility in court, Chain of custody and documentation, Role of forensics in incident response.	11
II	Data Acquisition and Analysis: Types of data: volatile vs. non-volatile, live vs. static acquisition, Disk imaging and cloning techniques, Hashing and verification of data integrity, File systems: FAT, NTFS, Ext3/4 – forensic perspectives, Recovery of deleted files and partitions, Analyzing system logs and user activity, Keyword searching and pattern matching.	11
III	Network and Email Forensics: Basics of network forensics – sniffing, packet capturing, and session reconstruction, Tools: Wireshark, TCPDump, Log analysis and firewall audit trails, Intrusion detection and correlation of events, Email forensics: header analysis, attachments, spoofing detection, Identifying phishing and scam mails, Cloud forensics – issues in data ownership and jurisdiction.	12
IV	Incident Response and Reporting: Incident response lifecycle: preparation, detection, analysis, containment, eradication, recovery, and post-incident activities, Building an incident response team and policies, Threat intelligence and its role in IR, Forensic investigation using open-source tools (Autopsy, FTK Imager), Writing forensic reports and presentation of evidence, Case studies and scenarios.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Creating forensic disk images using FTK Imager or Guymager • Performing hash verification using MD5/SHA256 tools • Recovering deleted files and folders using forensic tools • Analyzing system event logs and user activity • Capturing and examining network packets using Wireshark • Tracing email origins and identifying spoofed headers • Simulating an incident and writing an incident report • Using Autopsy for file system analysis and keyword search • Performing browser history and registry analysis • Mini project: Perform an end-to-end investigation of a simulated	30

	cyberattack	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Nelson, Phillips, and Steuart – <i>Guide to Computer Forensics and Investigations</i>, Cengage • Marjie T. Britz – <i>Computer Forensics and Cyber Crime: An Introduction</i>, Pearson • Bill Nelson, Amelia Phillips, and Christopher Steuart – <i>Digital Forensics: Computer Crime Scene Investigation</i>, Cengage • Eoghan Casey – <i>Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet</i>, Academic Press • NIST – <i>Computer Security Incident Handling Guide (SP 800-61)</i>.		

*Applicable for courses having practical components.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (CTIS)		
Semester	VI		
Name of the Course	Cloud Deployment and Automation		
Course Code	B23-CTS-603		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Knowledge of basics of cloud computing.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Deploy and manage infrastructure and applications on AWS and Azure platforms. 2. Use cloud-native services for compute, storage, and networking. 3. Automate infrastructure provisioning using templates and scripting tools. 4. Design and implement basic CI/CD pipelines for cloud deployments. 5. * Practically Monitor, scale, and secure deployed cloud resources.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Cloud Deployment Models and Infrastructure Services: Overview of cloud deployment models – public, private, hybrid, and multi-cloud, AWS and Azure overview – services comparison, Regions, availability zones, and resource groups, Launching and managing virtual machines (EC2 in AWS, Azure VMs), Storage options – S3, Azure Blob, file and block storage, Networking services – VPC, subnets, NSG, Load Balancers.	11
II	Deployment Tools and Automation Concepts: Introduction to Infrastructure as Code (IaC), Scripting vs. declarative provisioning, AWS CloudFormation – stacks, templates, parameters, Azure Resource Manager (ARM) templates – structure, deployment methods, Introduction to AWS CLI and Azure CLI, Common automation use cases in cloud deployments.	11
III	Configuration Management and DevOps Integration: Configuration management tools – overview of Ansible, Chef, and Puppet, Automating with AWS Systems Manager and Azure Automation, Using AWS Lambda and Azure Functions for serverless automation, Introduction to CI/CD concepts, Setting up CI/CD pipelines using AWS CodePipeline, CodeBuild, Azure DevOps Services, Deployment strategies – rolling, blue-green, canary.	12
IV	Monitoring, Scaling, and Security Automation: Cloud monitoring tools – AWS CloudWatch, Azure Monitor, Auto-scaling configurations for VMs and containers, Security best practices in automation, IAM roles, policies and RBAC in AWS/Azure, Audit logs and alerts, Backup automation, Disaster recovery planning and testing, Case studies of deployment automation in enterprises.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Launching and configuring EC2 instances and Azure VMs • Creating and managing S3 buckets and Azure Blob containers • Deploying cloud infrastructure using AWS CloudFormation templates • Creating Azure resources using ARM templates • Automating infrastructure deployment using AWS CLI / Azure CLI • Writing simple Lambda and Azure Functions to automate tasks • Setting up a basic CI/CD pipeline in AWS CodePipeline / Azure DevOps • Configuring auto-scaling groups and load balancers in AWS • Monitoring VM performance using AWS CloudWatch and Azure Monitor • Mini project: Fully automated deployment of a web app with monitoring and scaling	30
Suggested Evaluation Methods		
Internal Assessment:		End-Term

➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Mark Wilkins – <i>Learning AWS: Design, Build, and Deploy Responsive Applications using AWS Cloud Components</i>, O'Reilly • Yohan Wadia – <i>AWS Certified DevOps Engineer - Professional Certification and Beyond</i>, Packt • Steve Smith and Mike Pfeiffer – <i>Azure for Architects</i>, Packt • Scott Duffy – <i>Microsoft Azure Administrator Exam Ref AZ-104</i>, Microsoft Press • Jeffrey Barr and Jeff Barr – <i>Host Your Web Site in the Cloud: Amazon Web Services Made Easy</i>, SitePoint.	

*Applicable for courses having practical components.

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Scheme: 2024-25, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (CTIS)		
Semester	VI		
Name of the Course	Basics of Blockchain		
Course Code	B23-CTS-604		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Must have basic knowledge of security		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the fundamental principles of blockchain and its architecture. 2. Understand and apply basic cryptographic principles in the context of blockchain. 3. Analyze various consensus mechanisms and their use in decentralized networks. 4. Describe the workings of Bitcoin, Ethereum, and smart contracts. 5. Develop and deploy basic smart contracts practically using blockchain platforms.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.			

The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Blockchain Technology: Overview of blockchain – definition, features, and benefits, History and evolution of blockchain, Distributed ledger technology, Centralized vs. decentralized systems, Blockchain components: block, hash, timestamp, nonce, public and private keys, Types of blockchains – public, private, consortium, Applications of blockchain in finance, healthcare, supply chain.	11
II	Cryptography and Consensus Mechanisms: Cryptography basics: hash functions (SHA-256), digital signatures, Merkle trees, Blockchain identity – public/private keys, wallets, Transactions and blocks – structure and validation, Consensus algorithms: Proof of Work (PoW), Proof of Stake (PoS), Practical Byzantine Fault Tolerance (PBFT), Mining and incentives, Blockchain security threats.	11
III	Blockchain Platforms and Architecture: Bitcoin overview – transactions, scripting, and UTXO model, Ethereum overview – Ether, Gas, Ethereum Virtual Machine (EVM), Accounts – EOA vs. contract account, Smart contracts – definition, use cases, creation, Blockchain layers – network, data, consensus, application, Introduction to Hyperledger Fabric and private blockchains.	12
IV	Smart Contracts and Blockchain Use Cases: Smart contract development using Solidity (basics), Writing and deploying smart contracts in Remix IDE, Decentralized applications (DApps) introduction, Blockchain in cloud security, identity management, healthcare, education, and logistics, Blockchain limitations and future trends – scalability, interoperability, energy consumption, Case studies of successful blockchain deployments.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Setting up MetaMask wallet and connecting to test networks • Exploring blockchain transactions on Bitcoin/Ethereum explorers • Generating hash values using SHA-256 algorithm • Creating and simulating blockchain using basic Python scripts • Writing and deploying a simple smart contract using Solidity • Interacting with smart contracts using Remix IDE • Creating and verifying Merkle trees • Sending and verifying transactions on a testnet	30

	(Ropsten/Goerli) • Simulating PoW with nonce and hash calculation • Mini project: Design and demo of a basic decentralized voting or record system using smart contracts	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Narayanan et al. – <i>Bitcoin and Cryptocurrency Technologies</i>, Princeton University Press • Andreas M. Antonopoulos – <i>Mastering Bitcoin: Unlocking Digital Cryptocurrencies</i>, O'Reilly Media • Imran Bashir – <i>Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained</i>, Packt • Melanie Swan – <i>Blockchain: Blueprint for a New Economy</i>, O'Reilly Media • Arvind Narayanan, Joseph Bonneau, Edward Felten – <i>Bitcoin and Cryptocurrency Technologies</i>, Princeton • Roger Wattenhofer – <i>The Science of the Blockchain</i>, Createspace.		

*Applicable for courses having practical component.

Kurukshetra University, Kurukshetra
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॥ योगस्थः कुरु कर्माणि ॥
समबुद्धिं व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Modified Scheme of Examination (5th and 6th Semester) for Under-
Graduate Programmes
Bachelor of Computer Applications (BCA) (DATA SCIENCE) :
SCHEME D
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based
Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

Kurukshetra University Kurukshetra
Modified Scheme of Examination (5th and 6th Semester) for Undergraduate programmes
Subject: BCA (Data Science)
According to
Curriculum Framework for Undergraduate Programmes
as per NEP 2020 (Multiple Entry-Exit, Internships, and Choice Based Credit System)

Sem	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T + P
5	CC-A5	B23-CDS-501	Machine Learning Fundamentals using Python	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-B5	B23-CDS-502	Cloud Computing for Data Science	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-C5	B23-CDS-503	Computer Networks	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M5(V)	To be taken from VOC Pool							
	SEC-4	Internship @ 4 Credits							
6	CC-A6	B23-CDS-601	Data Visualization	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-B6	B23-CDS-602	Internet of Things	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-C6	B23-CDS-603	Basics of Neural Networks and Deep Learning	3	3	20	50	70	3
			Practical	1	2	10	20	30	3
	CC-M6	B23-CDS-604	Design and Innovation Thinking	3	3	20	50	70	3
			Practical	1	2	10	20	30	3

	CC-M7(V)	To be taken from VOC Pool							

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समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (5th & 6th Semester) for Under-Graduate Programmes
Bachelor of Computer Applications (BCA) (Data Science)
Scheme D
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA(Data Science)		
Semester	V		
Name of the Course	Machine Learning Fundamentals using Python		
Course Code	B23-CDS-501		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Knowledge of Basic Python		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn the basic of Numpy and Pandas. 2. understand about basics of machine learning. 3. Know about supervised learning. 4. Know about unsupervised learning 5*. Implement the various machine learning models in python.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter			
The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Python Libraries for Data Handling and Manipulation: Introduction to NumPy for numerical computing with Python, Working with arrays and matrices in NumPy, Introduction to Pandas for data manipulation and analysis, Data structures in Pandas: Series, DataFrame, Index, Data cleaning and preprocessing techniques using Pandas	11
II	Introduction to Machine Learning: Introduction: Definition, History and Application of Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Semi Supervised, and Reinforcement Learning. Labeled and Unlabeled Dataset. Supervised Learning Tasks: Regression vs. Classification, Learning Framework: Training, Validation and Testing of ML models. Performance Evaluation Parameters: Confusion matrix, Accuracy, Precision, Recall, F1 Score, and AUC.	11
III	Supervised Learning: Regression: Linear and non-linear Regression, Logistic Regression. Classification: Naïve Bayes, K Nearest Neighbors, Decision Trees.	12
IV	Unsupervised Learning: Clustering: K-Means, Hierarchical Clustering, DBSCAN, Clustering Validation Measures. Dimensionality Reduction: PCA Applications: Customer Segmentation, Anomaly Detection	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Load a dataset (e.g., Iris dataset, Titanic dataset) into Python using Pandas. Explore the dataset by: (i) Displaying the first few rows. (ii) Checking for missing values. (iii) Calculating summary statistics. (iv) Visualizing distributions of numerical variables. (v) Perform data preprocessing tasks. • Implement linear regression on a dataset and visualize the regression line. • Implement logistic regression on a binary classification data set and plot the decision boundary. • Implement and evaluate the performance of Decision tree ID3/ Cart classifier for any given dataset. • Implement and evaluate the performance of the Naïve Bayes Classifier on a given dataset. • Implement K-Means clustering on a point dataset and visualize and evaluate the clusters. • Implement hierarchical clustering on a dataset. • Implement DBSCAN clustering on a dataset and visualize and evaluate the clusters. • Perform Principal Components Analysis (PCA) and apply any one or more classifiers to show the performance variation with or without feature reduction.	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig • "Introduction to Machine Learning" by Ethem Alpaydin • "Introduction to Machine Learning with Python: A Guide for Data Scientists" by Andreas C. Müller and Sarah Guido • "Python for Data Analysis" by Wes McKinney • Oliver Theobald, Machine Learning for absolute beginners. • Jiawei Han and MichelineKamber, Data Mining Concepts and Techniques • C.M. Bishop, Pattern Recognition and Machine Learning.	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Data Science)		
Semester	V		
Name of the Course	Cloud Computing for Data Science		
Course Code	B23-CDS-502		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	None		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Use Cloud-Based software services by comprehending the cloud Computing Architecture. 2. Configure Virtual Machines using Virtualization techniques. 3. Implement Virtualized storage system in Cloud. 4. Use Machine Learning algorithms in Cloud Environment 5*. to equip with the knowledge of cloud technology introductory programming.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:75(50(T)+25(P)) Internal Assessment Marks:20(15(T)+5(P)) End Term Exam Marks: 55(35(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper-Setter The examiner will set a total of nine questions. Out of which first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions, selecting one from each unit. The first question will be compulsory.			

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Cloud Computing: Introduction to Cloud Computing: Definition, Evolution of Cloud computing (from Mainframes to Clouds), Service – Oriented Architecture, Web Services, Grid Computing, Utility Computing, Characteristics of a Cloud computing. Cloud computing architecture: Basic components: front-end platform, back-end, platform, Networking, cloud based delivery. Cloud Service Models: Software as a Service (SaaS), Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Continuous delivery using PaaS	11
II	Virtualization and Cloud Computing: Introduction to Virtualization, types of Virtualization, Application Virtualization, Network Virtualization, Desktop Virtualization, Storage Virtualization, Server Virtualization, Data virtualization Cloud Deployment Models: Public, Private, Community, Hybrid, Role of Cloud computing in data Science, Advantages of Cloud Computing in Machine Learning	11
III	Cloud Storage: Cloud Storage: Introduction, Benefits of using Cloud Storage, Use cases of Cloud Storage (Backup, Archiving, Disaster recovery, Data processing, Content delivery) Cloud storage system: Block-Based, File-Based, Object-Based Storages	11
IV	Cloud Computing for Data Science: Machine Learning in the Cloud: Benefits and Limitations. Types of Cloud-Based Machine Learning Services: Artificial Intelligence as a Service (AIaaS), GPU as a Service (GPUaaS), Introduction to various ML systems and benefits of using Managed ML platforms. Cloud Machine Learning Platforms: AWS SageMaker, Azure Machine Learning studio, Google Cloud AutoML	12
V*	The following activities be carried out/ discussed in the lab during the initial period of the semester. Programming Lab: • Use Google Services to create Doc/Sheet/Keep/Forms • Create Virtual Machine using VMware workstation for Windows/Linux • Create Web server (WAMP/XAMP/APACHE) on Virtual Machine • Create an account on AWS or Azure, or Google Cloud Platform	30

	• Create an account on Google Cloud Platform. a) Create a project and access BigQuery. b) Query data directly from Google Sheets. c) Create tables and views using BigQuery • Launch an EC2 instance with a specified configuration and configure Block-Based storage • Create and Configure File-Based storage on EC2 instance • Create and Configure Object-Based storage on EC2 instance • Create instance of Amazon Sagemaker notebook	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.:5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: A three-hour exam for both theory and practicum.	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Dr. Anand Nayyar Handbook of Cloud Computing BPB Publication • Toby Velte, Anthony Velte, Robert C Cloud Computing: A Practical Approach McGraw Hill Professional • Noah Gift, Alfredo Deza Cloud Computing for Data Analysis Pragmatic AI Labs • Valliappa Lakshmanan Data Science on the Google Cloud Platform: Implementing End-to-End Real-Time Data Pipelines O'Reilly Media • Abhishek Mishra Machine Learning in the AWS Cloud: Add Intelligence to Applications with Amazon SageMaker Wiley Publication		

*Applicable for courses having practical component.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Data Science)		
Semester	V		
Name of the Course	Computer Networks		
Course Code	B23-CDS-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	None		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamental concepts of Computer Networks and their applications. 2. Develop problem-solving skills related to network design, implementation, and troubleshooting. 3. Implement network protocols and configure network devices. 4. Know about emerging technologies in computer networks. 5* implement the various aspects of computer network.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter			
The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			
Unit	Topics		Contact Hours
I	Introduction to Computer Networks: Overview of Computer Networks: Definition and Objectives, Applications and Examples Network Components and Architecture Network Models: OSI Model: Layers and Functions. TCP/IP Model: Layers and Functions Comparison between OSI and TCP/IP Models Network Topologies: Physical vs. Logical Topologies, Common		11

	Topologies: Star, Ring, Bus, Mesh, Hybrid, Advantages and Disadvantages of Each Topology Data Transmission: Analog vs. Digital Signals, Transmission Modes: Simplex, Half-Duplex, Full-Duplex, Bandwidth and Latency Networking Devices: Routers, Switches, Hubs, Bridges, Gateways, Functions and Configurations of Each Device.	
II	Data Link Layer and Networking Protocols: Data Link Layer Fundamentals: Functions of the Data Link Layer, Framing, Error Detection, and Error Correction, Flow Control Mechanisms. Ethernet: Ethernet Standards and Frame Structure, MAC Addressing and ARP, Ethernet Switching: Basic Concepts and Methods Network Protocols: Introduction to TCP/IP Protocol Suite, IP Addressing: IPv4 and IPv6 Subnetting and CIDR Notation.	11
III	Network Layer and Transport Layer: Network Layer: IP Routing: Static vs. Dynamic Routing, Routing Protocols: RIP, OSPF, BGP, Network Address Translation (NAT) Transport Layer: TCP vs. UDP: Characteristics and Use Cases, TCP Handshake and Connection Management, Flow Control and Congestion Control in TCP Network Security Fundamentals: Threats and Vulnerabilities, Basic Security Mechanisms: Firewalls, VPNs, Encryption	11
IV	Application Layer and Emerging Technologies: Application Layer Protocols: HTTP/HTTPS: Structure and Operation, FTP, SMTP, POP3, IMAP: Protocols and Uses, DNS: Domain Name System and Resolution Network Applications: Web Browsing, Email Communication, File Transfer, Voice over IP (VoIP) and Streaming. Emerging Technologies: Software-Defined Networking (SDN), Network Function Virtualization (NFV), Internet of Things (IoT) and Its Impact on Networking Network Management: SNMP: Simple Network Management Protocol, Network Monitoring Tools and Techniques.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Configure Basic Network Settings: a) IP Address Configuration b) Subnet Mask and Gateway Settings • Implement Network Protocols: a) Write a simple Python script to perform DNS resolution. b) Implement a basic HTTP client-server application. • Network Simulation: a) Use network simulation tools to design and simulate network topologies. b) Configure routers and switches in a simulated environment. • Performance Measurement: a) Measure network performance using tools like `ping`, `traceroute`, and `iperf`. b) Analyze network traffic using Wireshark. • Set Up a Simple Web Server: a) Deploy a basic web server and configure HTTP/HTTPS access.	30

	• Network Security Lab: a) Implement basic firewall rules and VPN configurations. b) Perform vulnerability scanning and analyze results. • Network Troubleshooting: a) Diagnose and resolve common network issues. b) Use troubleshooting commands and techniques to fix connectivity problems.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Andrew S. Tanenbaum, "Computer Networks", Pearson Education • James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach", Pearson • Behrouz A. Forouzan, "Data Communications and Networking", McGraw-Hill Education. • Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann. * Applicable for courses having practical components.		

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Data Science)		
Semester	VI		
Name of the Course	Data Visualization		
Course Code	B23-CDS-601		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of Python and Excel		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the basic concepts and principles of data visualization. 2. Know about the various techniques for data visualization. 3. Know about the various techniques for advanced data visualization. 4. <u>Apply the various data visualization techniques.</u> 5*. Implement the data visualization techniques.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions in all, selecting one question from each unit. The first question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			

Part B- Contents of the Course		
Unit	Topics	Contact Hours
I	Introduction to Data Visualization: Definition and importance of data visualization, Principles of effective data visualization. Types of data visualization: charts, graphs, maps, etc. Data visualization process: data acquisition, exploration, analysis, visualization, interpretation, Ethical considerations and best practices in data visualization.	11
II	Basic Data Visualization Techniques: Introduction to basic visualization tools: Excel, Google Sheets, Tableau Public, etc., Creating and customizing simple charts: bar charts, line charts, pie charts, scatter plots, etc., Adding labels, titles, legends, and annotations to visualizations, Data filtering and sorting techniques for effective visualization, Exporting and sharing visualizations.	11
III	Advanced Data Visualization Techniques: Introduction to advanced visualization libraries: Matplotlib, Seaborn, Plotly, etc., Creating complex and interactive visualizations using Python, Heatmaps, box plots, violin plots, histograms, etc., Geographic visualization: maps, choropleth maps, geospatial data visualization, Dashboard creation and customization	11
IV	Data Visualization Best Practices: Choosing the right visualization for different types of data and analysis goals. Design principles for effective visualization: color theory, layout, typography, etc. Data storytelling: conveying insights and narratives through visualizations, Accessibility and inclusivity considerations in data visualization, Critique and evaluation of data visualizations	12
V*	The following activities be carried out/ discussed in the lab during the semester. Programming Lab: Visualization using Excel - Creating bar charts, pie charts, line charts, and scatter plots - Conditional formatting and sparkline charts - Using Pivot Charts for summarization - Customizing chart elements: axis, labels, legends, titles Visualization using Google Sheets - Inserting charts: column, bar, line, area, combo, pie, scatter - Real-time data visualization with Google Finance - Collaborative visualization and embedding charts - Using FILTER and QUERY functions for chart data Visualization using Matplotlib (Python) - Basic plotting (line, bar, scatter, histogram) - Customization: labels, titles, colors, grid, styles - Subplots and figure control - Saving plots to files (PNG, PDF) Visualization using Seaborn (Python) - Relational plots: scatterplot, lineplot - Categorical plots: barplot, boxplot, violinplot, swarmplot - Distribution plots: distplot, histogram, KDE	30

	• Heatmaps and correlation matrices • Themes and aesthetics Visualization using Plotly (Python) • Static and interactive charts: line, bar, scatter, pie • 3D plots and surface charts • Dashboards and layout configuration • Exporting interactive charts (HTML)	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • "Data Visualization: A Practical Introduction" by Kieran Healy • "Python Data Visualization: An Introduction to Data Visualization in Python with Matplotlib, Seaborn, and Plotly" by Adel Osmani • "The Visual Display of Quantitative Information" by Edward Tufte • "Story telling with Data : A Data Visualization Guide for Business Professionals " Cole Nussbaumer Knaflic, Wiley.		

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Data Science)		
Semester	VI		
Name of the Course	Internet of Things		
Course Code	B23-CDS-602		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	None		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand about IoT. 2. Know about IoT devices. 3. learn protocols used in IoT. 4. Learn Arduino programming. 5* To work on program based on IoT using Arduino.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.			

Unit	Topics	Contact Hours
I	Introduction to Internet of Things: Introduction, Definition and Characteristics, Physical Design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT, IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies, Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels & Deployment Templates.	11
II	IoT Physical Devices & Domain Specific IoT: IoT Devices, Boards –Arduino - Raspberry PI – ESP 8266, ESP 8233 – About the board, Sensors, Actuators, Gateways. Domain Specific IoT: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle.	11
III	IoT & M2M- Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT. Protocols for IoT: Infrastructure Protocols: Routing Protocol, IEEE 802.15.4, Bluetooth Low Energy, Z-Wave, Zigbee, MQTT Protocol. Protocols For IoT Service Discovery: multicast Domain Name System (mDNS).	11
IV	Programming IoT Using Python: Python basics for IoT applications, Installing and using Python on IoT devices like Raspberry Pi, GPIO programming with Python, Interfacing sensors and actuators using Python, Reading and writing data using Python, Working with communication protocols in Python, Sending data to the cloud using Python, Accessing APIs and parsing JSON data, Building simple IoT applications using Python.	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Set up Python on Raspberry Pi/ESP32/ESP8266: Install Python and necessary libraries, configure Wi-Fi and SSH. Basic Python scripting on IoT device: Write and execute simple Python scripts (LED blinking, system info displays). GPIO programming using Python: Control LEDs, buzzers, and buttons using GPIO pins on Raspberry Pi or ESP. Interfacing Sensors with Python: Read data from sensors like DHT11 (temperature/humidity), Ultrasonic sensor, or LDR using Python. Actuator control using Python: Control actuators like servo motors, DC motors, and relays through Python scripts. Sensor data logging: Read sensor data and log it to a local file or CSV using Python. Real-time data visualization: Plot sensor data in real-time using Python libraries such as Matplotlib or Plotly.	30

	8. Communication using protocols (I2C, SPI, UART): Connect and communicate with devices like displays or ADCs using I2C or SPI via Python. 9. Send sensor data to cloud platforms: Use Python to send data to cloud services like ThingSpeak, Google Sheets, or MQTT broker. 10. Access and parse JSON from web APIs: Use Python to fetch and display weather or location data from public APIs. 11. Build a simple home automation system: Use Python to control appliances (lights, fans) via web interface or smartphone.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Arshdeep Bahga, Vijay Madisetti, The Internet of Things: A Hands on Approach Universities press. • RajkumarBuyya and Amir VahidDastjerdi, Internet of Things-Principles and Paradigms Edition. • Brian Evans Beginning Arduino Programming, Apress. • Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols–Wiley. • Pethuru Raj and AnupamaC.Raman, The Internet of Things: Enabling Technologies, Platforms and Use Cases- CRC Press.		

*Applicable for courses having practical components.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Data Science)		
Semester	VI		
Name of the Course	Basics of Neural Network and Deep Learning		
Course Code	B23-CDS-603		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Knowledge of basics of machine learning and python.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. learn the basics of neural networks and deep learning. 2. understand deep learning using python. 3. Understand CNN and RNN. 4. Apply deep learning in real-life. 5*. Implement the various tools and techniques used in deep learning.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. The practicum will be evaluated by an external and an internal examiner. The examination will be of			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Neural Networks and Deep Learning: Overview of AI, Machine Learning, and Deep Learning, Introduction to artificial neural networks, Biological vs artificial neurons, Structure of a perceptron, Multilayer Perceptrons (MLP), Activation functions – sigmoid, tanh, ReLU, Introduction to forward and backward propagation, Loss functions – MSE and cross-entropy, Concept of learning rate and epochs.	11
II	Basics of Deep Learning with Python: Overview of Python libraries: Introduction to TensorFlow and Keras, Building a basic neural network using Keras Sequential API, Compiling and training a model, Model evaluation – accuracy, loss, validation set, Overfitting and underfitting, Techniques to avoid overfitting – dropout, early stopping.	11
III	Introduction to CNN and RNN: Understanding convolution and pooling operations, Basics of Convolutional Neural Networks (CNN), Applications of CNN in image classification, Introduction to Recurrent Neural Networks (RNN), Concept of time series and sequential data, Simple RNN and LSTM (basic concept only), Introduction to use cases – image recognition, text classification.	12
IV	Applications: Case studies of neural networks in real-world problems – digit recognition, spam detection, sentiment analysis, Overview of transfer learning using pre-trained models, Introduction to autoencoders and basic anomaly detection, Ethical concerns in deep learning – bias, fairness, and explainability.	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Install and configure TensorFlow/Keras on local or cloud platforms • Build and train a basic MLP model on the MNIST dataset • Implement activation functions and visualize their behavior • Use dropout and early stopping in training • Apply CNN to simple image classification tasks • Build a basic RNN for time series or text classification • Mini project involving real-world data (e.g., classification, regression, prediction)	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks:

• Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Ian Goodfellow, Yoshua Bengio, and Aaron Courville – <i>Deep Learning</i>, MIT Press • François Chollet – <i>Deep Learning with Python</i>, Manning Publications • Michael Nielsen – <i>Neural Networks and Deep Learning</i>, available online at http://neuralnetworksanddeeplearning.com • Aurélien Géron – <i>Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow</i>, O'Reilly Media • Charu C. Aggarwal – <i>Neural Networks and Deep Learning: A Textbook</i>, Springer • Nikhil Buduma – <i>Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms</i>, O'Reilly Media • Antonio Gulli, Amita Kapoor, and Sujit Pal – <i>Deep Learning with Keras and TensorFlow</i>, Packt Publishing.	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2024-25, Syllabus: 2025-26			
Part A - Introduction			
Subject	BCA (Data Science)		
Semester	VI		
Name of the Course	Design and Innovation Thinking		
Course Code	B23-CAP-604		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Must have basic knowledge of computer		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Propose real-time innovative product designs and Choose appropriate frameworks, strategies, techniques during prototype development. 2. Know wicked problems and how to frame them in a consensus manner that is agreeable to all stakeholders using appropriate frameworks, strategies, techniques during prototype development. 3. Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products 4. Understand the importance of prototyping in the innovation journey 5*. to implement the various innovative designs.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			

Instructions for Paper- Setter

Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus.

The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Basics of Design Thinking: Understand the concept of innovation and its significance in business, understanding creative thinking process and problem solving approaches, Know Design Thinking approach and its objective. Design Thinking and customer centricity – real world examples of customer challenges, use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product. Discussion of a few global success stories like AirBnB, Apple, IDEO, Netflix etc., Stages of Design Thinking Process – Empathize, Define, Ideate, Prototype, Implement	12
II	Learning to Empathize and Define the Problem: Know the importance of empathy in innovation process – how can students develop empathy using design tools, Observing and assimilating information, Individual differences & Uniqueness Group Discussion and Activities to encourage the understanding, acceptance and appreciation of individual differences, Wicked problems, Identifying wicked problems around us and the potential impact of their solutions	11
III	Ideate, Prototype and Implement: Know the various templates of ideation like brainstorming, systems thinking, Concept of brainstorming – how to reach consensus on wicked problems, Mapping customer experience for ideation, Know the methods of prototyping, purpose of rapid prototyping, Implementation	11
IV	Feedback, Re-Design & Re-Create: Feedback loop, focus on User Experience, address ergonomic challenges, user focused design, Final concept testing, Final Presentation – Solving Problems through innovative design concepts & creative solution	11
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: Mind Mapping: Students map out what they understand by innovation and creativity. Case Study Discussion: Examples from Airbnb, IDEO, Apple, and Netflix – what makes them innovative?	30

	Group Activity: Reverse Engineering – “Why do you think this product succeeded or failed?” Empathy Walk / Interview: Students interact with real users (or conduct surveys) to understand problems. Persona Creation: Based on user interviews, create user personas highlighting needs, pain points, behaviors. Empathy Mapping: Fill the empathy map – “Says, Thinks, Does, Feels” for target users. Problem Statement Framing: Convert insights from empathy into actionable problem definitions. Wicked Problem Identification: Brainstorm and identify complex social/technological/local problems. Whys & Fishbone Diagram: Use root cause analysis to understand the deeper problem. Brainstorming Session: Generate 50+ ideas in 30 minutes. SCAMPER Technique: Apply SCAMPER (Substitute, Combine, Adapt...) to refine ideas. Customer Journey Mapping: Understand touchpoints and generate ideas to improve experience. Rapid Prototyping: Use paper, cardboard, digital mockups (Canva/Figma) to create low-fidelity prototypes. Storyboarding: Visual storytelling of how users will interact with the solution. Wireframes / Mockups: Create a digital layout of app/website/product (optional tech tool: Figma/PowerPoint) Feedback from Peers/Target Users: Use Likert scale or open-ended questions for user testing. Redesign Based on Feedback: Refine the prototype and re-test. Final Presentation & Showcase: Students present their problem, process, prototype, and insights.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • E Balaguruswamy, Developing Thinking Skills (The way to Success), Khanna Book Publishing Company • Tim Brown, “Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation”, Harvard Business Review • 8 steps to Innovation by R T Krishnan & V Dabholkar, Collins Publishing		

- Design Thinking by Nigel Cross, Bloomsbury

*Applicable for courses having practical component.

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
(‘A++’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योग युक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (5th and 6th Semester) for Under-Graduate Programmes
Subject: Computer Applications
according to
Curriculum Framework for Under-Graduate Programmes
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit System)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
(For the Batches Admitted From 2023-2024)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	V		
Name of the Course	Data Analytics using SpreadSheets		
Course Code	B23-CAC-501		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-5/MCC-9		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic computer literacy, familiarity with MS Office or Google Workspace, understanding of basic mathematics/statistics concepts		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1.Understand and use spreadsheet tools for data organization and analysis 2.Perform data cleaning, transformation, and statistical operations using spreadsheet functions 3.Create data visualizations to support business decisions 4.Apply spreadsheet-based analytics to real-life problems 5.* Practicals based on data analytics using spreadsheets.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. First			

question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Data Analytics using Spreadsheets Definition and scope of data analytics, Types of analytics – descriptive, diagnostic, predictive, prescriptive, Spreadsheet software overview – MS Excel and Google Sheets, Interface and basic operations – sorting, filtering, formatting, Cell referencing – absolute, relative, mixed, Basic formulas – SUM, AVERAGE, COUNT, MIN, MAX, IF	11
II	Data Cleaning and Preparation Handling missing and inconsistent data, Text functions – LEFT, RIGHT, MID, LEN, TRIM, CONCATENATE, TEXTJOIN, Logical functions – IF, AND, OR, NOT, Lookup functions – VLOOKUP, HLOOKUP, XLOOKUP, INDEX, MATCH, Date and time functions, Removing duplicates, data validation, conditional formatting, Flash fill, importing data (CSV, TSV)	11
III	Statistical Analysis using Spreadsheets Descriptive statistics – Mean, Median, Mode, Variance, Standard Deviation, Frequency distributions, Histograms, Charts – bar, pie, line, scatter, Using Pivot Tables and Pivot Charts, Correlation and regression basics, Using Data Analysis ToolPak	11
IV	Applied Analytics and Dashboarding Business case studies – sales, marketing, finance, What-If analysis – Goal Seek, Data Tables, Scenario Manager, Creating dashboards – charts, slicers, pivot tables, Introduction to macros (recording only), Collaborative analytics using Google Sheets, Report generation and export, Ethics in data handling	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Formatting and organizing raw data in Excel • Using basic functions (SUM, AVERAGE, COUNTIF) on sales dataset • Data cleaning using text and logical functions • Using VLOOKUP and INDEX-MATCH for data retrieval • Creating Pivot Tables and Pivot Charts • Conditional formatting for outlier detection • Generating summary statistics with Data Analysis ToolPak • Creating charts to visualize survey data • What-If analysis using Goal Seek and Scenario Manager • Designing a dashboard for monthly sales performance • Create a class called cube with the data members • Importing and preparing CSV data • Recording and executing simple macros	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Exploring Microsoft Excel for Data Analysis by R. Kishore and B. Sinha • Data Analysis Using Microsoft Excel by Michael R. Middleton • Excel 2021 Bible by Michael Alexander • Google Workspace Documentation • NPTEL/Coursera Excel Courses,	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
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Scheme: 2023-24, Syllabus: 2025-26			
Part A – Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	V		
Name of the Course	Computer Networks		
Course Code	B23-CAC-502		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MCC-10		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic knowledge of computer systems and operating systems		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1.Explain the principles of data communication and networking 2.Compare network models and protocols (OSI, TCP/IP) 3.Analyze various routing and switching techniques 4.Configure and troubleshoot basic networks 5.* Demonstrate practical knowledge of IP addressing and subnetting.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u>			
Examiner will set a total of nine questions. Out of which first question will be compulsory Remaining eight questions will be set from four unit selecting two questions from each unit Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			
Unit	Topics		Contact Hours

I	Introduction to Computer Networks and Models Definition and uses of computer networks, Types of networks – LAN, MAN, WAN, PAN, Network topologies – bus, star, ring, mesh, hybrid, Network devices – hub, switch, router, bridge, Network architecture – client-server, peer-to-peer, Network reference models – OSI and TCP/IP, Layers and their functions, Encapsulation and decapsulation process	11
II	Data Communication and Transmission Media Analog vs digital signals, Transmission modes – simplex, half duplex, full duplex, Encoding and modulation techniques, Transmission media – guided (twisted pair, coaxial, fiber optic), unguided (radio, microwave, infrared), Bandwidth, attenuation, latency, multiplexing – FDM, TDM, WDM, Error detection and correction – parity, CRC, Hamming code	11
III	Internetworking, Addressing and Routing IP addressing – IPv4 and IPv6, classes, static and dynamic addressing, Subnetting and supernetting, Introduction to DNS and DHCP, Routing concepts – static vs dynamic routing, Distance vector and link state routing, Routing protocols – RIP, OSPF, BGP, Switching techniques – circuit switching, packet switching, virtual circuit	11
IV	Transport Layer, Application Layer and Network Security Transport layer protocols – TCP and UDP, Flow control and error control mechanisms, Application layer protocols – HTTP, FTP, SMTP, POP, IMAP, DNS, Network security fundamentals – threats, attacks, firewalls, encryption, digital signatures, SSL/TLS basics, Introduction to network simulation tools (e.g., Cisco Packet Tracer, Wireshark), Emerging trends – IoT networking, mobile networks	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Identify and compare different types of network topologies using simulation tools • Setup a small peer-to-peer and client-server network • Configure IP addressing (manual and DHCP) • Perform subnetting and VLSM exercises • Configure and verify static routing between routers • Simulate packet flow using Cisco Packet Tracer • Use Wireshark to capture and analyze network packets • Implement DNS and HTTP communication in a network simulation • Demonstrate basic firewall rules in simulation • Simulate basic encryption and decryption techniques • Configure NAT and port forwarding • Study of wireless network setup and security configuration	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Computer Networking: A Top-Down Approach by Kurose and Ross • Data Communications and Networking by Behrouz A. Forouzan • Computer Networks by Andrew S. Tanenbaum • Cisco Networking Academy Resources • NPTEL Video Lectures on Computer Networks,	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	V		
Name of the Course	Foundations of Server-Side Development		
Course Code	B23-CAC-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSE-2		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic knowledge of programming, familiarity with HTML, CSS, and client-side scripting, understanding of HTTP protocol and web browsers.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the architecture and components of server-side web applications 2. Build and manage RESTful APIs 3. Develop backend logic using a server-side language 4. Implement CRUD operations with a database 5. * Practicals based on Server-Side Development.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter			
Unit	Topics		Contact Hours
I	Introduction to Server-Side Development Client-server architecture, Static vs dynamic web pages, Role of server-side scripting, Overview of HTTP protocol, request-response cycle, Introduction to server-side platforms –		11

	Node.js, Express.js, Setting up a development environment, Writing your first server application, Understanding ports and localhost	
II	Routing, Middleware, and API Development Defining routes and HTTP methods (GET, POST, PUT, DELETE), Route parameters and query strings, Introduction to RESTful APIs, Working with JSON data, Understanding middleware – request, response, next, Error handling middleware, Building modular route handlers	11
III	Working with Databases and CRUD Operations Connecting to databases – MongoDB, MySQL, Performing CRUD operations – Create, Read, Update, Delete, Schema design and validation, Using ORM/ODM – Mongoose (for MongoDB) or Sequelize (for SQL), Query optimization and security, Handling file uploads and form data	11
IV	Session Management, Authentication, and Deployment Session vs token-based authentication, Using cookies, sessions, and JWT, User authentication and authorization (signup, login, logout), Securing APIs and handling CORS, Introduction to HTTPS and SSL, Deploying applications – local server, Logging, debugging, and performance monitoring	12
V*	The following activities be carried out/ discussed in the lab during the initial period of the semester. Programming Lab: • Set up a basic server using Node.js • Create routes for handling different HTTP methods • Develop a RESTful API to manage user data • Implement middleware for logging and error handling • Build a form handler that stores data to a database • Perform CRUD operations using MongoDB or MySQL • Develop user registration and login functionality, Use JWT for secure authentication • Handle file uploads and form validations • Use Postman to test REST APIs • Secure routes using middleware and authentication	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 4 • Seminar/presentation/assignment/quiz/class test etc.:4 • Mid-Term Exam: 7 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.:5 • Mid-Term Exam: NA		End Term Examination: A three-hour exam for both theory and practicum.

Part C-Learning Resources
Recommended Books/e-resources/LMS: • Web Development with Node and Express by Ethan Brown • Server-Side Web Development with Node.js and Express by Andrew Mead (Online) • Learning Web App Development by Semmy Purewal • Full Stack Open (open-source curriculum) • NPTEL/Digital India resources on backend web development,

*Applicable for courses having practical component.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	V		
Name of the Course	Cloud Computing		
Course Code	B23-CAC-504		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSE-2		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic knowledge of computer networks, operating systems, and internet usage.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals and evolution of cloud computing. 2. Identify cloud service models and deployment models. 3. Explore virtualization and its role in cloud architecture. 4. Use cloud services and tools such as AWS, Google Cloud, or Azure. 5. * Deploy simple applications on cloud platforms. Demonstrate understanding of security and management in cloud environments.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Instructions for Paper-Setter Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. The candidate must attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			

Part B- Contents of the Course		
Unit	Topics	Contact Hours
I	Introduction to Cloud Computing: Definition and characteristics of cloud computing, Evolution of cloud computing, Advantages and challenges of cloud computing, Cloud architecture, Service models: IaaS, PaaS, SaaS, Deployment models: Public, Private, Hybrid, and Community Cloud, Use cases of cloud computing	11
II	Virtualization in Cloud: Definition and benefits of virtualization, Types of virtualization: Hardware, OS, Server, Storage, Virtual Machines (VMs), Hypervisors: Type 1 and Type 2, Role of virtualization in cloud computing, VM provisioning and management	11
III	Cloud Service Providers and Tools: Introduction to major cloud platforms: AWS, Google Cloud, Microsoft Azure, Creating and managing cloud accounts, Cloud storage services: S3, Google Drive, Azure Blob, Deploying basic applications on cloud (e.g., web servers), Introduction to containers: Docker and Kubernetes	11
IV	Security, Management, and Future Trends: Cloud security fundamentals: data privacy, authentication, encryption, Identity and Access Management (IAM), Cloud service level agreements (SLAs), Cloud monitoring and billing, Green computing and cloud, Emerging trends: Edge computing, Serverless computing	12
V*	The following activities be carried out/ discussed in the lab during the semester. Programming Lab: • Create an account on AWS/Google Cloud/Azure • Launch and manage a Virtual Machine (VM) instance • Deploy a static website using cloud storage (e.g., AWS S3) • Create and configure cloud storage buckets • Install and run a basic container using Docker • Explore IAM roles and permissions • Monitor usage and generate billing reports • Deploy a simple application using serverless architecture (e.g., AWS Lambda)	30
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10		End Term Examination: A three-hour exam for both theory and practicum. End Term Exam

➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Cloud Computing: Concepts, Technology & Architecture by Thomas Erl • Cloud Computing: A Practical Approach by Anthony T. Velte, Toby J. Velte, Robert Elsenpeter • Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi • Learning Cloud Computing by Alok Shrivastwa, Packt Publishing	

*Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	V		
Name of the Course	Java Based Web App Development		
Course Code	B23-CAC-505		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSE-3		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic knowledge of Java programming, HTML, CSS, and databases.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the architecture of Java web applications. 2. Develop dynamic websites using Java Servlets and JSP. 3. Handle form data, session, and cookies in web applications. 4. Integrate databases using JDBC for CRUD operations. 5. * Deploy and test Java-based web applications on web servers like Apache Tomcat.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> The examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory. Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.			
Unit	Topics		Contact Hours

I	Basics of Web Development and Java EE Architecture: Overview of web development, Introduction to Java EE architecture, HTTP basics and request-response cycle, Java web application structure, Introduction to Apache Tomcat server, Setting up a development environment (Eclipse/NetBeans + Tomcat)	11
II	Servlets Programming: Servlet lifecycle, Creating and deploying servlets, Handling request and response (GET and POST methods), Session tracking: Cookies, URL rewriting, HttpSession, ServletConfig and ServletContext, Exception handling and filters in servlets	11
III	JavaServer Pages (JSP): Introduction to JSP, JSP lifecycle, JSP elements: declarations, scriptlets, expressions, directives, and standard actions, JSP implicit objects, JSP with JavaBeans, Model-View-Controller (MVC) architecture in Java web apps	11
IV	Database Connectivity and Web App Deployment: JDBC overview and architecture, Connecting to databases using JDBC, Performing CRUD operations, Connection pooling, Error handling in JDBC, Deploying web apps using WAR files, Security basics in Java web apps	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Setup and configure Apache Tomcat server • Create and deploy a basic servlet application • Handle form submission using GET and POST in servlets • Implement session tracking using cookies and HttpSession • Create a dynamic JSP page with embedded Java code • Connect a JSP/Servlet app to a MySQL database using JDBC • Perform CRUD operations (Create, Read, Update, Delete) using JDBC • Package and deploy the web application as a WAR file • Use MVC design pattern to build a login application	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Seymour Lipschutz, Data Structures, Tata McGraw- Hill Publishing Company Limited, Schaum's Outlines.
- Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, Data Structures Using C, Pearson Education.
- Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures with Applications, McGraw-Hill.
- Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Addison- Wesley.

* Applicable for courses having practical components.

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	V		
Name of the Course	Programming in R		
Course Code	B23-CAC-506		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-3		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Basic knowledge of statistics, programming fundamentals, and data structures.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of R programming language. 2. Write and debug R programs for data analysis. 3. Work with data frames, lists, and control structures in R. 4. Apply statistical functions and data visualization techniques. 5. *Perform data wrangling and exploratory data analysis using R.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First			

question will be compulsory. Practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.		
Unit	Topics	Contact Hours
I	Introduction to R and RStudio: Installing R and RStudio, R as a calculator, variables and data types, R scripts and console, R packages and libraries, Basic I/O operations, Basic functions in R	11
II	Data Structures and Control Flow: Vectors, matrices, arrays, lists, data frames, factors, Type coercion and indexing, Conditional statements: if, else, switch, Looping: for, while, repeat, Apply family of functions (apply, lapply, sapply)	11
III	Data Manipulation and Visualization: Reading and writing data (CSV, Excel, TXT), Data cleaning and preprocessing using dplyr, Filtering, selecting, mutating, summarising data, Data visualization using ggplot2, Histograms, bar charts, scatter plots, box plots, Handling missing data	11
IV	Statistical Analysis and R for Data Science: Descriptive statistics: mean, median, mode, variance, Standard deviation and correlation, Hypothesis testing: t-test, chi-square, ANOVA, Introduction to linear regression, Introduction to R for machine learning and data science (overview), Project: exploratory data analysis on real-world dataset	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Install and set up R and RStudio • Write R scripts using basic data types and operators • Create and manipulate vectors, matrices, and data frames • Implement control structures and functions in R • Load and clean data using read.csv() and dplyr functions • Create visualizations using ggplot2 (bar, line, scatter, histogram) • Perform basic statistical analysis using in-built R functions • Conduct hypothesis testing using t-test and chi-square test • Build a simple linear regression model • Mini-project: Exploratory data analysis on a real dataset (e.g., COVID-19, sales, population)	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10		End Term Examination: A three-hour exam for both theory and

➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • The Art of R Programming by Norman Matloff • R for Data Science by Hadley Wickham and Garrett Grolemund • Hands-On Programming with R by Garrett Grolemund • Beginning R: The Statistical Programming Language by Mark Gardener • Practical Data Science with R by Nina Zumel and John Mount	

*Applicable for courses having practical components.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	VI		
Name of the Course	Artificial Intelligence		
Course Code	B23-CAC-601		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-6/MCC-11		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic knowledge of Python programming, data structures, logic and algorithms.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals, scope, and goals of artificial intelligence. 2. Apply various AI problem-solving techniques including search strategies. 3. Implement basic AI algorithms such as heuristic search, game playing, and knowledge representation. 4. Explore machine learning foundations and rule-based expert systems. 5. *Develop simple AI applications using Python-based AI libraries.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper-Setter</u> The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions in all, selecting one question from each unit. The first question will be compulsory.			

The practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Artificial Intelligence: Definition and scope of AI, History and evolution of AI, Applications of AI in various domains, Intelligent agents, types and structure of agents, Concept of environment and rationality, Turing test and limitations of AI	11
II	Problem Solving and Search Strategies: Problem formulation, State space representation, Uninformed search: Breadth-first, Depth-first, Uniform cost, Informed search: Greedy, A* algorithm, Heuristic functions, Local search: Hill climbing, Simulated annealing, Game playing: Minimax algorithm, Alpha-beta pruning	11
III	Knowledge Representation and Reasoning: Knowledge representation techniques: propositional logic, predicate logic, semantic networks, frames, Production rules, Inference techniques, Forward and backward chaining, Rule-based expert systems and architecture, Handling uncertainty: Bayesian reasoning, Fuzzy logic	11
IV	Introduction to Machine Learning and AI Tools: Basic concepts of machine learning: supervised, unsupervised learning, Introduction to decision trees, regression and clustering, Introduction to AI libraries: NumPy, Pandas, Real-life applications: chatbots, recommender systems, virtual assistants	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Implement a simple chatbot using rule-based logic • Develop Python programs for uninformed and informed search algorithms • Write a program for the Minimax algorithm with alpha-beta pruning • Design and evaluate a simple expert system using rules • Perform classification using k-NN or logistic regression • Use fuzzy logic for a basic decision-making system • Create a recommendation engine using collaborative filtering	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End-Term Examination: A three-hour exam for both theory and practicum. End Term Exam Marks: 70(50(T)+20(P))
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig • Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B. Nair • Introduction to Artificial Intelligence by Wolfgang Ertel • Python Machine Learning by Sebastian Raschka • Artificial Intelligence with Python by Prateek Joshi	

*Applicable for courses having practical components.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	VI		
Name of the Course	Advanced Web Development Techniques		
Course Code	B23-CAC-602		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	MCC-12		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Basic knowledge of HTML, CSS, JavaScript, and introductory web development (including client-server concepts).		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Develop dynamic, interactive, and responsive websites using modern frameworks. 2. Implement AJAX-based interactions and API integrations. 3. Utilize JavaScript frameworks and state management techniques. 4. Build and deploy full-stack applications using best practices. 5. *Practicals based on Advanced Web Development techniques.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question			

will comprise of short answer type questions covering entire syllabus.
Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.
Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Responsive and Modern Frontend Development: Advanced HTML5 and CSS3 features, Responsive design using media queries and Flexbox/Grid, CSS pre-processors, JavaScript ES6+ features, DOM manipulation and event handling, Introduction to frontend frameworks (React/Angular)	11
II	JavaScript Frameworks and State Management: Component-based architecture (React), Props and state, Conditional rendering, Routing using React Router, State management using Redux, Handling forms and validation	11
III	Asynchronous Web and API Integration: AJAX and Fetch API, Consuming RESTful APIs, Promises and async/await, Error handling in asynchronous calls, CORS and JSON Web Tokens (JWT), WebSockets and real-time communication basics	11
IV	Full Stack Development and Deployment: Introduction to Node.js and Express.js, Connecting frontend with backend APIs, Introduction to MongoDB or MySQL, CRUD operations in full stack apps, Application security (XSS, CSRF, HTTPS, authentication), Deployment on platforms	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Design a responsive website layout using Flexbox and media queries • Build an interactive UI with React components • Implement client-side routing and dynamic navigation • Create and validate forms using modern JavaScript • Fetch and display data from a public API using async/await • Handle real-time data using WebSockets or polling techniques • Develop a full-stack CRUD app using React + Node.js + MongoDB/MySQL • Implement user authentication with JWT and protected routes • Secure a web application from common vulnerabilities	30
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 5		End Term Examination: A three hour

• Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Eloquent JavaScript by Marijn Haverbeke • Learning React by Alex Banks and Eve Porcello • Full-Stack React Projects by Shama Hoque • Web Development with Node and Express by Ethan Brown • Pro MERN Stack by Vasan Subramanian	

*Applicable for courses having practical component.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	VI		
Name of the Course	Developing Modern Web Applications using React		
Course Code	B23-CAC-603		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-4		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Proficiency in HTML, CSS, JavaScript (ES6+), and basic understanding of web development and DOM.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of React and component-based architecture. 2. Develop interactive and dynamic front-end applications using React. 3. Manage application state and routing effectively. 4. Integrate RESTful APIs and perform asynchronous operations. 5. *Build, test, and deploy modern single-page applications (SPAs).		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First			

question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to React and Component Architecture: Introduction to SPA and React ecosystem, Setting up React development environment using Create React App (CRA), JSX syntax and rendering elements, Components: class-based vs functional, Props and state, Event handling in React, React Developer Tools	11
II	React State Management and Lifecycle: Component lifecycle methods, useState and useEffect hooks, Lifting state up, Conditional rendering, Controlled and uncontrolled components, Forms handling and validation, Context API for global state	11
III	React Routing and API Integration: React Router: navigation, route parameters, nested routing, Programmatic navigation, Introduction to Axios and Fetch API, Making GET and POST requests, Handling async/await and Promises, Error boundaries and loading states	11
IV	Application Development and Deployment: Project structuring and reusable components, State management using Redux (basic concepts), Custom hooks and composition, Building and testing React apps, Deployment using Netlify/GitHub Pages, Best practices and performance optimization	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Set up a React project using Create React App • Create functional components and use props and state • Build an interactive form with validation • Implement state management using React hooks • Build a multipage SPA using React Router • Fetch data from a REST API and render it dynamically • Handle loading and error states in data fetching • Use Context API for managing global state • Create and use custom hooks • Deploy a complete React application to Netlify	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10		End Term Examination: A three hour exam for both theory and

➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Learning React by Alex Banks and Eve Porcello • React Up and Running by Stoyan Stefanov • Fullstack React by Accomazzo, Murray, Lerner et al. • The Road to React by Robin Wieruch • React – The Complete Guide (Udemy Course) by Maximilian Schwarzmüller	

*Applicable for courses having practical component.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	VI		
Name of the Course	Data Storage Technologies and Networks using AWS		
Course Code	B23-CAC-604		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSE-4		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Basic knowledge of cloud computing, computer networks, and Linux/Windows OS.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand fundamental concepts of data storage technologies and network infrastructure. 2. Explore AWS storage services like S3, EBS, and Glacier. 3. Configure virtual private cloud (VPC) and networking components in AWS. 4. Implement secure and scalable storage and networking solutions. 5. *Monitor, manage, and optimize storage and network resources on AWS.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.			

Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Data Storage Technologies: Types of storage: primary, secondary, online, offline, Overview of traditional vs cloud-based storage, File systems and storage architectures: DAS, NAS, SAN, RAID levels and data redundancy, Backup and archival concepts, Storage performance metrics	11
II	AWS Storage Services: Overview of AWS storage solutions, Amazon S3: buckets, objects, lifecycle policies, permissions, Versioning and cross-region replication, Amazon EBS: volumes, snapshots, and backups, Amazon EFS: file storage for EC2, Amazon Glacier: archival storage and retrieval policies	11
III	Network Fundamentals and AWS Networking: Basics of computer networks: LAN, WAN, IP addressing, DNS, Subnetting, Cloud networking principles, AWS VPC: subnets, route tables, internet gateways, NAT, security groups, Elastic IPs and endpoints, Connecting EC2 instances securely within VPC	11
IV	Storage-Network Integration and Security on AWS: Attaching storage to EC2, Data transfer services (AWS DataSync, Snowball), Monitoring storage and network using AWS CloudWatch, Cost estimation and optimization tools (AWS Pricing Calculator), Identity and Access Management (IAM) for storage and network, Security best practices for storage and network design	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Create and configure S3 buckets with versioning and permissions • Upload, retrieve, and manage objects using AWS CLI and S3 • Create and attach EBS volumes to EC2 instances • Set up and test lifecycle policies in S3 • Implement file sharing using Amazon EFS • Launch EC2 instances in a custom VPC with subnets and route tables • Configure security groups and network ACLs for VPC • Use AWS CloudWatch to monitor storage and network activity • Perform cross-region replication of an S3 bucket • Estimate and analyze AWS storage and networking costs using pricing tools	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	End Term Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • AWS Certified Solutions Architect Official Study Guide by Joe Baron et al. • Cloud Storage Forensics by Darren Quick • Amazon Web Services in Action by Michael Wittig and Andreas Wittig • Cloud Computing: Concepts, Technology & Architecture by Thomas Erl • Networking Fundamentals by Richard M. Roberts	

*Applicable for courses having practical component.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	VI		
Name of the Course	Data Analytics using Python		
Course Code	B23-CAC-606		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Basic knowledge of Python programming, statistics, and data structures.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the role of Python in data analytics. 2. Perform data cleaning, transformation, and analysis using Python libraries. 3. Visualize data using Python’s visualization tools. 4. Apply statistical techniques and generate insights from data. 5. *Work with real-world datasets and communicate findings effectively.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus. Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.			

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.		
Unit	Topics	Contact Hours
I	Introduction to Data Analytics and Python Basics: Overview of data analytics and its importance, Python installation and environment setup, Jupyter Notebook and IDEs, Data types, variables, operators, control statements, Functions and modules, File handling	11
II	Working with Data Using NumPy and Pandas: Introduction to NumPy: arrays, indexing, slicing, array operations, Introduction to Pandas: Series and DataFrames, Reading and writing data (CSV, Excel), Data selection, filtering, sorting, and aggregation, Handling missing data and duplicates	11
III	Data Visualization and Exploratory Data Analysis: Introduction to Matplotlib and Seaborn, Line, bar, pie, histogram, scatter, and box plots, Customizing plots and labels, Exploratory Data Analysis (EDA): identifying patterns and anomalies, Correlation and trend analysis	11
IV	Statistical Analysis and Mini Project: Descriptive statistics: mean, median, mode, std deviation, Inferential statistics: hypothesis testing, t-tests, chi-square, Introduction to linear regression, Real-world case study and mini-project using dataset (e.g., sales, weather, education, health), Report generation and dashboard basics using libraries	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Set up Python and Jupyter Notebook environment • Write Python programs for data manipulation using lists and dictionaries • Create and operate on NumPy arrays • Load, clean, and explore datasets using Pandas • Handle missing data and perform group-wise analysis • Visualize data using Matplotlib and Seaborn • Perform correlation analysis and plot heatmaps • Apply basic statistical techniques on datasets	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA		End Term Examination: A three hour exam for both theory and practicum.

• Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • Python for Data Analysis by Wes McKinney • Data Science from Scratch by Joel Grus • Think Stats by Allen B. Downey • Practical Statistics for Data Scientists by Peter Bruce and Andrew Bruce • Hands-On Data Analysis with Pandas by Stefanie Molin	

*Applicable for courses having practical component.

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Scheme: 2023-24, Syllabus: 2025-26			
Part A - Introduction			
Subject	COMPUTER APPLICATIONS		
Semester	VI		
Name of the Course	Data Analytics using R		
Course Code	B23-CAC-607		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	DSE-5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Basic knowledge of statistics, programming concepts, and spreadsheet operations.		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the fundamentals of R programming for data analysis. 2. Perform data import, manipulation, and cleaning using R. 3. Visualize and interpret datasets using appropriate R libraries. 4. Apply statistical techniques to draw insights from data. 5. *Execute data-driven projects using real-world datasets.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(70(T)+30(P)) Internal Assessment Marks:30(20(T)+10(P)) End Term Exam Marks: 70(50(T)+20(P))		Time: 3 Hrs.(T), 3Hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter</u> Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.			

Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.

Practicum will be evaluated by an external and an internal examiner. Examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to R Programming and Data Types: Installing and setting up R and RStudio, R syntax and operators, Variables and data types (numeric, character, logical, factor), Vectors, matrices, lists, and data frames, Writing and using functions, control structures (if, else, for, while), Importing and exporting data (CSV, Excel, TXT)	11
II	Data Wrangling and Manipulation with dplyr and tidyr: Data selection, filtering, arranging, and mutating with dplyr, Summarization and grouping data, Joining datasets, Handling missing data, Reshaping data using tidyr (gather, spread, unite, separate), Working with categorical data and date-time	11
III	Data Visualization using ggplot2 and Exploratory Data Analysis (EDA): Introduction to data visualization, Plot types: bar, histogram, boxplot, line, scatterplot, Customizing graphs (labels, colors, legends), ggplot2 grammar of graphics, Exploring relationships and distributions, Basic correlation analysis and visual diagnostics	11
IV	Statistical Techniques and Case Study: Descriptive statistics: mean, median, variance, std dev, Inferential statistics: t-test, chi-square, ANOVA, Introduction to regression analysis, Basic clustering and classification overview, Final case study using real dataset (healthcare, finance, education, etc.), Report generation using R Markdown	12
V*	Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems: • Set up RStudio and execute basic R commands • Work with vectors, lists, data frames, and matrices • Load and clean data using readr, dplyr, and tidyr • Perform data filtering, sorting, and aggregation • Handle missing and inconsistent data • Visualize data using ggplot2 (scatter, bar, box, histogram) • Conduct correlation and summary statistics • Perform hypothesis testing (t-test, chi-square) • Run a simple linear regression in R	30
Suggested Evaluation Methods		
Internal Assessment:		End Term

➤ Theory • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA	Examination: A three hour exam for both theory and practicum.
Part C-Learning Resources	
Recommended Books/e-resources/LMS: • R for Data Science by Hadley Wickham and Garrett Grolemund • The Art of R Programming by Norman Matloff • Hands-On Programming with R by Garrett Grolemund • Practical Data Science with R by Nina Zumel and John Mount • Data Analytics with R by Bharti Motwani	

*Applicable for courses having practical component.

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

(“A++” Grade, NAAC Accredited)



Scheme of Examination for Post Graduate Programme

M.A. Fine Arts

as per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme

With Multiple Entry-Exit, Internship and CBCS-LOCF

With effect from the session 2025-26 (in phased manner)

**DEPARTMENT OF FINE ARTS
FACULTY OF INDIC STUDIES**

**KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA**

Kurukshetra University, Kurukshetra

Scheme of Examination for Postgraduate Programme M.A. Fine Arts
as per NEP 2020 Curriculum and Credit Framework for Postgraduate Programmes
(CBCS LOCF) with effect from the session 2025-26 (in phased manner)

Framework-1 Scheme-P

Semester	Course Type	Course Code	Nomenclature of course	Theory (T)/ Practical (P)	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
						Total	L	T	P	Total				
1	CC-1	M25- FAT -101 (Common)	HISTORY OF MODERN EUROPEAN ART-I	T	4	22	4	0	0	4	30	70	100	3
	CC-2	M25- FAT -102 (For Painting)	INDIAN PHILOSOPHY OF ART (ORIENTAL APPROACH)	T	4		4	0	0	4	30	70	100	3
		M25- FAT -103 (For Applied Art)	FOUNDATION OF ADVERTISING	T	4		4	0	0	4	30	70	100	3
	PC-1	M25- FAT -104 (For Painting)	ADVANCE LANDSCAPE-I	P	4		0	0	4	4	30	70	100	12
		M25- FAT -105 (For Applied Art)	GRAPHIC DESIGN-I	P	4		0	0	4	4	30	70	100	12
	PC-2	M25- FAT -106 (For Painting)	PORTRAITURE-I	P	4		0	0	8	8	30	70	100	18
		M25- FAT -107 (For Applied Art)	VISUALIZATION-I	P	4		0	0	8	8	30	70	100	18

	PC-3	M25- FAT -108 (For Painting)	FIGURATIVE COMPOSITION-I	P	4		0	0	8	8	30	70	100	18
		M25- FAT -109 (For Applied Art)	BASIC PHOTOGRAPHY	P	4		0	0	8	8	30	70	100	18
	SEMINAR	M25- FAT -110 (Common)	SEMINAR	S	2		0	0	0	2	0	50	50	1
2	CC-3	M25- FAT -201 (Common)	HISTORY OF MODERN EUROPEAN ART-II	T	4	22	4	0	0	4	30	70	100	3
	CC-4	M25- FAT -202 (For Painting)	WESTERN PHILOSOPHY OF ART (OCCIDENTAL APPROACH)	T	4		4	0	0	4	30	70	100	3
		M25- FAT -203 (For Applied Art)	ART OF ADVERTISING	T	4		4	0	0	4	30	70	100	3
	PC-4	M25- FAT -204 (For Painting)	ADVANCE LANDSCAPE-II	P	4		0	0	4	4	30	70	100	12
		M25- FAT -205 (For Applied Art)	GRAPHIC DESIGN-II	P	4		0	0	4	4	30	70	100	12
	PC-5	M25- FAT -206 (For Painting)	PORTRAITURE-II	P	4		0	0	8	8	30	70	100	18
		M25- FAT -207 (For Applied Art)	VISUALIZATION-II	P	4		0	0	8	8	30	70	100	18
	PC-6	M25- FAT -208 (For Painting)	CREATIVE COMPOSITION-I	P	4		0	0	8	8	30	70	100	18
		M25- FAT -209 (For Applied Art)	ADVANCE PHOTOGRAPHY	P	4		0	0	8	8	30	70	100	18

	CHM	M25-CHM 201 (Common)	Constitutional, Human & Moral Values and IPR	T	2		2	0	0	2	15	35	50	3
	Internship	M25-INT-200 (Common)	An internship course of 4 Credits of 4-6 weeks duration during summer vacation after 2 nd semester is to be completed by every student. Internship can be either for enhancing the employability or for developing the research aptitude.								50	50	100	
3	CC-5	M25- FAT -301 (Common)	HISTORY OF MODERN INDIAN ART-I	T	4	22	4	0	0	4	30	70	100	3
	CC-6	M25- FAT -302 (For Painting)	CONTEMPORARY INDIAN ART-I	T	4		4	0	0	4	30	70	100	3
		M25- FAT -303 (For Applied Art)	ADVERTISING AND PHOTOGRAPHY	T	4		4	0	0	4	30	70	100	3
	DEC-1	M25- FAT -304 (For Painting)	PICTORIAL COMPOSITION – I	P	4		0	0	4	4	30	70	100	12
		M25- FAT -305 (For Applied Art)	CAMPAIGN DESIGN – I	P	4		0	0	4	4	30	70	100	12
	PC-7	M25- FAT -306 (For Painting)	LIFE STUDY-I	P	4		0	0	8	8	30	70	100	18
		M25- FAT -307 (For Applied Art)	ADVERTISING CAMPAIGN (MANUAL)	P	4		0	0	8	8	30	70	100	18
	PC-8	M25- FAT -308 (For Painting)	CREATIVE COMPOSITION-II	P	4		0	0	8	8	30	70	100	18
		M254- FAT -309 (For Applied Art)	DOCUMENTARY PHOTOGRAPHY-I	P	4		0	0	8	8	30	70	100	18

	OEC (For other Deptt. Students)	M25-OEC-315	FUNDAMENTALS OF VISUAL ARTS	P	2		0	0	4	4	15	35	50	4
4	CC-7	M25-FAT-401 (Common)	HISTORY OF MODERN INDIAN ART-II	T	4	22	4	0	0	4	30	70	100	3
	CC-8	M25-FAT-402 (For Painting)	CONTEMPORARY INDIAN ART-II	T	4		4	0	0	4	30	70	100	3
		M25-FAT-403 (For Applied Art)	ADVERTISING: ETHICS AND REGULATION	T	4		4	0	0	4	30	70	100	3
	DEC-2	M25- FAT -404 (For Painting)	PICTORIAL COMPOSITION – II	P	4		0	0	4	4	30	70	100	12
		M25- FAT -405 (For Applied Art)	CAMPAIGN DESIGN – II	P	4		0	0	4	4	30	70	100	12
	PC-9	M25- FAT -406 (For Painting)	LIFE STUDY-II	P	4		0	0	8	8	30	70	100	18
		M25- FAT -407 (For Applied Art)	ADVERTISING CAMPAIGN (DIGITAL)	P	4		0	0	8	8	30	70	100	18
	PC-10	M25- FAT -408 (For Painting)	CREATIVE COMPOSITION-II	P	4		0	0	8	8	30	70	100	18
		M25- FAT -409 (For Applied Art)	DOCUMENTARY PHOTOGRAPHY-II	P	4		0	0	8	8	30	70	100	18
	EEC	M25- FAT -410 (Common)	EXHIBITION & PRESENTATION	T	1		1	0	0	1	10	20	30	2 (T)+ 4 (P)
				P	1		0	0	2	2	5	15	20	

OR

Scheme of Semester IV when a student opts for Dissertation Work or Project Work													
Course Type	Course Code	Nomenclature of course	Theory (T)/ Practical (P)	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
					Total	L	T	P	Total				
CC-7	M25-FAT-401 (Common)	HISTORY OF MODERN INDIAN ART-II	T	4	22	4	0	0	4	30	70	100	3
DEC-2	M25- FAT – 404 (For Painting)	PICTORIAL COMPOSITION – II	P	4		4	0	0	4	30	70	100	12
	M25- FAT - 405 (For Applied Art)	CAMPAIGN DESIGN – II	P	4		4	0	0	4	30	70	100	12
EEC	M25- FAT – 410 (Common)	EXHIBITION & PRESENTATION	T	1		1	0	0	1	10	20	30	2 (T) + 4 (P)
			P	1		0	0	2	2	5	15	20	
Dissertation/ Project work	M25- FAT – 411 (Common)	DISSERTATION/ PROJECT WORK	D	12		0	0	0	0	0	300	300	–

PLOs	Master Degree in Fine Arts [M.A. Fine Arts]
	After the completion of Master degree in Fine Arts the student will be able to:
PLO-1: Knowledge and Understanding	Demonstrate the fundamental and advanced knowledge of the subject and understanding of recent developments and issues, including methods and techniques, related to the Fine Arts.
PLO-2: General Skills	Acquire the general skills required for performing and accomplishing the tasks as expected to be done by a skilled professional in the fields of Fine Arts.
PLO-3: Technical/ Professional Skills	Demonstrate the learning of advanced cognitive technical/professional skills required for completing the specialized tasks related to the profession and for conducting and analyzing the relevant research tasks indifferent domains of the Fine Arts.
PLO-4: Communication Skills	Effectively communicate the attained skills of the Fine Arts in well-structured and productive manner to the society at large.
PLO-5: Application of Knowledge and Skills	Apply the acquired knowledge and skills to the problems in the subject area, and to identify and analyze the issues where the attained knowledge and skills can be applied by carrying out research investigations to formulate evidence-based solutions to complex and unpredictable problems associated with the field of Fine Arts or otherwise.
PLO-6: Critical thinking and Research Aptitude	Attain the capability of critical thinking in intra/inter-disciplinary areas of the Fine Arts enabling to formulate, synthesize, and articulate issues for designing of research proposals, testing hypotheses, and drawing inferences based on the analysis.
PLO-7: Constitutional, Humanistic, Moral Values and Ethics	Know constitutional, humanistic, moral and ethical values, and intellectual property rights to become a scholar/professional with ingrained values in expanding knowledge for the society, and to avoid unethical practices such as fabrication, falsification or misrepresentation of data or committing plagiarism.
PLO-8: Capabilities/qualities and mindset	To exercise personal responsibility for the outputs of own work as well as of group/team and for managing complex and challenging work(s) that requires new/strategic approaches.
PLO-9: Employability and job-ready skills	Attain the knowledge and skills required for increasing employment potential, adapting to the future work and responding to the rapidly changing demands of the employers/industry/society with time.

Kurukshetra University, Kurukshetra

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Syllabus for Post Graduate Programme M.A. (Fine Arts)

as per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme

With Multiple Entry-Exit, Internship and CBCS-LOCF

With effect from the session 2025-26 (in phased manner)

**DEPARTMENT OF FINE ARTS
FACULTY OF INDIC STUDIES**

**KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA**

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	First		
Name of the Course	History of Modern European Art-I		
Course Code	M25- FAT -101		
Course Type	CC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To identify and describe the major modern art movements in Western and Russian art from the late 19th century to the mid-20th century. CLO 2: To relate the development of modern art movements to their historical, social, and cultural contexts. CLO 3: To formulate and express opinions about modern art movements and their relevance to contemporary art practices. CLO 4: To critically analyze and distinguish the techniques, styles, and formal characteristics of artworks associated with various modern art movements.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Romanticism: Francisco Goya, Eugène Delacroix, John Constable, J.W.M. Turner. Realism: Gustave Courbet, Jean-François Millet, Camille Corot, Honoré Daumier.		15
II	Impressionism: Claude Monet, Edouard Manet, Edgar Degas, Pierre-Auguste Renoir. Neo-Impressionism: Georges Seurat, Camille Pissarro Post-impressionism: Henri de Toulouse-Lautrec, Paul Cézanne, Paul Gauguin, Vincent Van Gogh.		15
III	Expressionism: Die Brücke group - Edvard Munch, Emil Nolde, Ernst Ludwig Kirchner, Der Blaue Reiter group - Franz Marc, Paul Klee, Wassily Kandinsky. Figurative Expressionism- Oskar Kokoschka.		15
IV	Fauvism: Henri Matisse, André Derain		

	Cubism: Pablo Picasso, Georges Braque Futurism: Umberto Boccioni.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Deymatie : Fauvism (good introduction also in Encyclopedia of World Art.)		
2. Crespelle – The Fauves.		
3. Razanl, Modern Paining, Skira – Useful references from plates and text.		
4. Lake and Maillard – Dictionary of Modern Painting.		
5. Herbert Read – A concise History of Modern Paining.		
6. William Vaughan – Romantic Art.		
7. European Modern Movements in Encyclopedia of World Art.		
8. Leymarie – Impressionism (Skira).		
9. J. Rewald – History of impressionism – Museum of Modern Art, New York.		
10. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).		
11. Madsen – Art Nouveau.		
12. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.		
13. Rosenblum – Cubism and 20 th Century Art.		
14. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.		
15. Ritchie – German 20 th Century Art – Museum of Modern Art.		
16. Barr – Fantastio Art; Dada and Surrealism.		
17. Scuphor – Dictionary of Abstract Art.		
18. Motherwell Dada Poets and Painters (Anthology of Dada Writings).		
19. Marcel Jean – A History of Surrealist Painting (Comprehensive Study)		
20. Herbert Read – Surrealism (Mainly documents)		
21. Rubin – Dada & Surrealism.		
22. F.Pepper – Kinetic Art.		
23. H.H.Arnason – A history of modern art, Pearson Prentice hall, new Jersey, 2004.		
24. H.W.Janson – History of art, Pearson Prentice hall, new Jersey.		
25. E.H.Gombrich- The Story of Art, Phaidon Press Ltd.,London, 2001.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	First		
Name of the Course	Indian Philosophy of Art (Oriental Approach)		
Course Code	M25- FAT -102		
Course Type	CC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To know about the concept of Indian aesthetics and philosophy that would help them understand paintings and artworks. CLO 2: To gain knowledge about the principles of paintings in Hindi Shilpa texts. CLO 3: To understand the use of Rasa and its types in creating beautiful paintings. CLO 4: To understand the concept of different theories in Indian aesthetics.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics	Contact Hours	
I	Definition of Indian Philosophy (Darshan) and basic principles and religious thoughts Four Vedas – Rig, Sama, Yajura, Atharva Introduction to Upanishads.	15	
II	Fundamentals of Indian Arts, Principles and Iconography in the Shilpa Texts like Chitrastutam, Chitralakshanam.	15	
III	Concept and Types of Rasa Sutra by Bharat Muni and Abhinav Gupta. Shadanga- Six Limbs of Indian Painting (Rupabheda, Pramana, Bhava, Lavanya Yojanam, Sadrihsyam, and Varnika Bhangam	15	
IV	Theory of Alamkar, Dhvani, Auchitya, Riti.	15	
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Aesthetic Meaning by Rekha Jhanji			
2. An Introduction to Indian Aesthetics by Mini Chandran and V.S. Srinath			
3. Saundarya Shastra by Mamta Chaturvedi			
4. Indian Aesthetics- Convergence and divergence by Priyadarshani Patnaik and Joy Sen			
5. A Students Handbook to Indian Aesthetics by Neerja A. Gupta			
6. Indian Aesthetics- An Introduction by V. S. Seturaman.			
7. The Bloomsbury research handbook of Indian Aesthetics and the philosophy of Art by editor Arindam Chakrabarti.			

Session: 2025-26			
Part A – Introduction			
Name of Programe	M.A. Fine Arts		
Semester	First		
Name of the Course	Foundation of Advertising		
Course Code	M25- FAT -103 (For Applied Art)		
Course Type	CC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand advertising and different forms of trademarks. CLO 2: Explain the historical development and significance of early art and graphic design. CLO 3: To understand about print media. CLO 4: To understand the planning of moder advertising campaign designing.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Introduction to Advertising, Define Advertising; Graphic Design, Types of Advertising, Functions of Advertising, Trademark: Logo/ Logotype, signature, Seal, Monogram, Symbol, Emblem, Insignia etc.		15
II	Photography: Introduction, meaning & brief history. Introduction of Camera: Aperture, Shutter Speed, ISO; Introduction of Lens.		15
III	Print Media: Newspapers& Magazines Advertising; Outdoor Advertising: Posters& Hoardings: Broadcast Media: Radio & Television Direct Mail Advertising; Window Display& Counter Display		15
IV	Campaign planning, objectives and basic principles – Campaign objectives & Types, Factors influencing the planning of advertising campaign. The selling methods, Advertising Appeal, Types of Appeal.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Foundation of Advertising: S.A Chunnawalla, K.C Sethia.			
2. Advertising and Sales Promotion: S.H.H kazmi, Satish Batra.			
3. Social Dimension of Advertising: S.S Kaptan.			
4. Advertising theory and practice: C.H Sandage, Vernon Fryburger.			
5. Advertising and Promotion AN IMC Approach,Shimp Cengage Learning India Pvt. Ltd., New			
6. Delhi Contemporary Advertising: William F. Arens, Courtland L. Bovee.			
7. foKkiu *rduhd ,oaf\}kUr* : ujsUnz ;kno			
8. foKkiufMtkbu : ujsUnz ;kno			
9. foKkiudyk: ,ds'ojizlkngVoky			
10. foKkiu : v'kksd egktu			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	First		
Name of the Course	Advance Landscape-I		
Course Code	M25- FAT -104		
Course Type	PC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To develop practical skills in landscape drawing and painting techniques. CLO 2: Students will gain an understanding of contemporary landscape art, including current trends, techniques, and influential artists. CLO 3: To explore the relationship between nature, culture, and artistic expression. CLO 4: To cultivate an appreciation for the diverse approaches to representing landscapes		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B - Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Live study of Landscape from nature and surroundings (iv) Size: 30” X 40” (v) Medium: water colour, ink/ oil colour/acrylic colour etc. (vi) No. of canvas: 02 (vii) Sheet work- 15			
Unit	Topics		Contact Hours
I	Use of perspective in landscape painting: One-point, two-point to create an attractive landscape		15
II	Explore Landscape in different mediums- oil, acrylic, watercolors, pastels and any other medium.		15
III	Practical exercises focusing on the live study of natural color, texture, composition, perspectives.		15
IV	Observation and Practice of elements of nature like trees, sky, clouds, distant objects etc.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	70
• Class Participation:	5		
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	First		
Name of the Course	Graphic Design-I		
Course Code	M25- FAT -105 (For Applied Art)		
Course Type	PC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the planning of creative campaign. CLO 2: Use of design technology including digital resources. CLO 3: Understand the development of creative thought process. CLO 4: Creative use of new mediums such as Digital photography, Digital manipulation etc.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) First three hours is strictly for visualization and planning of campaign Any kind of reference is not allowed during this period. (iv) Poster Size – 12’ × 18’ or 20’ × 30’ (As per requirement); Layout Size – 8’ × 10’ (v) Total assignments for Sessional work – One campaign (Minimum 10 Assignment per Campaign).			
Unit	Topics		Contact Hours
I	Computer Graphics: Knowledge of basic Computer Application and Knowledge of various software’s mainly Adobe Illustrator, Adobe Photoshop. Microsoft Power-point, Corel Draw, Adobe Page-Maker, Digital Manipulation & its use in advertisement. Assignments: Logo, Stationary Set (Letter head, Visiting Card, Envelope)		15
II	Assignments: Poster		15
III	Assignments: Magazine Layout, Press Ad Layout		15
IV	Assignments: Calendar, Package, Dangler, Cut-out, Counter display, Packaging, Standee or any other assignment with permission of concern teacher. Any-2		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	First		
Name of the Course	Portraiture-I		
Course Code	M25- FAT -106		
Course Type	PC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To analyze masterworks of portraiture to understand prevalent styles, approaches and techniques. CLO 2: To develop a cohesive body of portrait works demonstrating personal style and voice. CLO 3: To learn to give and receive constructive critique on portraiture in a group setting. CLO 4: To prepare and present a final portfolio of portrait studies that demonstrates technical skills and personal growth.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Head study from live models of different age groups (male or female). (iv) Size 18" x 24 " (v) Medium: Water Colour, Ink/Oil Colour/Acrylic Colour etc. (vi) Number of assignments: 04 canvases (vii) No. of Sheets: 15 (Half Imperial)			
Unit	Topics		Contact Hours
I	Fundamentals of head drawing: Sketching face structure, eyes, nose, ears, lips and overall facial expressions		30
II	Proportions, anatomy and measurements in head studies		30
III	Composition of the portraiture with the surrounding and background		30
IV	Use of Diverse artistic styles and approaches to representing the human head.		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70
• Class Participation:	5		
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	First		
Name of the Course	Visualization-I		
Course Code	M25- FAT -107 (For Applied Art)		
Course Type	PC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To communicate messages visually through a combination of words, artworks, graphic and media. CLO 2: To sustained artistic engagement with socio-political realities and intensive investigation of contemporary critical issues. CLO 3: To skill of art and technology interface for creative outcomes. CLO 4: To utilize the visual message as a tool of social, moral and scientific awareness.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner will evaluate the Sessional work. (iii) First three hours is strictly for visualization and planning of campaign Any kind of reference is not allowed during this period. (iv) Poster Size – 12’ × 18’ or 20’ × 30’ (As per requirement); Layout Size – 8’ × 10’ (v) Total assignments for Sessional work – One campaign (Minimum 10 Assignment per Campaign).			
Unit	Topics		Contact Hours
I	Logo, Stationary Set (Letter head, Visiting Card, Envelope), Posters		30
II	Hoarding/Banner, Press Layout, Magazine Layout		30
III	Illustration, Calendar		30
IV	Cube, Package, Dangler, Cut-out, Counter display or any other assignment with permission of concern teacher. Any -2 Sketches – 100		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	First		
Name of the Course	Figurative Composition- I		
Course Code	M25- FAT -108		
Course Type	PC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To build confidence in drawing and painting the human figure from observation and imagination. CLO 2: To explore principles of composing multi-figure scenes including spatial arrangement, movement, story-telling, and choreography of figures. CLO 3: To gain experience working with a variety of media (drawing, painting, sculpture) to create compelling figurative compositions that demonstrate understanding of form, value, color, and perspective. CLO 4: To analyze and apply concepts from masterworks of figurative composition such as hierarchy, rhythm, balance, and narrative content to create impactful and expressive works.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Minimum Size: 30" x 40 " (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assignments: 04 canvases (vi) No. of Sheet work: 15			
Unit	Topics		Contact Hours
I	Study of full figure compositions from imagination and observation		30
II	Exercises of different painting techniques: texture work, distortion, symbolism, interpretation of themes		30
III	Exercises on application of different mediums both traditional and contemporary as a drawing tool		30
IV	Develop test and employ materials, process, and mediums in a way that activates ideas and concept		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	First		
Name of the Course	Basic Photography		
Course Code	M25- FAT -109 (For Applied Art)		
Course Type	PC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To build confidence in capturing the different composition. CLO 2: Understand to refine their ability to capture the textures in photographs. CLO 3: Acquire skills in Portraiture photographs. CLO 4: Produce professional-quality advertising photographs and creating a documentary.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner will evaluate the Sessional work. (iii) Size – 12’ × 18’ or 20’ × 30’ (As per requirement) (iv) Total assignments for Sessional work – Minimum 24 Assignment.			
Unit	Topics		Contact Hours
I	Photography: Basic knowledge of photography and its various equipment’s and materials – application of photography in advertising. Various photographic assignments of cityscape, nature, portrait, experimental photography etc. Assignment: Portraiture		30
II	Assignment: Texture Photography: To explore relationship between nature and artistic expression.		30
III	Assignment: Composition Photography: To develop practical skill of capturing creative composition through different techniques.		30
IV	Assignment: Advertising Photography: Study of Product Photography. Documentary / Small Commercial Movie - 1		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Second		
Name of the Course	History of European Western Art-II		
Course Code	M25- FAT -201		
Course Type	CC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the concept of movements like Dada and surrealism and their artists. CLO 2: To gain knowledge about the characteristics of abstraction and its elements. CLO 3: To analyze the principles and utopian visions promoted by the Bauhaus, De Stijl, and Constructivism. CLO 4: To critique Pop Art's embrace of popular culture imagery and commodities as a challenge to high art.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics	Contact Hours	
I	Introduction to Dadaism and its Characteristics Key Artists: Marchel Duchamp, Francis Picabia Surrealism: Influences and Major works Key Artists: Salvador Dalí, Max Ernst, Joan Miró	15	
II	Introduction to De Stijl Key Artists: Piet Mondrian, Theo Van Doesburg and their major works the Bauhaus Movement- Walter Gropius, Paul Klee	15	
III	Constructivism- Naum Gabo, Atonio Pevsner Key Artist: Vladamir Tatlin, Alexander Rodchenko Pop Art Key Artist: Andy Warhol	15	
IV	Op Art: Victor Vasarely Minimalism Art Key artist: Frank Stella	15	

	Modern European Sculptors: Constantin Brâncuși, Alberto Giacometti, Henry Moore Contemporary European Art Since 1980- Kinetic art: Alexander Calder		
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. History of Impressionism by J Rewald			
2. Art Since 1900: Modernism, Anti-modernism, Postmodernism by Hal Foster, Rosalind Krauss, Yve-Alain Bois, and Benjamin H. D. Buchloh.			
3. Modern Art: 1851-1929: Capitalism and Representation" by Richard R. Brettell			
4. Making Art History In Europe After 1915 by Noemi De Haro Gracia, Patricia Mayayo and Jesus Carrillo			
5. Adhunik Europe ka Itihas by Dr. A. K. Mittal			
6. Europiya Chitrakala Ka Itihas by Dr. Nisha Gupta			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Second		
Name of the Course	Western Philosophy of Art (Occidental approach)		
Course Code	M25- FAT -202		
Course Type	CC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To analyze the psychological mechanisms behind artistic perception, creation, and the role of the conscious/subconscious mind. CLO 2: To evaluate the relationships and intersections between psychology and art. To critically examine major philosophical theories and ideas about art from thinkers like Plato, Aristotle, Hegel etc. CLO 3: Marx, assessing their relevance and impact. CLO 4: To explore contemporary concepts like anti-aesthetics, globalization's impact on art, and theories by critics.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics	Contact Hours	
I	Introduction to Western aesthetics Pre- Socratic School – Milesian School, Eleatic School Ancient Philosophers – Socrates, Plato, Aristotle, Plotinus, Hegel	15	
II	Medieval Period philosophers- Augustine of Hippo, Early Modern- David Hume, Immanuel Kant.	15	
III	19 th & 20 th century Philosophers – Arthur Schopenhauer, Karl Marx, Friedrich, Roger Fry, Herbert Read	15	
IV	Benedetto Croce (Theory of intuition), Sigmund Freud & Carl Jung (Relationship between Psychology & art, Gestalt Theory,	15	

(Theory of empathy), Clive Bell (Theory of Significant forms), contribution of Leo Tolstoy & Susanne Langer in art			
Total Contact Hours		60	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Aesthetic Meaning by Rekha Jhanji			
2. Introductory Reading in Aesthetics by Hospers John			
3. Art as experience by John Dewey			
4. Art, beauty and Creativity by Shyamala Gupta			
5. Neoplatonism and western aesthetics by Aphrodite Alexandrakis			
6. Art Aesthetics and philosophy by S. G. Kulkarni and Kavita Chauhan			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Second		
Name of the Course	Art of Advertising		
Course Code	M25- FAT -203 (For Applied Art)		
Course Type	CC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To analyze and apply the concept of copywriting and advertisement. CLO 2: Planning and execution of advertising skills. CLO 3: To develop understanding in creating effective visual and layout design for various media. CLO 4: Understand the marketing and advertising concepts.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B – Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Introduction to Copy Writing, Copy Format: Headline, Sub-Headline, Body copy etc., Types of copy, Characteristics of copy, Publicity& Propaganda, The Advertiser, Target Audience and U.S.P.		15
II	Creative Advertising –Creativity, five stages of Creativity, Creative concept & Creative leap, Creative brief and big Idea, Creative Strategy & Component of creative Strategy, Creative thinking, Creative Thought process.		15
III	Introduction to advertising agency, Types of Advertising agency, Functional department of advertising agency. Brief introduction of Prominent Personalities of Advertising world; Prasoon Joshi, Prahlad Kakar, Piyush Pandey, Alyque Padamasi.		15
IV	Advertising Marketing: Nature and scope of Marketing, Advertising role in marketing, Types of market. Marketing mix, 4P’s of marketing, Packaging& Transportation, Direct marketing, Motivational research, Brand image.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Foundation of Advertising: S.A Chunnawalla, K.C Sethia.			
2. Advertising and Sales Promotion: S.H.H kazmi, Satish Batra.			
3. Social Dimension of Advertising: S.S Kaptan.			
4. Advertising theory and practice: C.H Sandage, Vernon Fryburger.			
5. Advertising and Promotion AN IMC Approach, Shimp Cengage Learning India Pvt. Ltd., New			
6. Delhi Contemporary Advertising: William F. Arens, Courtland L. Bovee.			
7. foKkiu *rduhd ,oaf\}kUr* : ujsUnz ;kno			
8. foKkiufMtkbu : ujsUnz ;kno			
9. foKkiudyk: ,ds'ojizlkngVoky			
10. foKkiu : v'kksd egktu			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Second		
Name of the Course	Advance Landscape-II		
Course Code	M25- FAT -204		
Course Type	PC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to develop understanding of chiaroscuro and texture. CLO 2: They will gain traditional style and techniques of landscape painting in India. CLO 3: Understanding of contemporary landscape art, including current trends, techniques, and influential artists. CLO 4: To cultivate an appreciation for the diverse approaches to representing landscapes		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Live study of Landscape from nature and surroundings (iv) Size 30" x 40 " (v) Medium: water colour, ink/ oil colour/acrylic colour etc. (vi) Number of assignments: 02 canvases (vii) No. of Sheet Works: 15			
Unit	Topics		Contact Hours
I	Architectural landscape: Capturing light and shade, texture in architectural buildings.		15
II	Observing traditional landscape paintings of India		15
III	Landscape in different styles and techniques like realistic, abstract landscape etc.		15
IV	Practicing landscape in western landscape techniques like pointillism, Impressionism etc.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	70
• Class Participation:	5		
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Second		
Name of the Course	Graphic Design-II		
Course Code	M25- FAT -205 (For Applied Art)		
Course Type	PC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1:Understand the planning of creative campaign. CLO 2:Use of design technology including digital resources. CLO 3:Understand the development of creative thought process through layout design process. CLO 4:Creative use of new mediums such as Digital photography, digital manipulation etc.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: (i) The Topics/Themes/Subject matters will be of multiple choices. (ii) The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in a sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. (iii) First three hours is strictly for visualization and planning of campaign Any kind of reference is not allowed during this period. (iv) Internal examiner will evaluate the Sessional work. (v) The student will have to submit one assignment for computer graphics given by the examiner. The photograph captured by the candidate should be used only. (vi) Poster Size – 12’ × 18’ or 20’ × 30’ (As per requirement); Layout Size – 8’ × 10’ (vii) Total assignments for Sessional work – One campaign (Minimum 10 Assignment per Campaign).			
Unit	Topics		Contact Hours
I	Computer Graphics: Knowledge of basic Computer Application and Knowledge of various software’s mainly Adobe Illustrator, Adobe Photoshop, Microsoft Power-point, Corel Draw, Adobe Page-Maker, Digital Manipulation & its use in advertisement. Assignments: Logo, Stationary Set (Letter head, Visiting Card, Envelope) Practice of different trademarks.		15
II	Assignments: Poster – Observing traditional poster in Indian Advertising		15

III	Assignments: Magazine Layout, Press Ad Layout: Analyzing and creating layout for magazines.	15		
IV	Assignments: Calendar-1, Package, Dangler, Cutout, Counter display, Packaging, Standee or any other assignment with permission of concern teacher. Any -2 Study of composing element in different packaging and other promotion materials.	15		
Total Contact Hours		60		
Suggested Evaluation Methods				
Internal Assessment: 30		End Term Examination: 70		
➤ Theory		30	➤ Theory:	70
• Class Participation:		5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:		10		
• Mid-Term Exam:		15		
Part C - Learning Resources				
Recommended Books/e-resources/LMS:				

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Second		
Name of the Course	Portraiture-II		
Course Code	M25- FAT -206		
Course Type	PC-5		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To develop a deep understanding of facial anatomy, proportions, and features, enabling them to accurately capture likeness and expression in their portraits. CLO 2: To observe and interpret the effects of light and shadow on the human face, enhancing their ability to create three-dimensional form and depth in their artwork. CLO 3: To develop technical proficiency in drawing and painting techniques specific to portraiture, including line work, shading, blending, and color mixing, to create realistic and expressive representations of the human form. CLO 4: To develop a personal artistic voice within the realm of head studies.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: (i) Head study from live models of different age groups (male or female). (ii) Size 18" x 24 " (iii) Medium: water colour, ink/ oil colour/acrylic colour etc. (iv) Number of assessments: 03 canvases (v) No. of Sheet works: 15			
Unit	Topics		Contact Hours
I	Capture likeness, expression, and character of the live model		30
II	Light and shadow study on the Human Face, 3D facial study		30
III	Techniques: pencil shading, blending, oil color study, acrylic color study, color mixing		30
IV	Study of the composition used in figure study by composing objects like vase and other object along with the model.		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Second		
Name of the Course	Visualization-II		
Course Code	M25- FAT -207 (For Applied Art)		
Course Type	PC-5		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To visualize the message through creativity. CLO 2: Execute social-moral and professional realities through creative campaign. CLO 3: Capable to utilize skill of art and technology interface for creative outcomes. CLO 4: Understand to utilize the visual message as a tool of social, moral and scientific awareness.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: (i) Themes/Subject matters/topics will be of multiple choices. (ii) The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. (iii) Internal examiner will evaluate the Sessional work. (iv) Tracing of illustration/Photography is not allowed in any assignment however slogan writing is allowed with tracing or screen printing. (v) First three hours is strictly for visualization and planning of campaign Any kind of reference is not allowed during this period. (vi) Poster Size – 12’ × 18’ or 20’ × 30’ (As per requirement); Layout Size – 8’ × 10’ (vii) Total assignments for Sessional work – One campaign (Minimum 10 Assignment per Campaign).			
Unit	Topics		Contact Hours
I	Logo Stationary Set (Letter head, Visiting Card, Envelope) Posters – Study of Poster on any particular issue i.e. social, cultural etc.		30
II	Hoarding/Banner; Press Layout; Magazine Layout Observation process of designing layout for magazine.		30
III	Illustration, Calendar Application process of composition of different visual elements.		30

IV	Cube, Package, Dangler, Cutout, Counter display or any other assignment with permission of concern teacher. Any -2 One reference file and Sketches – 200	30
Total Contact Hours		120
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Second		
Name of the Course	Creative Composition-I		
Course Code	M25- FAT -208		
Course Type	PC-6		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To conceptualize and execute an original series of figurative compositions unified by theme, concept or visual approach. CLO 2: To engage with principles like hierarchy, rhythm, movement, and balance in choreographing and staging multi-figure scenes. CLO 3: To prepare a cohesive body of work demonstrating technical skills and an individual creative viewpoint. CLO 4: To experiment with a variety of media like charcoal, pastel, ink, watercolor, and mixed media for figurative works.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Minimum Size: 30" x 40" (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assessments: 04 canvases (vi) No. of Sheet works: 15			
Unit	Topics		Contact Hours
I	Series work on any particular theme or concept		30
II	Application concepts of line, value, gesture, and composition to create compelling drawings.		30
III	Understanding Color theory, layering, and paint handling techniques to create convincing form and flesh tones.		30
IV	Master creative paintings to understand approaches to light, shadow, edges, and expressive brushwork.		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Second		
Name of the Course	Advance Photography		
Course Code	M25- FAT -209 (For Applied Art)		
Course Type	PC-6		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the advance knowledge of photography. CLO 2: Understand to refine their ability to capture the travel & product photographs. CLO 3: Acquire skills in digital manipulation by using software. CLO 4: Produce professional-quality advertising photographs and creating a documentary.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
(i)	Instruction: The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in a sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper.		
(ii)	Internal examiner will evaluate the Sessional work.		
(iii)	The student will have to submit one photograph on given topic.		
(iv)	For sessional work student can choose one topic for all assignment/project or all given topics		
(v)	Size – 12’ × 18’ or 20’ × 30’ (As per requirement)		
(vi)	Total assignments for Sessional work – Minimum 24 Assignment.		
Unit	Topics		Contact Hours
I	Assignments: Travel Photography: Advanced knowledge of photography		30
II	Assignments: Street Photography: Advance knowledge of various equipment and materials		30
III	Assignments: Product Photography: Application of photography in advertising, industrial and creative.		30
IV	Assignments: Digital Manipulation: Creating different creative and imaginative compositions through self-captured images. Small Documentary /Commercial Movie- 1		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Common to all PG Programmes		
Semester	Second		
Name of the Course	Constitutional, Human & Moral Values and IPR		
Course Code	M25-CHM-201		
Course Type	CHM		
Level of the course	400-499		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Learn the different Constitutional Values, Fundamental rights and duties enshrined in the India Constitution. CLO-2: Understand humanism, human virtues and values, and ide of International peace. CLO-3: Grasp the basic concepts of Moral Values and Professional Conduct which are required to become a part of the civil society and for developing professionalism. CLO-4: Understand concepts of Intellectual Property Rights, Copyright, Patent, Trademark etc., and about threats of Plagiarism.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unitand the compulsory question. All questions will carry equal marks.			

Unit	Topics	Contact Hours
I	Constitutional Values: Historical Perspective of Indian Constitution; Basic Values enshrined in the Preamble of the Indian Constitution; Concept of Constitutional Morality; Patriotic Values and Ingredients Nation Building; Fundamental Rights and Duties; Directive Principles of the State Policy.	8
II	Humanistic Values: Humanism, Human Virtues and Civic Sense; Social Responsibilities of Human Beings; Ethical ways to deal with human aspirations; Harmony with society and nature; Idea of International Peace and Brotherhood (Vasudhaiv Kutumbkam).	7
III	Moral Values and Professional Conduct Understanding Morality and Moral Values; Moral Education and Character Building; Ethics of Relations: Personal, Social and Professional; Introduction to Gender Sensitization; Affirmative approach towards Weaker Sections (SCs, STs, OBCs, EWS& DAs); Ethical Conduct in Higher Education Institutions; Professional Ethics.	8
IV	Intellectual Property Rights: Meaning, Origins and Nature of Intellectual Property Rights (IPRs); Different Kinds of IPRs – Copyright, Patent, Trademark, Trade Secret/Dress, Design, Traditional Knowledge; Infringement and Offences of IPRs – Remedies and Penalties; Basics of Plagiarism policy of UGC.	7
	Note: Scope of the syllabus shall be restricted to generic and introductory level of mentioned topics.	
Total Contact Hours		30
Suggested Evaluation Methods		
Internal Assessment: 15		End Term Examination: 35
➤ Theory	15	➤ Theory 35
•Class Participation:	4	Written Examination
•Seminar/presentation/assignment/quiz/class test etc.:	4	
•Mid-Term Exam:	7	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - Ahuja, V K. (2017). <i>Law relating to Intellectual Property Rights</i>, India, IN: Lexis Nexis. - Bajpai, B. L., <i>Indian Ethos and Modern Management</i>, New Royal Book Co., Lucknow, 2004. - Basu, D.D., <i>Introduction to the Constitution of India</i> (Students Edition) Prentice Hall of India Pvt. Ltd., New Delhi, 20th ed., 2008. - Dhar, P.L. & R.R. Gaur, <i>Science and Humanism</i>, Commonwealth Publishers, New Delhi, 1990. - George, Sussan, <i>How the Other Half Dies</i>, Penguin Press, 1976.		

- Govindarajan, M., S. Natarajan, V.S. Sendilkumar (eds.), *Engineering Ethics (Including Human Values)*, Prentice Hall of India Private Ltd, New Delhi, 2004.
- Harries, Charles E., Michael S. Pritchard & Michael J. Robins, *Engineering Ethics*, Thompson Asia, New Delhi, 2003.
- Illich, Ivan, *Energy & Equity*, Trinity Press, Worcester, 1974.
- Meadows, Donella H., Dennis L. Meadows, Jorgen Randers & William W. Behrens, *Limits to Growth: Club of Rome's Report*, Universe Books, 1972.
- Myneni, S.R, Law of Intellectual Property, Asian Law House.
- Narayanan, P, *IPRs*.
- Neeraj, P., &Khusdeep, D. (2014). *Intellectual Property Rights*, India, IN: PHI learning Private Limited.
- Nithyananda, K V. (2019). *Intellectual Property Rights: Protection and Management*. India, IN: Cengage Learning India Private Limited.
- Palekar, Subhas, *How to practice Natural Farming*, Pracheen (Vaidik) KrishiTantraShodh, Amravati, 2000.
- Phaneesh, K.R., *Constitution of India and Professional Ethics*, New Delhi.
- Pylee, M.V., *An Introduction to Constitution of India*, Vikas Publishing, New Delhi, 2002.
- Raman, B.S., *Constitution of India*, New Delhi, 2002.
- Reddy, B., *Intellectual Property Rights and the Law*, Gogia Law Agency.
- Reddy, N.H., SantoshAjmera, *Ethics, Integrity and Aptitude*, McGraw Hill, New Delhi.
- Sharma, Brij Kishore, *Introduction to the Constitution of India*, New Delhi,
- Schumacher, E.F., *Small is Beautiful: A Study of Economics as if People Mattered*, Blond & Briggs, Britain, 1973.
- Singles, Shubham et. al., *Constitution of India and Professional Ethics*, Cengage Learning India Pvt. Ltd., Latest Edition, New Delhi, 2018.
- Tripathy, A.N., *Human Values*, New Age International Publishers, New Delhi, 2003.
- Wadehra, B.L., Law relating to Intellectual Property, Universal Law Publishing Co.
- **Relevant Websites, Movies and Documentaries:**
- Value Education Websites, <http://uhv.ac.in>, <http://www.uptu.ac.in>.
- Story of Stuff, <http://www.storyofstuff.com>
- Cell for IPR Promotion and Management: <http://cipam.gov.in/>.
- World Intellectual Property Organization: <https://www.wipo.int/about-ip/en/>
- Office of the Controller General of Patents, Designs & Trademarks: <http://www.ipindia.nic.in/>
- Al Gore, *An Inconvenient Truth*, Paramount Classics, USA.
- Charlie Chaplin, *Modern Times*, United Artists, USA.
- *Modern Technology – The Untold Story*, IIT, Delhi.
- A. Gandhi, *Right Here Right Now*, Cyclewala Productions.

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	History Of Modern Indian Art-I		
Course Code	M25- FAT -301		
Course Type	CC-5		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the historical context of modern Indian art. CLO 2: Identify major artists and movements in modern Indian art. CLO 3: Describe the socio-political influences on Indian art from the mid- 18th century to the Early 20th century. CLO 4: Critically analyze artworks within their historical and cultural contexts.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Company School: subjects, style, and major artists Impact of British colonialism on Indian art		15
II	Pre -Independence Art Schools and Institutions- Madras, Bombay, Calcutta Early Modernist Artist – Raja Ravi Verma, Amrita Sher Gill, Rabindranath Tagore, Gaganendranath Tagore, Jamini Roy		15
III	Bengal School and its philosophy Key figures of Bengal School- Abanindranath Tagore, Nandlal Bose, Benode Bihari Mukherjee, Ram Kinker Baij, Asit Kumar Haldar		15

IV	Calcutta Group- Paritosh Sen, Pradosh Das Gupta, Bikashbattacharya, Ganesh Pyne, Jogen Chaudhury Bengal Femine – Chittoprasad, Somnath Hore	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS:		
1. Indian Art (Oxford History of Art), Partha Mitter, Oxford		
2. The Triumph of Modernism: India's Artists and the Avant-Garde 1922-1947, Partha Mitter, Oxford, 2007		
3. The Making of a New 'Indian' Art: Artists, Aesthetics and Nationalism in Bengal, c.1850–1920. Tapati Guha Thakurta, Cambridge University Press, 2007		
4. Forgotten Masters: Indian Painting for the East India Company, William Dalrymple, Philip Wilson Publishers, 2019		
5. Indian Life and People in the 19th Century Company Paintings in the Tapi Collection, J. P. Losty, Roli Books, 2018		

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	Contemporary Indian Art-I		
Course Code	M25-FAT-302		
Course Type	CC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To discuss the thematic and stylistic characteristics of figurative art in India. CLO 2: To understand the role of art criticism in shaping the discourse of modern and contemporary Indian art. CLO 3: To understand the significance of installation art in contemporary Indian art. CLO 4: To analyze their works within the context of Indian sculpture and feminist art practices		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	- Figurative Artists: Sudhir Patwardhan, Thota Vaikuntam, Shakti Burman, - Art Critics: Geeta Kapur, Vinod Bhardwaj, B. N. Goswamy, Partha Mitter		15
II	- Female Painter – Nalini Malini, Gogi Saroj Paul, Neeima Sheikh, Anjoli Ela Menon - Female Sculptor Artists: Mrinalini Mukherjee, Meera Mukherjee, Piloo Pochkhanawala		15
III	Installation Artists: Sheela Gowda, Reena Saini Kallat, Shilpa Gupta, Shukla Sawant, Mithu Sen		15
IV	Other Female Artists: Arpita Singh, Arpana Caur, Anita Dube, Bharti Kher, Hema Upadhyia, Seema Kohli		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Art and Visual Culture in India 1857-2007 edited by Gayatri Sinha			
2. Contemporary Art in India: A Perspective by Pran Nath Mago			
3. The Empire Strikes Back: Indian Art Today edited by A. M. Kapoor and N. Malani			
4. Edge of Desire: Recent Art in India edited by Chaitanya Sambrani			
5. India: Contemporary Photographic and New Media Art edited by Steven Evans and Sunil Gupta			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	Advertising and Photography		
Course Code	M25- FAT -303 (For Applied Art)		
Course Type	CC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Able to understand the historical background of photography and fundamental components of camera. CLO 2: Identify and differentiate various types of photography and its techniques. CLO 3: Familiar with significant Indian photographers and their contributions to the field of photography. CLO 4: Understand the concept and purpose of documentary photography and contribution of prominent photographers.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B – Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Introduction and history of Indian Photography, Raja Deen Dyal and Swai Man Singh, Advertising photography, Digital Photography, The digital darkroom,	15	
II	Types of Photography, Importance of photography in Advertising. Advertising Photography. Drawing/Illustration vs Photography in advertising.	15	
III	Photographers of India; Advertising photography of India, Hardesh Dhingra, Prabudha Das Gupta, Prashant Godbole. Atul Kasbekar.	15	
IV	Introduction of Documentary Photography, Documentary Photographers: Raghu Rai, Sudharak Olwe, Altaf Qadri.	15	
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Foundation of Advertising: S.A Chunnawalla, K.C Sethia.			
2. In Search of Dignity and Justice: SudharakOlwe			
3. Pinney, christophes, photography, Art of India, Encyclopaedia Britannica			
4. Sinha,Gayatri, Curator, Middleages spread imaging, India			
5. Mother Teresa: A Life of Dedication by Raghu Rai			
6. India: Reflections in Black and White by Raghu Rai			
7. Prabuddha Dasgupta 1956 – 2012 by Prabuddha Dasgupta			
8. QksVksxzkQh *rduhd ,oac;ksx * : ujsUnz ;kno			
9. foKkiufMtkbu : ujsUnz ;kno			
10. Nk;kadu : xykc dksBkjh			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	Pictorial Composition-I		
Course Code	M25- FAT -304		
Course Type	DEC-I		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To practice and create art with different painting medium and developing artistic skill. CLO 2: To gain functional knowledge of tradition, conventions, and evolution of the discipline as related to issue of representation and illusion. CLO 3: To be able to synthesize the use of drawing, two dimensional compositions and Colour. CLO 4: To enhance the emotional intelligence of students.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	12 hours	
Part B - Contents of the Course			
Instructions: - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal Examiner/ Committee will evaluate the Sessional work. - No. of Assignments: 05 (02 canvas and 03 sheets) - Size of Canvas: 22” X 18” - Size of Sheets: Half Imperial			
Unit	Topics		Contact Hours
I	Landscape Study in Different Mediums (Mediums: Pastel, Poster Color, Watercolor, Oil Color, Acrylic Colour.) (1 Canvas)		15
II	Portrait study in different Mediums. (Mediums: Pastel, Poster Colour, Watercolour, Oil Colour, Acrylic Colour.) (1 Canvas and 1 sheet)		15
III	Indian Miniature Art – Traditional Techniques ((Mediums: Pastel, Poster Colour, Watercolour, Oil Colour, Acrylic Colour.) (1 sheet)		15
IV	Creative Composition (1 sheet)		15
Total Contact Hours			60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	Campaign Design- I		
Course Code	M24- FAT -305 (For Applied Art)		
Course Type	DEC-I		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To introduce the basics and its need in communication design. CLO 2: To understand various aspects of graphic design and using it in designing. CLO 3: Understanding the relevance of design principals in historic and contemporary art & design. CLO 4: Enhances scientific temperament by application of Design.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal Examiner/ Committee will evaluate the Sessional work. - First three hours is strictly for visualization and planning of campaign Any kind of reference is not allowed during this period. - Poster Size – 12’ × 18’ or 20’ × 30’ (As per requirement); Layout Size – 8’ × 10’ Total assignments for Sessional work – One campaign (Minimum 10 Assignment per Campaign).			
Unit	Topics		Contact Hours
I	Stationary Set: Visiting Card, Envelope, Letter Head Development of designs in modern advertising.		15
II	Logo Design/ Symbol/ Monogram/ Insignia Creating imaginative and creative designs of trademarks.		15
III	Illustration, Medium: Computer/ Hand Work. To develop the skills through different techniques.		15
IV	Portfolio Development Select and refine a series of images from all practical assignments to create a cohesive portfolio		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	Life Study- I		
Course Code	M25-FAT-306		
Course Type	PC-7		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To basics of figure drawing materials and techniques like gestural line, contour, value rendering. CLO 2: To study human anatomical structure, proportions, and understand the figure as a three-dimensional form. CLO 3: To compose full figure drawings using sighting, measuring and constructing techniques CLO 4: To understand concepts like foreshortening, overlap, figure-ground relationships.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Head study from live models of different age groups (male or female). (iv) Size 30” X 40” (v) Medium: water colour, ink/ oil colour/acrylic colour etc. (vi) Number of assessments: 04 canvases (vii) No. of Sheet Works: 25			
Unit	Topics		Contact Hours
I	Study human anatomical structure, proportions, and understand the figure as a three-dimensional form		30
II	Explore a range of drawing media like charcoal, conte, ink for more expressive life studies		30
III	Render muscles, tendons, and depict muscular form and movement using expressive brushwork		30
IV	Compose full figure drawings using observing, measuring and constructing techniques		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
Practical	30		
• Class Participation:	5		
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	Advertising Campaign (Manual)		
Course Code	M25-FAT-307 (For Applied Art)		
Course Type	PC-7		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Produce impactful campaign that aims to respond to cultural, social, political and environmental issues. CLO 2: Technical study of various tools, methods and processes of advertising. CLO 3: Utilize the art practices encouraging the evolution of independent artworks. CLO 4: Utilize the visual message as a tool of social, moral and scientific awareness.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: (i) Internal examiner will evaluate the Sessional work Internal Assessment. (ii) Tracing of illustration/Photography is not allowed in any assignment however slogan writing is allowed with tracing or screen printing. (iii) First three hours is strictly for visualization and planning of campaign Any kind of reference is not allowed during this period. (iv) Poster Size – 12’ × 18’ or 20’ × 30’ (As per requirement); Layout Size – 8’ × 10’ (v) Total assignments for Sessional work – One campaign (Minimum 10 Assignment per Campaign).			
Unit	Topics		Contact Hours
I	Advertising campaign in different media, mainly the product campaign social campaign. Analytical study of different product groups. Visuals to be based on the class of commodity and class of appeal. Logo; Stationary Set (Letter head, Visiting Card, Envelope); Posters		30
II	Hoarding/Banner; Press Layout; Magazine Layout Understanding of creative impactful campaign process.		30
III	Illustration; Calendar Technical study of various tools and methods.		30

IV	Cube, Package, Dangler, Cutout, Counter display or any other assignment with permission of concern teacher. Any -2 One reference file and Sketches – 100	30
Total Contact Hours		120
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	
• Class Participation:	5	
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	Creative Composition-II		
Course Code	M25-FAT-308		
Course Type	PC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand basic principles of composition like balance, movement, rhythm, pattern. CLO 2: To explore compositional elements such as line, shape, value, texture, color. CLO 3: To develop skills in creating unified and visually cohesive compositions. CLO 4: To experiment with composition using mixed media, installation art, abstract art, series work.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Minimum Size 30" x 40" (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assessments: 04 canvases (vi) No. of Sheet Works: 25			
Unit	Topics		Contact Hours
I	Develop skills in storytelling through compositional techniques		30
II	Utilize concepts like hierarchy, focal points, rule of third in creating an attractive composition.		30
III	Developing layouts for composition on particular topic		30
IV	Understanding color schemes and paint handling techniques to create convincing form and fresh color tones.		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30		
• Class Participation:	5		
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	Documentary Photography-I		
Course Code	M25-FAT-309 (For Applied Art)		
Course Type	PC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Technical study of various tools, methods and processes of photography. CLO 2: Impactful photographic art work that aims to respond to social, cultural and environmental issues. CLO 3: Explore art photography as creative medium. CLO 4: Utilize the documentary photography as visual massage of social, moral and scientific awareness.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: 1. Submit 3 photo on given Documentary photography topic. 2. Size – 12’ × 18’ or 20’ × 30’ (As per requirement) 3. Total assignments for Sessional work – Minimum 24 Assignment.			
Unit	Topics		Contact Hours
I	Assignments: Advanced knowledge of photography		30
II	Assignments: Advance knowledge of various equipment and materials		30
III	Assignments: Application of creative vision in Documentary photography		30
IV	Assignments: Study of Social, Cultural, Political & Environmental issues.		30
Total Contact Hours			120
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30		
• Class Participation:	5		
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
Session: 2025-26			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Third		
Name of the Course	Fundamentals of Visual Arts		
Course Code	M25- OEC- 315		
Course Type	OEC		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To develop foundational skills in drawing, understanding the basic elements and principles of visual art. CLO 2: To demonstrate proficiency in color mixing and application, understanding how color interacts within a composition and influences visual impact. CLO 3: To develop theoretical proficiency in drawing and painting techniques specific to portraiture, including line work, shading, blending, and color mixing, to create realistic and expressive representations of the human form. CLO 4: To develop a personal artistic voice in due course.		
Credits	Theory	Practical	Total
	0	2	2
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	0	15
End Term Exam Marks	0	0	35
Max. Marks	0	0	50
Examination Time	-	6 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Introduction to Visual Arts: Overview of visual art forms (drawing, painting, sculpture, etc.) Practical Assignment-1		15
II	Practice of Element of Art (Line, Form, Color, Tone, Texture, Shape etc.) Practical Assignment-1		15
III	Principles of Art: Balance, contrast, emphasis, movement, pattern, rhythm, unity Still Life- Object Drawing (Medium- Pencil, Pastel, Poster Colour)- Practical Assignment-1		15
IV	Color Theory: Primary, secondary, and tertiary colors Nature Drawing -Tree Study, Animal Study etc. (Medium- Pencil, Poster, Pestle) - Practical Assignment-2		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 50	
➤ Practical	30	➤ Practical:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
The Fundamentals of Drawing" by Barrington Barber			
The Complete Guide to Drawing" by Giovanni Civardi			
Fundamentals of Art and Design" by Robert L. Wicks			
Drawing for the Absolute Beginner" by Mark Willenbrink and Mary Willenbrink			
Keys to Drawing" by Bert Dodson			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Forth		
Name of the Course	History of Modern Indian Art-II		
Course Code	M25- FAT -401		
Course Type	CC-7		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To develop a keen insight into the contribution of movements and artists in shaping modern art in India. CLO 2: Introduction to postmodern art and theories. Analytical study of some of the prominent artists of post- independence. CLO 3: Identify and analyze the discourse of postmodernism and its relevance to visual art practice. CLO 4: Critical understanding of the work of some of the seminal post-70s artists of Indian Art to develop a critical understanding of the transitions from modernism to postmodernism and Contemporary art trends and enhancement in the knowledge of Folk Art, Tribal Art and Indian Culture.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	- PAG Group – M.F. Husain, K.H. Ara, F.N Souza, S.H. Raza, S.K. Bakre - Delhi Silpi Chakra – B.C. Sanyal. P.N. Mago, Dhanraj Bhagat, K.S. Kulkarni		15
II	- Baroda Group – Bhupen Khakar, N.S. Bendre, K.G. Subramaniyn, Gulam. Mohamad Shaeikh, Jyoti Bhatt - Madras Group – D.P. Roy Chaudhury, K.C.S Panikar, S.Nandagopal		15
III	- Group 1890 – Ambadas, J.Swaminathan, Jeyram Patel, Himat Shah - Cholamandal – K.Jayapal Panikar, K. Ramanujam		15

IV	- Group-8 – Anupam Sud, Jagdish Dey, Jagmohan Chopra - Tantric Art- G.R.Santosh, Biren Dey, Sohar Qadri, P.T. Reddy, Shobha Baroota	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Studies in Modern Indian Art – Ratan Parimoo 2. Moving Focus – K.G. Subrahmanyam 3. Pictorial Space – Geeta Kapoor 4. Modern Indian Art – Keshav Malik 5. Lalit Kala Contemporary 6. Lalit Kala Monographs 7. Contemporary Art in India : P.N. Mago 8. Contemporary Art – The Flamed Mosaic by Naviel Tuli 9. Contemporary Indian Art- GaytriSinha 10. Handbook of Indian Art- Sunil Khosa 11. Company Painting- Mildred Archer 12. Art of India- Fredrick M. Asher 13. Indian Painting for The British 1770-1880- Mildred Archer, W.G. Archer 14. Indian Miniatures in The India Office Library- Mildred Archer, Toby Falk 15. Contemporary Indian Art- Other realities- Yashodhara Dalmia 16. The Making of Modern Indian Art- The Progressives-Yashodhara Dalmia 17. Memory, Metaphor, Mutarions- Yashodhara Dalmia 18. Arts of India 1550-1900- John Guy, Deborah Swallow 19. Essays on contemporary practice in India- Geeta Kapoor 20. Triumph of Modernism- Partha Mitter 21. Flamed Mosaic- Neville Tuli 22. Kala Chitrkala- Vinod Bhardwaj 23. Char Chitrkaar- Ashok Mitra 24. Samkalin Kala- Dr. Ramviranjan 25. Chitrkalaka Rasaswadan- RamchandShukl 26. Lalit Kala Ki Dhara- Asit Kumar Haldar		

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Fourth		
Name of the Course	Contemporary Indian Art-II		
Course Code	M25-FAT-402		
Course Type	CC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand the new media concepts, public art, performance art and some selected artists. CLO 2: To Identify and analyze the works of significant printmaking groups and artists. CLO 3: To analyze and understand the works of major contemporary sculptors of India. CLO 4: To explore the origin of video art in India and its pioneering artists.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	● Printmakers: Jayant Parekh, V Nagdas, Jai Zharotia, Rini Dhumal, Shyam Sharma, Moti Zharotia		15
II	● Sculptors: Ram V. Sutar, Anish Kapoor, Dhruva Mistry, Subodh Gupta, Ranbir Kaleka, Shanku Chaudhury, Nagji Patel		15
III	● Video art: Pushpamala N., Vibha Galhotra, Sudarshan Shetty, Sheba Chhachhi		15
IV	● New Media (Performance based) – Piyali Ghosh, Nikhil Chopra, Himali Singh Sain,		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
1. Art and Visual Culture in India 1857-2007 edited by Gayatri Sinha			
2. Contemporary Art in India: A Perspective by Pran Nath Mago			
3. The Empire Strikes Back: Indian Art Today edited by A. M. Kapoor and N. Malani			
4. Edge of Desire: Recent Art in India edited by Chaitanya Sambrani			
5. India: Contemporary Photographic and New Media Art edited by Steven Evans and Sunil Gupta			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Forth		
Name of the Course	Advertising: Ethics And Regulation		
Course Code	M25- FAT -403 (For Applied Art)		
Course Type	CC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the multifaceted role of advertising in society, including its economic, social, and cultural implications. CLO 2: Develop an awareness of ethical considerations in advertising and impact on societal perceptions and behaviours. CLO 3: Students will become familiar with advertising regulations and legal frameworks governing the industry. CLO 4: Explore the social responsibilities of advertisers and its implications for consumer trust.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B – Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics	Contact Hours	
I	Advertising and Society: Advertising business offers employment, Advertising promotes freedom of press, Information and Freedom of choice, Advertising Creates demand and consequently sales, advertising reduces selling cost, Advertising tries to raise the standard of living.	15	
II	Ethics in Advertising, Taste and Advertising, Stereotyping in Advertising: Women in advertisement, racial and ethnic stereotypes, Advertising to children,	15	
III	Code of conduct, Advertising controversial products & legal aspects of advertising; Copyright, Trade Mark act, Press act, Female indecent representational act (1986) etc.	15	
IV	Social Responsibilities: ASCI (Advertising standard council of India), Advertising and Cultural Value, Justification of expenditure on advertisement, Truth in advertising.	15	
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Foundation of Advertising: S.A Chunnawalla, K.C Sethia.			
2. Advertising and Sales Promotion: S.H.H kazmi, Satish Batra.			
3. Social Dimension of Advertising: S.S Kaptan.			
4. Advertising theory and practice: C.H Sandage, Vernon Fryburger.			
5. Advertising and Promotion AN IMC Approach, Shimp Cengage Learning India Pvt. Ltd., New			
6. Delhi Contemporary Advertising: William F. Arens, Courtland L. Bovee.			
7. foKkiu *rduhd ,oaf\}kUr* : ujsUnz ;kno			
8. foKkiufMtkbu : ujsUnz ;kno			
9. foKkiudyk: ,ds'ojizlkngVoky			
10. foKkiu : v'kksd egktu			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Fourth		
Name of the Course	Pictorial Composition-II		
Course Code	M25- FAT -404		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand to control visual and physical control of medium used in the application of colour, Texture & tones, concepts. CLO 2: To enhances the creative process through studio exercise and assignments. CLO 3: To gain knowledge to develop drawing and painting skills for creative composition in art. CLO 4: To inculcate emotional attachment towards nature & society.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal Examiner/ Committee will evaluate the Sessional work. - Total No. of assignment – 5 (02 Canvas and 03 Sheets) - Size- 2’x2” (Canvas) - Size- Half Imperial (Sheet)			
Unit	Topics		Contact Hours
I	Creative composition based on portrait (1 Canvas and 1 sheet)		15
II	Composition based on object, figure and landscape in the Background (Mediums: Pastel, Poster Colour, Watercolour, Oil Colour, Acrylic Colour.) (1 sheet)		15
III	Study of developing own style in Composition (1 Canvas)		15
IV	Creative landscape composition (1 sheet)		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Fourth		
Name of the Course	Campaign Design- II		
Course Code	M25- FAT -405 (For Applied Art)		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To introduce the advanced techniques and its need in communication design. CLO 2: To understand various aspect of graphic design and using it in designing. CLO 3: Understanding the relevance of design principals in historic and contemporary art & design. CLO 4: Enhances scientific temperament by application of Design.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal Examiner/ Committee will evaluate the Sessional work. - First three hours is strictly for visualization and planning of campaign Any kind of reference is not allowed during this period. - Poster Size – 12’ × 18’ or 20’ × 30’ (As per requirement); Layout Size – 8’ × 10’ Total assignments for Sessional work – One campaign (Minimum 10 Assignment per Campaign).			
Unit	Topics		Contact Hours
I	Poster: Social Poster, Products Poster		15
II	Hoarding/ Banner		15
III	Catalogue/ Folder & Invitation/ poster of annual art exhibition etc.		15
IV	Portfolio Development Select and refine a series of images from all practical assignments to create a cohesive portfolio		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Fourth		
Name of the Course	Life Study-II		
Course Code	M25- FAT -406		
Course Type	PC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To understand concepts like foreshortening, overlap, figure-ground relationships. CLO 2: To develop studies considering negative spaces and the figure's spatial context. CLO 3: To learn principles of exaggeration and simplification to create dynamic figures. CLO 4: To understand concepts like shape, value, and color for depicting life figures.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Life study from live models of different age groups (male or female). (iv) Size 30" x 40 " (v) Medium: water colour, ink/ oil colour/acrylic colour etc. (vi) Number of assignments: 04 canvases (vii) No. of Sheet Works: 25			
Unit	Topics		Contact Hours
I	Develop skills in painting accurate likenesses and details for portraits		30
II	Explore techniques for rendering textures like hair texture, skin texture, drapery and clothes.		30
III	Understand sculptural concepts of planes, volumes, and edges for the figure by color mediums and techniques		30
IV	Understand anatomy for animating figures through paint application		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Forth		
Name of the Course	Advertising Campaign (Digital)		
Course Code	M25- FAT -407 (For Applied Art)		
Course Type	PC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop skill based Knowledge and new creative ideas for problem solving. CLO 2: Develop social moral and cultural values to utilize the art. CLO 3: Develop personal approach to visualization, conceptualization and art making. CLO 4: Enhance the understanding about the art and advertising business		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: (i) Themes/Subject matters/topics will be of multiple choices. (ii) The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. (iii) Internal examiner will evaluate the Sessional work. (iv) First three hours is strictly for visualization and planning of campaign Any kind of reference is not allowed during this period. (v) Poster Size – 12’ × 18’ or 20’ × 30’ (As per requirement); Layout Size – 8’ × 10’ (vi) Total assignments for Sessional work – One campaign (Minimum 10 Assignment per Campaign).			
Unit	Topics		Contact Hours
I	Advertising campaign in different media, mainly the product campaign social campaign. Analytical study of different product groups. Visuals to be based on the class of commodity and class of appeal. Logo, Stationary Set (Letter head, Visiting Card, Envelope), Posters		30
II	Hoarding/Banner, Press Layout, Magazine Layout Explore different approaches to the creative composition of layout design for magazine		30
III	Illustration, Calendar		30

	Explore the visual story-telling through illustration by using different techniques.	
IV	Cube, Package, Dangler, Cutout, Counter display or any other assignment with permission of concern teacher. Any -2 Observe new media in the field of advertising for innovative approach and creative representation.	30
Total Contact Hours		120
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Fourth		
Name of the Course	Creative Composition-II		
Course Code	M25- FAT -408		
Course Type	PC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To demonstrate a deep understanding of artistic perspectives and their relationship to society. CLO 2: To exhibit proficiency in applying foundational elements and principles of composition in their creative works. CLO 3: To analyse and interpret the historical context of art, recognizing its evolution and cultural influences. CLO 4: To develop professional skills in art critique, analysis, portfolio development, and presentation		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B- Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Size: 30 " X 40” (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assignssments: 05 canvases (vi) No. of Sheet works: 25			
Unit	Topics		Contact Hours
I	Explore integration of different elements like geometric shapes, forms from daily life and imagery objects in creative composition		30
II	To express themes, moods, narratives, metaphors from memory and the surrounding.		30
III	Developing sequential and storyboarding techniques for visual storytelling in creative composition.		30
IV	Prepare a body of work reflecting an original compositional style.		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Forth		
Name of the Course	Documentary Photography-II		
Course Code	M25- FAT -409		
Course Type	PC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Technical study of various tools, methods and processes of photography. CLO 2: Impactful photographic art work that aims to respond to social, cultural and environmental issues. CLO 3: Explore art photography as creative medium. CLO 4: Utilize the documentary photography as visual massage of social, moral and scientific awareness.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	-	18 hours	
Part B – Contents of the Course			
Instruction: 1. Size – 12’ × 18’ or 20’ × 30’ (As per requirement) 2. Total assignments for Sessional work – Minimum 24 Assignment. Advanced knowledge of photography and its various equipment’s and materials – application of photography on any topic i.e. Social, Cultural political & Environmental issues.			
Unit	Topics		Contact Hours
I	Assignments: Advanced knowledge of technical aspects of documentary photography.		30
II	Assignments: Observation of different creative work on social, cultural and other issue for the documentary photography.		30
III	Assignments: Explore cultural and environmental influences through the art of documentary photography.		30
IV	Assignments: Developing sequential story-boarding techniques for visual story-telling through documentary photography.		30
Total Contact Hours			120

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	M.A. Fine Arts		
Semester	Fourth		
Name of the Course	Exhibition & Presentation		
Course Code	M25- FAT -410		
Course Type	EEC		
Level of the course	500-599		
Pre-requisite for the course (if any)	–		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To demonstrate the ability to plan and curate an art exhibition, showcasing an understanding of the selection, arrangement, and presentation of artworks that convey a clear theme or concept. CLO 2: To develop and present effective visual communication skills, including the ability to convey artistic ideas, concepts, and themes clearly through visual presentation and arrangement of artworks. CLO 3: To apply professional standards in the setup and organization of an exhibition, including aspects such as lighting, labelling, space management, and audience flow. CLO 4: To effectively communicate artistic processes and concepts during exhibition presentations, including the ability to articulate the creative journey.		
Credits	Theory	Practical	Total
	1	1	2
Teaching Hours per week	1	2	3
Internal Assessment Marks	10	5	15
End Term Exam Marks	20	15	35
Max. Marks	30	20	50
Examination Time	2 (T)+ 4 (P)		
Part B - Contents of the Course			
Instruction: Students have to present their works in the exhibition in the last semester. Students have to present a presentation of their works.			

Session: 2026-27		
Part A – Introduction		
Name of Programme	M.A. Fine Arts	
Semester	Forth	
Name of the Course	Project work/ Dissertation	
Course Code	M25- FAT -411	
Course Type	Project/ Dissertation	
Level of the course	500-599	
Pre-requisite for the course (if any)		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Comprehend the basic of the Dissertation proposal. CLO 2: Figure out the contents of the Dissertation proposal. CLO 3: Develop the skills of research for higher studies like Doctorate. CLO 4: Find new knowledge and areas of their interest. CLO 5: Develop of communication, reading and writing through the project/ dissertation proposals.	
Credits	12	Total
		12
Max. Marks	300	300
Examination Time	6 hours	
Part B - Contents of the Course		
Instruction: 1. Students have to choose any new/unique topic of Project/Dissertation. 2. They must include appropriate images according to their choice of topics. 3. Only 10% Plagiarism will be accepted in the Project/Dissertation. 4. Students have to complete the project/dissertation under the guidance of the teacher.		

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

(“A++” Grade, NAAC Accredited)



Scheme of Examination for Post Graduate Programme Master of Fine Arts (MFA)

as per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme

With Multiple Entry-Exit, Internship and CBCS-LOCF

With effect from the session 2025-26 (in phased manner)

**DEPARTMENT OF FINE ARTS
FACULTY OF INDIC STUDIES**

**KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA**

Kurukshetra University, Kurukshetra

Scheme of Examination for Postgraduate Programme Master of Fine Arts (MFA) as per NEP 2020 Curriculum and Credit Framework for Postgraduate Programmes (CBCS LOCF) with effect from the session 2025-26 (in phased manner) Framework-1; Scheme-P

Semester	Course Type	Course Code	Nomenclature of course	Theory (T)/ Practical (P)	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
						Total	L	T	P	Total				
1	CC-1	M25-MFA-101 (Common)	History of Modern Western Art – I	T	4	22	4	0	0	4	30	70	100	3
	CC-2	M25-MFA-102 (For Painting)	Indian Philosophy of Art (Oriental Approach)	T	4		4	0	0	4	30	70	100	3
		M25-MFA-103 (For Applied Art)	Fundamental of Advertising	T	4		4	0	0	4	30	70	100	3
		M25-MFA-104 (For Sculpture)	Technical Theory of Sculpture – I	T	4		4	0	0	4	30	70	100	3
		M25-MFA-105 (For Graphics/ Printmaking)	Technical Theory of Printmaking	T	4		4	0	0	4	30	70	100	3
	PC-1	M25-MFA-106 (For Painting)	Figurative Drawing – I	P	4		0	0	4	4	30	70	100	18
		M25-MFA-107 (For Applied Art)	Commercial Campaign – I	P	4		0	0	4	4	30	70	100	18
		M25-MFA-108 (For Sculpture)	Sculpture Composition – I	P	4		0	0	4	4	30	70	100	18
		M25-MFA-109 (For Graphics/ Printmaking)	Printmaking Art – I	P	4		0	0	4	4	30	70	100	18
	PC-2	M25-MFA-110 (For Painting)	Creative Painting – I	P	4		0	0	8	8	30	70	100	18

		M25-MFA-111 (For Applied Art)	Visual Communication – I	P	4		0	0	8	8	30	70	100	18
		M25-MFA-112 (For Sculpture)	Advance Sculpture Composition – I	P	4		0	0	8	8	30	70	100	18
		M25-MFA-113 (For Graphics/ Printmaking)	Advance Printmaking Art – I	P	4		0	0	8	8	30	70	100	18
	PC-3	M25-MFA-114 (For Painting)	Mural	P	4		0	0	8	8	30	70	100	18
		M25-MFA-115 (For Applied Art)	Commercial Photography – I	P	4		0	0	8	8	30	70	100	18
		M25-MFA-116 (For Sculpture)	Sculpture Murals – I	P	4		0	0	8	8	30	70	100	18
		M25-MFA-117 (For Graphics/ Printmaking)	Mixed Media Printmaking – I	P	4		0	0	8	8	30	70	100	18
	SEMIN AR	M25-MFA-118	SEMINAR	S	2		0	0	0	2	0	50	50	1
2	CC-3	M25-MFA-201 (Common)	History of Modern Western Art – II	T	4	22	4	0	0	4	30	70	100	3
	CC-4	M25-MFA-202 (For Painting)	Western Philosophy of Art (Occidental Approach)	T	4		4	0	0	4	30	70	100	3
		M25-MFA-203 (For Applied Art)	Creative Advertising	T	4		4	0	0	4	30	70	100	3
		M25-MFA-204 (For Sculpture)	Technical Theory of Sculpture – II	T	4		4	0	0	4	30	70	100	3
		M25-MFA-205 (For Graphics/ Printmaking)	History of Western Printmaking	T	4		4	0	0	4	30	70	100	3
	PC-4	M25-MFA-206 (For Painting)	Figurative Drawing – II	P	4		0	0	4	4	30	70	100	18

		M25-MFA-207 (For Applied Art)	Commercial Campaign – II	P	4		0	0	4	4	30	70	100	18
		M25-MFA-208 (For Sculpture)	Sculpture Composition – II	P	4		0	0	4	4	30	70	100	18
		M25-MFA-209 (For Graphics/ Printmaking)	Printmaking Art – II	P	4		0	0	4	4	30	70	100	18
	PC-5	M25-MFA-210 (For Painting)	Creative Painting – II	P	4		0	0	8	8	30	70	100	18
		M25-MFA-211 (For Applied Art)	Visual Communication – II	P	4		0	0	8	8	30	70	100	18
		M25-MFA-212 (For Sculpture)	Advance Sculpture Composition – II	P	4		0	0	8	8	30	70	100	18
		M25-MFA-213 (For Graphics/ Printmaking)	Advance Printmaking Art – II	P	4		0	0	8	8	30	70	100	18
	PC-6	M25-MFA-214 (For Painting)	Installation Art	P	4		0	0	8	8	30	70	100	18
		M25-MFA-215 (For Applied Art)	Commercial Photography – II (For Applied Art)	P	4		0	0	8	8	30	70	100	12
		M25-MFA-216 (For Sculpture)	Sculpture Murals – II	P	4		0	0	8	8	30	70	100	18
		M25-MFA-217 (For Graphics/ Printmaking)	Mixed Media Printmaking – II	P	4		0	0	8	8	30	70	100	18
	CHM	M25-CHM-201	Constitutional, Human & Moral Values and IPR	T	2		2	0	0	2	15	35	50	3
	Internshi p	M25-INT-200	An internship course of 4 Credits of 4-6 weeks duration during summer vacation after IInd semester is to be completed by every student. Internship can be either for enhancing the employability or for developing the research aptitude.								50	50	100	

3	CC-5	M25-MFA-301 (Common)	History of Modern Indian Art – I	T	4	22	4	0	0	4	30	70	100	3
	CC-6	M25-MFA-302 (For Painting)	Contemporary Indian Art – I	T	4		4	0	0	4	30	70	100	3
		M25-MFA-303 (For Applied Art)	Art of Advertising Photography	T	4		4	0	0	4	30	70	100	3
		M25-MFA-304 (For Sculpture)	History of Indian Sculpture	T	4		4	0	0	4	30	70	100	3
		M25-MFA-305 (For Graphics/ Printmaking)	History of Indian Printmaking	T	4		4	0	0	4	30	70	100	3
	DEC-1	M25-MFA-306 (For Painting)	Pictorial Composition – I	P	4		0	0	4	4	30	70	100	18
		M25-MFA-307 (For Applied Art)	Graphic Design – I	P	4		0	0	4	4	30	70	100	18
		M25-MFA-308 (For Sculpture)	Clay Modelling – I	P	4		0	0	4	4	30	70	100	18
		M25-MFA-309 (For Graphics/ Printmaking)	Relief Composition	P	4		0	0	4	4	30	70	100	18
	PC-7	M25-MFA-310 (For Painting)	Creative Drawing – I	P	4		0	0	8	8	30	70	100	18
		M25-MFA-311 (For Applied Art)	Campaign Design – I	P	4		0	0	8	8	30	70	100	18
		M25-MFA-312 (For Sculpture)	Figurative Sculpture – I	P	4		0	0	8	8	30	70	100	18
		M25-MFA-313 (For Graphics/ Printmaking)	Figurative Printmaking – I	P	4		0	0	8	8	30	70	100	18
	PC-8	M25-MFA-314 (For Painting)	Creative Painting – III	P	4		0	0	8	8	30	70	100	18

		M25-MFA-315 (For Applied Art)	Photography Composition – I	P	4		0	0	8	8	30	70	100	18
		M25-MFA-316 (For Sculpture)	Creative Sculpture – I	P	4		0	0	8	8	30	70	100	18
		M25-MFA-317 (For Graphics/ Printmaking)	Experimental Printmaking – I	P	4		0	0	8	8	30	70	100	18
	OEC	M25-OEC-316	Fundamentals of Visual Arts	T	2		0	0	4	4	15	35	50	6
4	CC-7	M25-MFA-401 (Common)	History of Modern Indian Art – II	T	4	22	4	0	0	4	30	70	100	3
	CC-8	M25-MFA-402 (For Painting)	Contemporary Indian Art – II	T	4		4	0	0	4	30	70	100	3
		M25-MFA-403 (For Applied Art)	Advertising: Ethics & Morel Values	T	4		4	0	0	4	30	70	100	3
		M25-MFA-404 (For Sculpture)	History of Western Sculpture	T	4		4	0	0	4	30	70	100	3
		M25-MFA-405 (For Graphics/ Printmaking)	Indian Master Printmakers	T	4		4	0	0	4	30	70	100	3
	DEC-2	M25-MFA-406 (For Painting)	Pictorial Composition – II	P	4		0	0	4	4	30	70	100	18
		M25-MFA-407 (For Applied Art)	Graphic Design – II	P	4		0	0	4	4	30	70	100	18
		M25-MFA-408 (For Sculpture)	Clay Modelling – II	P	4		0	0	4	4	30	70	100	18
		M25-MFA-409 (For Graphics/ Printmaking)	Intaglio Composition – I	P	4		0	0	4	4	30	70	100	18
	PC-9	M25-MFA-410 (For Painting)	Creative Drawing – II	P	4		0	0	8	8	30	70	100	18
		M25-MFA-411 (For Applied Art)	Campaign Design – II	P	4		0	0	8	8	30	70	100	18

	PC-10	M25-MFA-412 (For Sculpture)	Figurative Sculpture – II	P	4	0	0	8	8	30	70	100	18
		M25-MFA-413 (For Graphics/ Printmaking)	Figurative Printmaking – II	P	4	0	0	8	8	30	70	100	18
		M25-MFA-414 (For Painting)	Contemporary Painting	P	4	0	0	8	8	30	70	100	18
		M25-MFA-415 (For Applied Art)	Photography Composition – II	P	4	0	0	8	8	30	70	100	18
		M25-MFA-416 (For Sculpture)	Creative Sculpture – II	P	4	0	0	8	8	30	70	100	18
		M25-MFA-417 (For Graphics/ Printmaking)	Experimental Printmaking – II	P	4	0	0	8	8	30	70	100	18
	EEC	M25-MFA-418 (Common)	Exhibition & Presentation	T	1	1	0	0	1	10	20	30	2 (T) + 4 (P)
				P	1	0	0	1	1	5	15	20	

OR

Scheme of Semester IV when a student opts for Dissertation Work or Project Work													
Course Type	Course Code	Nomenclature of course	Theory (T)/ Practical (P)	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
					Total	L	T	P	Total				
CC-7	M25-MFA-401 (Common)	History of Modern Indian Art – II	T	4	22	4	0	0	4	30	70	100	3
DEC-2	M25-MFA-406 (For Painting)	Pictorial Composition – II	P	4		0	0	4	4	30	70	100	18
	M25-MFA-407 (For Applied Art)	Graphic Design – II	P	4		0	0	4	4	30	70	100	18
	M25-MFA-408 (For Sculpture)	Clay Modelling – II	P	4		0	0	4	4	30	70	100	18
	M25-MFA-409 (For Graphics/ Printmaking)	Intaglio Composition – I	P	4		0	0	4	4	30	70	100	18
EEC	M25-MFA-418 (Common)	Exhibition & Presentation	T	1		1	0	0	1	10	20	30	2 (T) + 4 (P)
			P	1		0	0	1	1	5	15	20	
Dissertation/ Project work	M25-MFA-419 (Common)	Dissertation / Project Work	D	12		0	0	0	12	0	300	300	–

STREAM-WISE COURSE DISTRIBUTION

Painting		Applied Art		Sculpture		Graphics/Printmaking	
M25-MFA-101	History of Modern Western Art – I						
M25-MFA-102	Indian Philosophy of Art (Oriental Approach)	M25-MFA-103	Fundamental of Advertising	M25-MFA-104	Technical Theory of Sculpture – I	M25-MFA-105	Technical Theory of Printmaking
M25-MFA-106	Figurative Drawing – I	M25-MFA-107	Commercial Campaign – I	M25-MFA-108	Sculpture Composition – I	M25-MFA-109	Printmaking Art – I
M25-MFA-110	Creative Painting – I	M25-MFA-111	Visual Communication – I	M25-MFA-112	Advance Sculpture Composition – I	M25-MFA-113	Advance Printmaking Art – I
M25-MFA-114	Mural	M25-MFA-115	Commercial Photography – I	M25-MFA-116	Sculpture Murals – I	M25-MFA-117	Mixed Media Printmaking – I
M25-MFA-201	History of Modern Western Art – II						
M25-MFA-202	Western Philosophy of Art (Occidental Approach)	M25-MFA-203	Creative Advertising	M25-MFA-204	Technical Theory of Sculpture – II	M25-MFA-205	History of Western Printmaking
M25-MFA-206	Figurative Drawing – II	M25-MFA-207	Commercial Campaign – II	M25-MFA-208	Sculpture Composition – II	M25-MFA-209	Printmaking Art – II
M25-MFA-210	Creative Painting – II	M25-MFA-211	Visual Communication – II	M25-MFA-212	Advance Sculpture Composition – II	M25-MFA-213	Advance Printmaking Art – II
M25-MFA-214	Installation Art	M25-MFA-215	Commercial Photography – II	M25-MFA-216	Sculpture Murals – II	M25-MFA-217	Mixed Media Printmaking – II
M25-MFA-301	History of Modern Indian Art –I						
M25-MFA-302	Contemporary Indian Art – I	M25-MFA-303	Art of Advertising Photography	M25-MFA-304	History of Indian Sculpture	M25-MFA-305	History of Indian Printmaking
M25-MFA-306	Pictorial Composition – I	M25-MFA-307	Graphic Design – I	M25-MFA-308	Clay Modelling – I	M254-MFA-309	Relief Composition
M25-MFA-310	Creative Drawing – I	M25-MFA-311	Campaign Design – I	M25-MFA-312	Figurative Sculpture – I	M25-MFA-313	Figurative Printmaking – I
M25-MFA-314	Creative Painting – III	M25-MFA-315	Photography Composition – I	M25-MFA-316	Creative Sculpture – I	M25-MFA-317	Experimental Printmaking – I
M25-MFA-401	History of Modern Indian Art –II						

M25-MFA-402	Contemporary Indian Art – II	M25-MFA-403	Advertising: Ethics & Morel Values	M25-MFA-404	History of Western Sculpture	M25-MFA-405	Indian Master Printmakers
M25-MFA-406	Pictorial Composition – II	M25-MFA-407	Graphic Design – II	M25-MFA-408	Clay Modelling – II	M25-MFA-409	Intaglio Composition – I
M25-MFA-410	Creative Drawing – II	M25-MFA-411	Campaign Design – II	M25-MFA-412	Figurative Sculpture – II	M25-MFA-413	Figurative Printmaking – II
M25-MFA-414	Contemporary Painting	M25-MFA-415	Photography Composition – II	M25-MFA-416	Creative Sculpture – II	M25-MFA-417	Experimental Printmaking – II

PLOs	Master of Fine Arts (MFA)
	After the completion of Master degree in Fine Arts the student will be able to:
PLO-1: Knowledge and Understanding	Demonstrate the fundamental and advanced knowledge of the subject and understanding of recent developments and issues, including methods and techniques, related to the Fine Arts.
PLO-2: General Skills	Acquire the general skills required for performing and accomplishing the tasks as expected to be done by a skilled professional in the fields of Fine Arts.
PLO-3: Technical/ Professional Skills	Demonstrate the learning of advanced cognitive technical/professional skills required for completing the specialized tasks related to the profession and for conducting and analyzing the relevant research tasks indifferent domains of the Fine Arts.
PLO-4: Communication Skills	Effectively communicate the attained skills of the Fine Arts in well-structured and productive manner to the society at large.
PLO-5: Application of Knowledge and Skills	Apply the acquired knowledge and skills to the problems in the subject area, and to identify and analyze the issues where the attained knowledge and skills can be applied by carrying out research investigations to formulate evidence-based solutions to complex and unpredictable problems associated with the field of Fine Arts or otherwise.
PLO-6: Critical thinking and Research Aptitude	Attain the capability of critical thinking in intra/inter-disciplinary areas of the Fine Arts enabling to formulate, synthesize, and articulate issues for designing of research proposals, testing hypotheses, and drawing inferences based on the analysis.
PLO-7: Constitutional, Humanistic, Moral Values and Ethics	Know constitutional, humanistic, moral and ethical values, and intellectual property rights to become a scholar/professional with ingrained values in expanding knowledge for the society, and to avoid unethical practices such as fabrication, falsification or misrepresentation of data or committing plagiarism.
PLO-8: Capabilities/qualities and mindset	To exercise personal responsibility for the outputs of own work as well as of group/team and for managing complex and challenging work(s) that requires new/strategic approaches.
PLO-9: Employability and job-ready skills	Attain the knowledge and skills required for increasing employment potential, adapting to the future work and responding to the rapidly changing demands of the employers/industry/society with time.

Kurukshetra University, Kurukshetra

(Established by the State Legislature Act-XII of 1956)

(“A++” Grade, NAAC Accredited)



Syllabus for Post Graduate Programme Master of Fine Arts (MFA)

as per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme

With Multiple Entry-Exit, Internship and CBCS-LOCF

With effect from the session 2025-26 (in phased manner)

**DEPARTMENT OF FINE ARTS
FACULTY OF INDIC STUDIES**

**KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119
HARYANA, INDIA**

Session: 2025-26			
Part A – Introduction			
Name of Programme	Master of Fine Arts		
Semester	First		
Name of the Course	HISTORY OF MODERN WESTERN ART-I		
Course Code	M25-MFA-101		
Course Type	CC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Trace the development of Modern Western art from the 18 th century to 20 th century. CLO 2: Develop a critical understanding of western Art Movements and its relevance and impact on art. CLO 3: Critical understanding of the art work of some of the seminal/prominent artists and their contributions to modern art. CLO 4: Develop a critical understanding of History of Western Art and its relevance and impact on art.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unitand the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Romanticism: Francisco Goya, Eugène Delacroix, John Constable, J.W.M. Turner. Realism: Gustave Courbet, Jean-François Millet, Camille Corot, Honoré Daumier.		15
II	Impressionism: Claude Monet, Edouard Manet, Edgar Degas, Pierre-Auguste Renoir. Neo-Impressionism: Georges Seurat, Camille Pissarro Post-impressionism: Henri de Toulouse-Lautrec, Paul Cézanne, Paul Gauguin, Vincent Van Gogh.		15
III	Expressionism: Die Brücke group - Edvard Munch, Emil Nolde, Ernst Ludwig Kirchner, Der Blaue Reiter group - Franz Marc, Paul Klee, Wassily Kandinsky. Figurative Expressionism- Oskar Kokoschka.		15
IV	Fauvism: Henri Matisse, André Derain Cubism: Pablo Picasso, Georges Braque Futurism: Umberto Boccioni.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Deymatie : Fauvism (good introduction also in Encyclopedia of World Art.)			
2. Crespelle – The Fauves.			
3. Razanl, Modern Paining, Skira – Useful references from plates and text.			
4. Lake and Maillard – Dictionary of Modern Painting.			
5. Herbert Read – A concise History of Modern Paining.			
6. William Vaughan – Romantic Art.			
7. European Modern Movements in Encyclopedia of World Art.			
8. Leymarie – Impressionism (Skira).			
9. J. Rewald – History of impressionism – Museum of Modern Art, New York.			
10. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).			
11. Madsen – Art Nouveau.			
12. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.			
13. Rosenblum – Cubism and 20 th Century Art.			
14. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.			
15. Ritchie – German 20 th Century Art – Museum of Modern Art.			
16. Barr – Fantastio Art; Dada and Surrealism.			
17. Scuphor – Dictionary of Abstract Art.			
18. Motherwell Dada Poets and Painters (Anthology of Dada Writings).			
19. Marcel Jean – A History of Surrealist Painting (Comprehensive Study)			
20. Herbert Read – Surrealism (Mainly documents)			
21. Rubin – Dada & Surrealism.			
22. F.Pepper – Kinetic Art.			
23. H.H.Arnason – A history of modern art, Pearson Prentice hall, new Jersey, 2004.			
24. H.W.Janson – History of art, Pearson Prentice hall, new Jersey.			
25. E.H.Gombrich- The Story of Art, Phaidon Press Ltd.,London, 2001.			

Session: 2025-26			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	First		
Name of the Course	Indian Philosophy of Art (Oriental Approach)		
Course Code	M25-MFA-102		
Course Type	CC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: To know about the concept of Indian aesthetics and philosophy that would help them understand paintings and artworks. CLO 2:To gain knowledge about the principles of paintings in Hindi Shilpa texts. CLO 3:To understand the use of Rasa and its types in creating beautiful paintings. CLO 4:To understand the concept of different theories in Indian aesthetics.		
Credits	Theory	Tutorial	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Definition of Indian Philosophy (Darshan) and basic principles and religious thoughts Four Vedas – Rig, Sama, Yajur, Atharva Introduction to Upanishads.	15	
II	Fundamentals of Indian Arts, Principles and Iconography in the Shilpa Texts like Chitrasutram, Chitralakshanam.	15	
III	Concept and Types of Rasa Sutra by Bharat Muni and Abhinav Gupta. Shadanga- Six Limbs of Indian Painting (Rupabheda, Pramana, Bhava, Lavanya Yojanam, Sadrihsyam, and Varnika Bhangam	15	
IV	Theory of Alamkar, Dhvani, Auchitya, Riti.	15	
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
•Class Participation:	5	Written Examination	
•Seminar/presentation/assignment/quiz/class test etc.:	10		
•Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Aesthetic Meaning by Rekha Jhanji			
2. An Introduction to Indian Aesthetics by Mini Chandran and V.S. Srinath			
3. Saundarya Shastra by Mamta Chaturvedi			
4. Indian Aesthetics- Convergence and divergence by Priyadarshani Patnaik and Joy Sen			
5. A Students Handbook to Indian Aesthetics by Neerja A. Gupta			
6. Indian Aesthetics- An Introduction by V. S. Seturaman.			
7. The Bloomsbury research handbook of Indian Aesthetics and the philosophy of Art by editor Arindam Chakrabarti			

Session: 2025-26			
Part A – Introduction			
Name of Programe	MASTER OF FINE ARTS		
Semester	First		
Name of the Course	Fundamental of Advertising		
Course Code	M25-MFA-103		
Course Type	CC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Explain the historical development and significance of early art and graphic design. CLO 2: Analyze the impact of modern art movements and development of modern advertising. CLO 3: Understand advertising and different forms of trademarks. CLO 4: Understand about advertising agencies and contributions of its renowned personalities.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Introduction to Advertising, Define Advertising; Graphic Design, Types of Advertising, Functions of Advertising, Trademark: Logo/ Logotype, signature, Seal, Monogram, Symbol, Emblem, Insignia etc.		15
II	Photography: Introduction, meaning & brief history. Introduction of Camera: Aperture, Shutter Speed, ISO; Introduction of Lens.		15
III	Print Media: Newspapers& MagazinesAdvertising; Outdoor Advertising: Posters& Hoardings: Broadcast Media: Radio&TelevisionDirect Mail Advertising; Window Display& Counter Display		15
IV	Campaign planning, objectives and basic principles – Campaign objectives & Types, Factors influencing the planning of advertising campaign. The selling methods, Advertising Appeal, Types of Appeal.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Foundation of Advertising: S.A Chunnawalla, K.C Sethia.			
2. Advertising and Sales Promotion: S.H.H kazmi, Satish Batra.			
3. Social Dimension of Advertising: S.S Kaptan.			
4. Advertising theory and practice: C.H Sandage, Vernon Fryburger.			
5. Advertising and Promotion AN IMC Approach, Shimp Cengage Learning India Pvt. Ltd., New			
6. Delhi Contemporary Advertising: William F. Arens, Courtland L. Bovee.			
7. foKkiu *rduhd ,oaf\}kUr* : ujsUnz ;kno			
8. foKkiufMtkbu : ujsUnz ;kno			
9. foKkiudyk: ,ds'ojizlkngVoky			
10. foKkiu : v'kksdegktu			

Session: 2025-26			
Part A – Introduction			
Name of Programme	Master of Fine Arts		
Semester	First		
Name of the Course	TECHNICAL THEORY OF SCULPTURE-I		
Course Code	M25-MFA-104		
Course Type	CC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Knowledge of the scientific and logical chemical and natural behavior of paint on metal techniques CLO 2: Students will have knowledge traditional and modern techniques casting process different temperaments of the furnaces. CLO :3 Students will understand the value of our Ancient, Modern casting process for sculpting, right proportion of the material CLO 4: Knowledge Modern techniques with moral values towards our Art and casting, carving.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Types of metal, Lost wax process (Cire Perdue), Dogra/ Baster/ Sand casting process, The Built-up runner & investment, Patina & Coloring	15	
II	Knowledge about foundry, Pit blast furnace, Blast furnace, Gas furnace, Coal furnace, Diesel furnaces, Mould baking Procedure.	15	
III	Cement concrete casting, , P.O.P. casting, Fiber glass casting, Paper pulp casting. Paper meshy, Ceramic Mural	15	
IV	Stone carving techniques on marble, sand stone, & granite, Understanding about stone carving techniques and tool, Wood carving techniques according to the maquette, Understanding about wood carving techniques and tool, Colouring on wood & seasoning	15	
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1 Masterpieces of Indian Bronze& Metal sculpture Rustam J. Mehta			
2 Sculpting in steel and other metals- Arthur Zaidenberg			
3 Modeling a figure in clay –Albert pounteney			
4 Principles of metal casting – Richard W. Heine &Philip C. Rosenthal			
5 Manual of Direct Metal Sculpture – Thames and Hudson			
6 Sculpture of primitive man – Warner Muensterberger			
7 George Segal – Sem hunter/Don howthorne			
8 Early Chola Bronze – Dougles Barrett			
9 Contemporary Stone Sculpture – DonazMeilach			
10 Marino Marini – A.M. Hammacher			
11 Birbhum Terracottas – Lalit kala Academy			
12 Terracottas of Bengal – S.S. Biswas			
13 Masterpieces of Indian Terracottas – M.K. Dhavalikar			
14 Sculpture in plastic arts – Nicholas Roukas			
15 Modern Sculpture – Harbeart Read			
16 The complete sculpture of Barbara Hepworth – Alan			
17 Masterpieces of western sculpture – Howard Hibbard			

Session: 2025-26			
Part A - Introduction			
Name of Programme	Master of Fine Arts		
Semester	First		
Name of the Course	TECHNICAL THEORY OF PRINTMAKING		
Course Code	M25-MFA-105		
Course Type	CC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop to understand the history and techniques of a variety of print processes used in making unique and limited-edition fine art prints. CLO 2: Expression is to be supported by mastery of means. Problem solving, critical thinking skills, aesthetic judgment, and self-confidence which comes from accomplishment by this subject. CLO 3: Knowledge about the Master Printmakers of the origin of representational Printmaking in Europe. CLO 4: Analyze the formal, technical characteristic work of art print.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	This Subject provides an in-depth theoretical exploration of printmaking techniques. Students will engage with the historical, technical, and conceptual foundations of various printmaking methods. Through lectures, readings, discussions, and written assignments, students will develop a comprehensive understanding of the technical theory behind printmaking. Historical and Conceptual Foundations - Introduction to Printmaking History - Overview of the history of printmaking from ancient times to contemporary practices - Key milestones and influential printmakers - Understanding the evolution of printmaking techniques and materials	15	

	- The Conceptual Framework of Printmaking - Exploring the conceptual underpinnings of printmaking as an art form - The role of multiples, reproduction, and originality in printmaking - Printmaking as a tool for communication and social change	
II	Technical Aspects of Relief and Intaglio Printmaking - Relief Printmaking Techniques - Detailed study of woodcut, linocut, and other relief methods - Tools, materials, and processes involved in relief printmaking - Analyzing the visual language and aesthetic qualities of relief prints - Explorative effect of Ukieo- E, Japanese Technique of Wood cut. - Intaglio Printmaking Techniques - Comprehensive exploration of etching, engraving, drypoint, aquatint, and mezzotint - Technical aspects of preparing plates, applying grounds, and etching Examining the tonal and textural possibilities in intaglio printmaking	15
III	Planographic and Stencil Techniques - Lithography - The chemical principles and processes of lithography - Materials and equipment used in traditional and contemporary lithography - Analyzing the unique qualities of lithographic prints - Screen Printing (Serigraphy) - Technical aspects of screen preparation, stencil methods, and printing - Exploring different types of screens, inks, and substrates The impact of screen printing on graphic design, art, and popular culture	15
IV	Contemporary and Experimental Printmaking - Digital and Photographic Printmaking - Integration of digital technologies in printmaking - Exploring digital printmaking techniques such as giclée, digital etching, and photogravure - The impact of digital media on the evolution of printmaking - Experimental Techniques and Contemporary Practices - Investigating mixed media, installation, and experimental approaches in printmaking - The role of innovation and interdisciplinary practices in contemporary printmaking	15
Total Contact Hours		60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Graphic Arts Encyclopedia – George A Stevenson			
2. Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen.			
3. Visual Imagination			
4. Prints of Twentieth Century – Phanes			
5. Dictionary of Print Making Terms – Rosemary Simmons.			
6. How to Identify Prints – Bamber Gaspoigne.			
7. The Complete Printmaker (Techniques/Traditions/Innovations)– John Ross/Clave Romano/Tim Ross.			
8. Collecting Original Prints – Rosemary Simmons Hanre			
9. Printmaking Today – Jules Heller.			
10. Contemporary Art (Journal) – Lalit Kala Academy			
11. Graphic Art in India since 1850 – Lalit Kala Academy.			
12. Hkkjrh; Nkikfp= dyk : Mk- Luhudekj			
13. Graphic Art of 18 th Century : Jean Adhemer			
14. A history of Etching and Engraving- Arthur Hind			
15. An Introduction of History of Wood cut – A.M. Hind			
Reference Journals:			
• JOA - Journal of Arts			
• ShodhKosh: Journal of Visual and Performing Arts			
• Atishay Kalit- A Bilingual Research Journal of Fine Arts, Culture and Humanities			
• Atishay Kalit- A Bilingual Research Journal of Fine Arts, Culture and Humanities			
• Contemporary Art (Journal) – Lalit Kala Academy			
• Early Graphic Art in Bengal (Journal) – Lalit Kala Academy, Pranabranjan Roy.			

Session: 2025-26			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	First		
Name of the Course	FIGURATIVE DRAWING-I		
Course Code	M25-MFA-106		
Course Type	PC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To develop practical skills in drawing and painting techniques. CLO 2: Students will gain an understanding of contemporary drawing, including current trends, techniques, and influential artists. CLO 3: To explore the relationship between nature, culture, and artistic expression. CLO 4: To cultivate an appreciation for the diverse approaches to representing landscapes		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		18 hours	
Part B - Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Size 30" x 40" (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assignments: 03 canvases (vi) Sheet work: 8			
Unit	Topics		Contact Hours
I	Exploration of an individual approach to drawing as an aesthetic exercise of visual sign and symbol and locate your practice in the broader context of contemporary art		15
II	Explore Advance Drawing in different mediums and techniques- oil, acrylic, watercolors, pen, pastels and ink and photocopy, impression, stencil and any other medium.Exercise of different drawing techniques of traditional and contemporary masters Exercise on application of different mediums both traditional and contemporary as a drawing tool		15
III	Practical exercises focusing on the live study of natural color, texture, composition, perspectives.		15
IV	Observation and Practice of elements of nature like trees, sky, clouds, distant objects etc.		15
Total Contact Hours			60

Practicals			Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practicals>		30
Suggested Evaluation Methods			
Internal Assessment: 30			End Term Examination: 70
➤ Practical		30	➤ Practical
• Class Participation:		5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:		10	
• Weekly Submission		15	
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	First		
Name of the Course	COMMERCIAL CAMPAIGN - I		
Course Code	M25-MFA-107		
Course Type	PC - 1		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO	Course Learning Outcomes	
	CLO: 1	Ability to communicate messages visually through a combination of words, artworks, graphic and media.	
	CLO: 2	Ability to sustained artistic engagement with socio-political realities and intensive investigation of contemporary critical issues.	
	CLO: 3	Capable to utilize the art and technology interface for creative outcomes.	
	CLO: 4	Ability to utilize the visual message as a tool of social, moral and scientific awareness.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	18 hours	
Part B – Contents of the Course			
Practical (Product Campaign: Manual)			Total Contact Hours
Instructions: - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal Examiner/ Committee will evaluate the Sessional work. - Market survey and about your campaign - Size: As per requirements Medium: Poster Colors Or other with the permission of the concern teacher. Computer Graphics: Knowledge of basic Computer Application and Knowledge of various software’s mainly Corel Draw, Adobe Page-Maker, Adobe Illustrator, Adobe Photoshop. Microsoft Power-point. Digital Manipulation & its use in advertisement. Total assignments for Sessional work –one campaign (Minimum 12 Assignment per Campaign ie.			60

List of Practical			
Unit-I Logo - 1 Letter head, Visiting Card, Envelope – 1 Set.			15
Unit-II Posters – 4 Hoarding, Banner – 2 Press Layout – 2			15
Unit-III Magazine Layout – 2 Package Design – 1			15
Unit-IV Dangler, Cutouts, Showcard, Standy, Wobbler and Cube Free hand Sketches – 200 Drawing - 10 (Full figure human study, portrait, animal study etc.) Report - 1			15
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS: • Market survey • Different Social NGOs • Visit Different Advertising Agencies			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	First		
Name of the Course	SCULPTURE COMPOSITION-I		
Course Code	M25-MFA- 108		
Course Type	PC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will learn the pictorial representation of sculptures with different Expressions and emotionmoods focusing on current scenario CLO 2: The students will understand the indirect depiction of contemporary national-international issues through this artform which will lead to understand the concept of nationalism and many more. CLO 3: Students will learn about the figurative depiction of theirthoughts which will help viewers to connect withthe artist and artwork very easily. CLO 4: The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	This Subject belongs to practical exploration of sculpture techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of sculpture as an art form. Sculpting Techniques Terracotta: - Understanding terracotta's plasticity and workability for additive sculpting techniques. - Techniques for modeling, coiling, and slab-building in terracotta. - Hands-on practice sessions: students will create basic forms and study anatomical details in terracotta. Cement: - Understanding cement's suitability for both additive and subtractive sculpting methods.		60

	- Techniques for modeling, carving, and casting in cement. - Experimentation with texture and surface treatments in cement sculptures. POP (Plaster of Paris): - Introduction to POP's quick setting properties and its application in both additive and subtractive sculpting. Techniques for modeling, carving, and casting with POP : Armature Construction and Support Systems Terracotta: - Understanding the need for armatures in large-scale terracotta sculptures for structural support. - Techniques for constructing armatures using materials like wire, wood, and metal for terracotta sculptures. - Design considerations for creating stable and durable support systems for terracotta sculptures. Cement: - Importance of reinforcing armatures in cement sculptures, especially for outdoor installations. - Techniques for constructing armatures using materials like rebar, wire mesh, and PVC pipe for cement sculptures. - Hands-on sessions: students will experiment with armature construction techniques for cement sculptures. POP (Plaster of Paris): - Introduction to armature construction for POP sculptures: wireframe armatures, internal supports, and reinforcement techniques.s - Hands-on practice sessions: students will create armatures for their POP sculptures using various materials and methods. - Design considerations for creating stable and durable armatures for POP sculptures of different sizes and complexity. Throughout the course, students will engage in hands-on practice sessions, critique sessions, and research assignments tailored to the specific materials and techniques used in terracotta, cement, and POP Note: Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc Minimum Size: 36" x 36"x 36" No. of Assignments : 2 sketches : 250 Number of assessments 05	

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. William Vaughan – Romantic Art.			
2. European Modern Movements in Encyclopedia of World Art.			
3. Leymarie – Impressionism (Skira).			
4. J. Rewald – History of impressionism – Museum of Modern Art, New York.			
5. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).			
6. Madsen – Art Nouveau.			
7. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.			
8. Rosenblum – Cubism and 20 th Century Art.			
9. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.			
10. Ritchie – German 20 th Century Art – Museum of Modern Art.			
11. Barr – Fantastio Art; Dada and Surrealism.			
12. Scuphor – Dictionary of Abstract Art.			
13. Motherwell Dada Poets and Painters (Anthology of Dada Writings).			
14. Marcel Jean – A History of Surrealist Painting (Comprehensive Study)			
15. Herbert Read – Surrealism (Mainly documents)			
16. Rubin – Dada & Surrealism.			
17. F.Pepper – Kinetic Art.			

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	First		
Name of the Course	PRINTMAKING ART - I		
Course Code	M25-MFA- 109		
Course Type	PC-1		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	1	Develop creative ways to solve problems using a variety of strategies for making prints by utilizing monoprints, relief and basic intaglio processes.	
	2	Enhancing to Create personal hand-printed artwork, which demonstrate an introductory level of understanding printmaking ideas, and the processes, materials, and techniques associated with different method.	
	3	Establish self-critiquing skills to develop autonomous expression through printmaking.	
	4	Scientific and logical knowledge of reproduction of art works.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	This Subject belongs to practical exploration of printmaking techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of printmaking as an art form. Fundamental Techniques and Processes • Introduction to Printmaking • Overview of printmaking history and its significance in contemporary art • Introduction to the printmaking studio, safety protocols, and equipment • Relief Printing (Woodcut and Linocut) • Techniques for carving wood and linoleum blocks • Inking and printing methods • Creating multi-block and reduction prints		60

Intaglio Techniques - Etching and Drypoint - Preparing metal plates, applying grounds, and etching in acid baths - Drypoint techniques for direct scratching on plates - Printing processes and paper preparation - Aquatint and Mezzotint - Techniques for creating tonal variations using aquatint - Introduction to mezzotint for rich, velvety blacks and gradients - Combining techniques for complex compositions Planographic and Stencil Techniques - Lithography - Preparing lithographic stones and plates - Drawing and processing images on lithographic surfaces - Printing lithographs with attention to detail and consistency - Screen Printing (Serigraphy) - Screen preparation using photo emulsion and stencil methods - Techniques for multi-color printing and registration - Experimenting with different inks and substrates Advanced Techniques - Experimental Printmaking - Exploring collagraphy, mono printing, and mixed media prints - Combining printmaking techniques for unique effects - Using non-traditional materials and methods in printmaking No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)	
Suggested Evaluation Methods	
Internal Assessment: 30	
➤ Practicum	30
• Class Participation:	5
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10
• Mid-Term Exam:	15
End Term Examination: 70	
➤ Practicum	70
Lab record, Viva-Voce, write-up and execution of the practical	
Part C - Learning Resources	
Recommended Books/e-resources/LMS:	
- The Printmaking Ideas Book Paperback – Illustrated, August 20, 2019 - Reddy, Krishna, New ways of color printmaking: signification of materials - Lalit Kala Academy, Graphic Art in India since 1850 - Hoskins, Steve, Water Based Screen Printing - Paul Croft, Stone Lithography - George Whale and Naren Barfield, Digital Printmaking. - John Ross/Clare Romano/Tim Ross, The Complete Printmaker (Techniques/Traditions/Innovations) - John Ross/Clare Romano/Tim Ross G. Ahlberg and O. Jarneryd. Block and Silk Screen Printing - Kapoor, Geeta, Three Graphic Artist (Journal) – Lalit Kala Academy. D. Kauffmann., Graphic Art and Craft - Biegeleisen and Cohn, Silk Screen Techniques - Eichenberg, Fritz, The Art of the Print. - Heller, Jules, Print Making Today	

Session: 2025-26			
Part A – Introduction			
Name of the Programme	MASTER OF FINE ARTS		
Semester	First		
Name of the Course	CREATIVE PAINTING -I		
Course Code	M25-MFA-110		
Course Type	PC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Identify and synthesis the connection between process and concept in reference to collage/ collision. CLO 2: Exercise with different methods and traditions of representation of space, form and colour in reference to history and visual culture, Proportions, anatomy and measurements in compositional rhythm. CLO 3: Medium: Develop, test and employ materials, process and mediums in a way that activates your ideas and concepts CLO 4: Use of Diverse artistic styles and approaches to representing the compositional balance.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	4 hours (or as decided by PGBOS)	
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Minimum Size: 30" x 40" (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assignments: 04 canvases (vi) Sheet work: 25			
Part B - Contents of the Course			
Unit	Topic		Contact Hours
I	Introduction to Painting Techniques & Mediums - Oil painting fundamentals - Acrylic painting techniques - Watercolour applications - Mixed media exploration		30
II	Surface Preparation & Layering - Canvas and paper preparation - Gesso, primers, and textures - Layering methods and glazing		30

III	Contemporary Art Practices and New Media This unit examines contemporary art movements, focusing on postmodernism, conceptual art, installation art, and the integration of digital technologies in painting	30
1V	Personal Artistic Development Students will explore ways to develop their personal artistic voice and style by identifying themes and concepts that resonate with them	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practical	30	➤ Practical
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
•Weekly Submission:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	First		
Name of the Course	VISUAL COMMUNICATION - I		
Course Code	M25-MFA-111		
Course Type	PC – 2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO	COURSE LEARNING OUTCOME	
	CLO: 1	Student will be able to Understand the meaning of Social Campaign Design.	
	CLO: 2	Student will be able to Understand the Purpose & Function of Social Campaign.	
	CLO: 3	Student will be able to describe various advantages &disadvantages of Social Campaign.	
	CLO: 4	Student will be able to describe the role of Social Campaign in Modern Society.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	18 hours	
Part B- Contents of the Course			
Practical (Social Campaign: Digital)			Total Contact Hours
- Market survey and about your campaign - Size: As per requirements Medium : Poster Colors Or other with the permission of the concern teacher. Computer Graphics: Knowledge of basic Computer Application and Knowledge of various software’s mainly Corel Draw, Adobe Page-Maker, Adobe Illustrator, Adobe Photoshop. Microsoft Power-point. Digital Manipulation & its use in advertisement. Total assignments for Sessional work –one campaign (Minimum 12 Assignment per Campaign ie.			120

List of Practical			
Unit-I Logo - 1 Letter head, Visiting Card, Envelope – 1 Set.			30
Unit-II Posters 4 Hoarding, Banner - 1			30
Unit-III Press Layout – 2 Magazine Layout – 2			30
Unit-IV Illustration – 2 Calendar, Cutout, Bunting and Pamphlet Free hand Sketches – 200 Drawing - 10 (Full figure human study, portrait, animal study etc.) Report - 1			30
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
• Market survey • Different Social NGOs • Different Advertising Agencies			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	First		
Name of the Course	ADVANCE SCULPTURE COMPOSITION-I		
Course Code	M25-MFA- 112		
Course Type	PC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will learn the pictorial representation of sculptures with different Expressions and emotion moods focusing on current scenario. CLO 2: The students will understand the indirect depiction of contemporary national-international issues through this art form which will lead to understand the concept of nationalism and many more. CLO 3: Students will learn about the figurative depiction of their thoughts which will help viewers to connect with the artist and artwork very easily. CLO 4: The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	This Subject belongs to practical exploration of sculpture techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of sculpture as an art form. Sculpting Techniques Exploring Mixed Media Sculpture • Introduction to mixed media sculpture techniques: assemblage, collage, and found object sculpture. • Integration of non-traditional materials such as found objects, textiles, and recycled materials into sculptural compositions. • Creative approaches to combining materials and textures in mixed media sculpture.		30

Unit-II	Mold Making and Casting Techniques • Introduction to mold making materials and methods: silicone, plaster, and alginate. • Techniques for creating one-part and multi-part molds for sculptures. • Exploring casting materials and processes: resin, plaster, and metal casting.	30
Unit-III	Large Scale Sculpture Construction • Considerations for scaling up sculptural works for outdoor or architectural settings. • Techniques for working with large-scale materials such as steel, concrete, and stone. • Engineering principles for creating structurally sound and weather-resistant large-scale sculptures.	30
Unit-IV	Installation and Site-Specific Sculpture • Understanding the relationship between sculpture and its environment. • Techniques for site analysis and conceptual development for site-specific sculpture projects. • Installation techniques and considerations for outdoor and indoor exhibition spaces. • Note: Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc Minimum Size: 36’’ x 36’’x 36’’ No. of Assignments : 4 sketches : 250 Number of assessments 05	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS: 1. Rosenblum – Cubism and 2^{0th} Century Art. 2. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art. 3. Ritchie – German 20th Century Art – Museum of Modern Art. 4. Barr – Fantastio Art; Dada and Surrealism. 5. Scuphor – Dictionary of Abstract Art. 6. Motherwell Dada Poets and Painters (Anthology of Dada Writings). 7. Marcel Jean – A History of Surrealist Painting (Comprehensive Study) 8. Herbert Read – Surrealism (Mainly documents) 9. Rubin – Dada & Surrealism. 10. F.Pepper – Kinetic Art.		

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	First		
Name of the Course	ADVANCE PRINTMAKING COMPOSITION-I		
Course Code	M25-MFA-113		
Course Type	PC-2		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	1 Develops the artistic skill to work interdisciplinary and collaborative discipline that focuses on our relationship with technology, visual culture, emotion, and performance in contemporary art. 2 Enhances the knowledge to find possibilities of creating artwork using emerging technologies within the context of a hands-on studio art environment. 3 This inculcates to execute projects challenge, tradition and embrace new forms of aesthetic thinking. 4 Inculcates the Moral values with emotional intelligence through the knowledge of art and aesthetics.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	This subject provides an in-depth, practical exploration of advanced printmaking techniques. Students will engage with complex methods and materials, refining their skills to produce sophisticated and innovative compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of advanced printmaking as an art form. Advanced Intaglio Techniques - Multi-plate Etching - Techniques for aligning and printing multiple plates - Layering colors and textures for complex compositions - Experimenting with various etching grounds and resists - Photogravure - Introduction to photogravure processes - Preparing photographic images for transfer to metal plates - Printing photogravure images with intaglio presses		30

Unit-II	Advanced Lithography and Planographic Methods - Color Lithography - Techniques for creating multi-color lithographs - Understanding registration and overlaying colors - Experimenting with different drawing materials and techniques on lithographic plates	30
Unit-III	- Polyester Plate and Photo Lithography - Using polyester plates for quick and efficient lithographic prints - Exploring photo-lithography techniques for transferring photographic and digital images - Combining traditional and digital methods for innovative compositions	30
Unit-IV	Contemporary and Experimental Techniques - Screen Printing Innovations - Advanced screen printing techniques (e.g., CMYK process printing, split fountains) - Incorporating photographic and digital elements in screen prints - Experimenting with unconventional substrates and inks (e.g., metallic, fluorescent) No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS: - The Printmaking Ideas Book Paperback – Illustrated, August 20, 2019 - Reddy, Krishna, New ways of color printmaking: signification of materials - Lalit Kala Academy, Graphic Art in India since 1850 - Hoskins, Steve, Water Based Screen Printing - Paul Croft, Stone Lithography - George Whale and Naren Barfield, Digital Printmaking. - John Ross/Clare Romano/Tim Ross, The Complete Printmaker (Techniques/Traditions/Innovations) - John Ross/Clare Romano/Tim Ross G. Ahlberg and O. Jarneryd. Block and Silk Screen Printing - Kapoor, Geeta, Three Graphic Artist (Journal) – Lalit Kala Academy. D. Kauffmann., Graphic Art and Craft - Biegeleisen and Cohn, Silk Screen Techniques - Eichenberg, Fritz, The Art of the Print		
E-Resources: - The Printmaking Bible: The Complete Guide to Materials and Techniques Hardcover – Import, 1 September 2008 by <u>Ann d'Arcy Hughes</u> (Author), <u>Hebe Verno, Morris</u> (Author) https://www.youtube.com/watch?v=A1LAyCSIAUw https://www.dailyartmagazine.com/seven-indian-printmakers/ https://www.scribd.com/presentation/437130387/ARTS-6-Elements-of-Art-Printmaking#		

Session: 2025-26			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	First		
Name of the Course	Mural		
Course Code	M25-MFA-114		
Course Type	PC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Study of compositions from imagination and observation with the help of concepts, theme, statements etc. CLO 2: Exercises of different painting techniques: texture work, distortion, symbolism, interpretation of themes. CLO 3: Develop proficiency in large-scale painting techniques, including surface preparation, priming, and layering. CLO 4: Develop test and employ materials, process, and mediums in a way that activates ideas and concept.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	18 hours		
Instructions: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Medium: As per choice (iv) Number of assignments: 02 (v) Sheet work (Layouts): 25			
Part B - Contents of the Course			
Unit	Topics		Contact Hours
I	Study of compositions from imagination and observation with the help of concepts, theme, statements etc.		30
II	Exercises of different painting techniques: texture work, distortion, symbolism, interpretation of themes		30
III	Develop themes and narratives that reflect cultural, social, or personal concepts. Experiment with styles and symbolism to communicate messages effectively through murals.		30
IV	Develop test and employ materials, process, and mediums in a way that activates ideas and concept		30
Total Contact Hours			120

Practicals		Contact Hours
<Instruction regarding practical><Syllabus/ List of Practicals>		30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practical	30	➤ Practical
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Weekly Submission (Layouts):	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	First		
Name of the Course	COMMERCIAL PHOTOGRAPHY - I		
Course Code	M25-MFA-115		
Course Type	PC – 3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO: 1	Student will be able to recognize, analyze, and adapt contemporary themes in art and photography.	
	CLO: 2	Student will be able to produce a cohesive group of photographs that demonstrate aesthetic and conceptual development.	
	CLO: 3	Student will be able to create and maintain a web presence for distributing, promoting, and developing visual art work.	
	CLO: 4	Students will gain hands-on experience and build a diverse portfolio suitable for entering the field of advertising photography.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	12 hours	
Part B – Contents of the Course			
Practical			Total Contact Hours
Unit-I Product Photography Choose a small product (e.g., a watch, a perfume bottle, or a piece of jewelry) and create a high-quality, professional advertisement photo.			30
Unit-II Food Photography Create a series of photos for a fictional restaurant menu. Include appetizers, main courses, desserts, and drinks.			30
Unit-III Beverage Photography Create an advertisement photo for a beverage (e.g., coffee, soda or Soft drink).			30
Unit-IV Cosmetics Photography Photograph a set of cosmetic products (e.g., makeup, skincare items) for a beauty brand. • Size: As per requirements • Total Assignments 25 to 40 Minimum Assignments			30

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
• "Light Science & Magic: An Introduction to Photographic Lighting" by Fil Hunter, Steven Biver, and Paul Fuqua			
• "Commercial Photography Handbook: Business Techniques for Professional Digital Photographers" by Kirk Tuck			
• "The Photographer's Guide to Marketing and Self-Promotion" by Maria Piscopo			
• "The Best of Professional Digital Photography" by Bill Hurter			
• "Studio Anywhere: A Photographer's Guide to Shooting in Unconventional Locations" by Nick Fancher			
• "Sketching Light: An Illustrated Tour of the Possibilities of Flash" by Joe McNally			
• "Advertising Photography: A Straightforward Guide to a Complex Industry" by Lou Lesko			
• "Professional Commercial Photography: Techniques and Images from Master Digital Photographers" by Lou Jacobs Jr.			
• "The Photographer's MBA: Everything You Need to Know for Your Photography Business" by Sal Cincotta			
• "Pricing Photography: The Complete Guide to Assignment and Stock Prices" by Michal Heron and David MacTavish			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	First		
Name of the Course	SCULPTURE MURALS-I		
Course Code	M25-MFA- 116		
Course Type	PC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will learn the pictorial representation of sculptures with different Expressions and emotion moods focusing on current scenario. CLO 2: The students will understand the indirect depiction of contemporary national-international issues through this artform which will lead to understand the concept of nationalism and many more. CLO 3: Students will learn about the figurative depiction of their thoughts which will help viewers to connect with the artist and artwork very easily. CLO 4: The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	This Subject belongs to practical exploration of sculpture techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of sculpture as an art form. Introduction to Mural Sculpture Materials - Overview of materials suitable for indoor and outdoor mural sculptures, such as terracotta, concrete, mosaic tiles, and metal. - Safety protocols and best practices for working with mural sculpture materials. - Basic tools and equipment used in mural sculpture: sculpting tools, trowels, mortar, grout, etc.		30

Unit-II	Indoor Mural Sculpture Techniques - Understanding the scale and spatial considerations for indoor mural sculptures. - Techniques for creating relief sculptures using materials like terracotta and plaster. - Hands-on practice sessions: students will create small-scale relief sculptures suitable for indoor murals.	30
Unit-III	Outdoor Mural Sculpture Techniques - Considerations for durability and weather resistance in outdoor mural sculptures. - Techniques for creating outdoor mural sculptures using materials like concrete, mosaic tiles, and metal. - Hands-on practice sessions: students will experiment with outdoor mural sculpture techniques, focusing on scale, texture, and durability.	30
Unit-IV	Installation and Site-Specific Considerations - Understanding the interaction between mural sculptures and their environment, both indoors and outdoors. - Techniques for planning and installing mural sculptures in indoor and outdoor settings. - Collaborative project: students will design and install a mural sculpture, considering site-specific factors such as lighting, architecture, and community engagement. NOTE Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc Minimum Size: 36” x 36”x 36” No. of Assignments : 4 sketches : 250 Number of assessments 05	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		
1. Crespelle – The Fauves.		
2. Razanl, Modern Paining, Skira – Useful references from plates and text.		
3. Lake and Maillard – Dictionary of Modern Painting.		
4. Herbert Read – A concise History of Modern Paining.		
5. William Vaughan – Romantic Art.		
6. European Modern Movements in Encyclopedia of World Art.		
7. Leymarie – Impressionism (Skira).		
8. J. Rewald – History of impressionism – Museum of Modern Art, New York.		
9. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).		
10. Madsen –		

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	First		
Name of the Course	MIXED MEDIA PRINTMAKING -I		
Course Code	M25-MFA-117		
Course Type	PC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	1 Apply skill and thoughts to bring realistic and creative Art work. 2 Demonstrate the thoughts and composition to present the viewer in unique way through their prints. 3 Apply advanced working knowledge of Relief and Planography printing. 4 Execute to work freely and independently, implement artistic skill of Printmaking.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	This subject explores the integration of various printmaking techniques with other media to create innovative and dynamic compositions. Students will engage with multiple processes and materials, refining their skills to produce sophisticated and experimental works. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of mixed media printmaking. Introduction to Mixed Media Printmaking • Overview of Mixed Media Printmaking Introduction to the concept of mixed media in printmaking Understanding the potential of combining different printmaking techniques Safety protocols and studio setup for mixed media processes • Combining Relief and Intaglio Techniques • Techniques for integrating relief (e.g., woodcut, linocut) and intaglio (e.g., etching, drypoint) processes Experimenting with registration and layering for complex images Exploring different papers and substrates Screen Printing and Collagraph • Advanced Screen Printing • Multi-layer screen printing techniques • Using photographic and hand-drawn imagery in screen prints • Exploring transparency and color blending • Collagraph Techniques		120

	• Building collagraph plates with a variety of textures and materials • Printing collagraphs with intaglio and relief methods Combining collagraph prints with other printmaking processes igital and Experimental Techniques • Digital Printmaking • Integrating digital tools and processes with traditional printmaking • Techniques for creating digital collages and transferring them to printmaking methods • Using software for designing and manipulating print compositions • Experimental Approaches • Exploring unconventional materials and techniques in printmaking • Incorporating found objects, textiles, and mixed media elements Creating 3D prints and sculptural forms No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)		
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
• The Printmaking Ideas Book Paperback – Illustrated, August 20, 2019 • Reddy, Krishna, New ways of color printmaking: signification of materials • Lalit Kala Academy, Graphic Art in India since 1850 • Hoskins, Steve, Water Based Screen Printing • Paul Croft, Stone Lithography • George Whale and Naren Barfield, Digital Printmaking. • John Ross/Clare Romano/Tim Ross, The Complete Printmaker (Techniques/Traditions/Innovations) John Ross/Clare Romano/Tim Ross • G. Ahlberg and O. Jarneryd. Block and Silk Screen Printing • Kapoor, Geeta, Three Graphic Artist (Journal) – Lalit Kala Academy. • D. Kauffmann., Graphic Art and Craft • Biegeleisen and Cohn, Silk Screen Techniques • Eichenberg, Fritz, The Art of the Print. • Heller, Jules, Print Making Today • Adhemer, Jean Graphic Art of 18th Century. • A Fern, A Half Century of American Print Making • Sattler, Oliver Modern Japanese Prints • Berri, D.C., The Art of Lithography . • Harrap, Charles, Offset Printing from stone and plates. • UmetaroAzechi, Japanese Woodblock printing.			

Session: 2025-26			
Part A – Introduction			
Name of Programme	Master of Fine Arts		
Semester	SECOND		
Name of the Course	HISTORY OF MODERN WESTERN ART- II		
Course Code	M25-MFA-201		
Course Type	CC-3		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Trace the development of Modern Western art from the 18 th century to 20 th century. CLO 2: Develop a critical understanding of western Art Movements and its relevance and impact on art. CLO 3: Critical understanding of the art work of some of the seminal/prominent artists and their contributions to modern art. CLO 4: Develop a critical understanding of History of Western Art and its relevance and impact on art.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Introduction to Dadaism and its Characteristics Key Artists: Marchel Duchamp, Francis Picabia Surrealism: Influences and Major works Key Artists: Salvador Dalí, Max Ernst, Joan Miró	15	
II	Introduction to De Stijl Key Artists: Piet Mondrian, Theo Van Doesburg and their major works the Bauhaus Movement- Walter Gropius, Paul Klee	15	
III	Constructivism- Naum Gabo, Atonio Pevsner Key Artist: Vladamir Tatlin, Alexander Rodchenko Pop Art Key Artist: Andy Warhol	15	

IV	Op Art: Victor Vasarely Minimalism Art Key artist: Frank Stella Modern European Sculptors: Constantin Brâncuși, Alberto Giacometti, Henry Moore Contemporary European Art Since 1980- Kinetic art: Alexander Calder	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		
1. Deymatie : Fauvism (good introduction also in Encyclopedia of World Art.)		
2. Crespelle – The Fauves.		
3. Razanl, Modern Paining, Skira – Useful references from plates and text.		
4. Lake and Maillard – Dictionary of Modern Painting.		
5. Herbert Read – A concise History of Modern Paining.		
6. William Vaughan – Romantic Art.		
7. European Modern Movements in Encyclopedia of World Art.		
8. Leymarie – Impressionism (Skira).		
9. J. Rewald – History of impressionism – Museum of Modern Art, New York.		
10. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).		
11. Madsen – Art Nouveau.		
12. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.		
13. Rosenblum – Cubism and 20 th Century Art.		
14. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.		
15. Ritchie – German 20 th Century Art – Museum of Modern Art.		
16. Barr – Fantastio Art; Dada and Surrealism.		
17. Scuphor – Dictionary of Abstract Art.		
18. Motherwell Dada Poets and Painters (Anthology of Dada Writings).		
19. Marcel Jean – A History of Surrealist Painting (Comprehensive Study)		
20. Herbert Read – Surrealism (Mainly documents)		
21. Rubin – Dada & Surrealism.		
22. F.Pepper – Kinetic Art		
23. John Galloway- Origin of Modern Art, 1905-1914, Mc Graw Hill Book Company, New York, 1965.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Second		
Name of the Course	WESTERN PHILOSOPHY OF ART (Occidental approach)		
Course Code	M25-MFA-202		
Course Type	CC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To analyze the psychological mechanisms behind artistic perception, creation, and the role of the conscious/subconscious mind. CLO 2: To evaluate the relationships and intersections between psychology and art. CLO 3: To critically examine major philosophical theories and ideas about art from thinkers like Plato, Aristotle, Hegel, and Marx, assessing their relevance and impact. CLO 4: To explore contemporary concepts like anti-aesthetics, globalization's impact on art, and theories by critics.		
Credits	Theory	Tutorial	Total
	3	1	4
Teaching Hours per week	3	1	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unitand the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction to Western aesthetics Pre- Socratic School – Milesian school, Eleatic school Ancient Philosophers- Socrates, Plato, Aristotle, Plotinus, Hegel		15
II	Medieval Period philosophers- Augustine of Hippo, Early Modern- David Hume, Immanuel Kant.		15
III	19 Th & 20 Th century Philosophers – Arthur Schopenhauer, Karl Marx, Friedrich, Roger Fry, Herbert Read		15
IV	Benedetto Croce (Theory of intuition), Sigmund Freud & Carl Jung (Relationship between Psychology & art, Gestalt Theory, (Theory of empathy), Clive Bell (Theory of Significant form), contribution of Leo Tolstoy & Susanne Langer in art		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
•Class Participation:	5	Written Examination	
•Seminar/presentation/assignment/quiz/class test etc.:	10		
•Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Aesthetic Meaning by Rekha Jhanji			
2. Introductory Reading in Aesthetics by Hospers John			
3. Art as experience by John Dewey			
8. Aesthetic Meaning by Rekha Jhanji			
9. Philosophy of Art -Aldrich Virgil			
10. Art and Illusion by E. H. Gombrich			

Session: 2025-26			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Second		
Name of the Course	Creative Advertising		
Course Code	M25-MFA-203		
Course Type	CC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the creative process of advertising. CLO 2: Plan and execute advertising skills. CLO 3: Develop skills in creating effective visual and layout design for various media. CLO 4: Understand the marketing and advertising		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B – Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Introduction to Copy Writing, Copy Format: Headline, Sub-Headline, Body copy etc., Types of copy, Characteristics of copy, Publicity& Propaganda, The Advertiser, Target Audience and U.S.P.		15
II	Creative Advertising –Creativity, five stages of Creativity, Creative concept & Creative leap, Creative brief and big Idea, Creative Strategy & Component of creative Strategy, Creative thinking, Creative Thought process.		15
III	Introduction to advertising agency, Types of Advertising agency, Functional department of advertising agency. Brief introduction of Prominent Personalities of Advertising world; Prason Joshi, Prahlad Kakar, Piyush Pandey, AlyquePadamasi.		15
IV	AdvertisingMarketing: Nature and scope of Marketing, Advertising role in marketing, Types of market. Marketing mix, 4P’s of marketing, Packaging& Transportation, Direct marketing, Motivational research, Brand image.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Foundation of Advertising: S.A Chunnawalla, K.C Sethia.			
2. Advertising and Sales Promotion: S.H.H kazmi, Satish Batra.			
3. Social Dimension of Advertising: S.S Kaptan.			
4. Advertising theory and practice: C.H Sandage, Vernon Fryburger.			
5. Advertising and Promotion AN IMC Approach, Shimp Cengage Learning India Pvt. Ltd., New			
6. Delhi Contemporary Advertising: William F. Arens, Courtland L. Bovee.			
7. foKkiu *rduhd ,oaf\}kUr* : ujsUnz ;kno			
8. foKkiufMtkbu : ujsUnz ;kno			
9. foKkiudyk: ,ds'ojizlkngVoky			
10. foKkiu : v'kksdegktu			

Session: 2025-26			
Part A – Introduction			
Name of Programme	Master of Fine Arts		
Semester	SECOND		
Name of the Course	TECHNICAL THEORY OF SCULPTURE-II		
Course Code	M25-MFA-204		
Course Type	CC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Knowledge of the scientific and logical chemical and natural behavior of paint on metal techniques CLO 2: Students will have knowledge traditional and modern techniques casting processdifferenttemperaments of the furnaces. CLO 3: Students will understand the value of our Ancient, Modern casting process for sculpting, right proportion of the material CLO 4: KnowledgeModern techniques with moral values towards our Art and casting, carving.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unitand the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Waste molding and casting, Piece molding and casting, Piece &Mother molding and casting, Flexible molds,Fiber glass mold		15
II	Casting a piece mold with slip, Pressing a piece mold with clay, Ceramic shell casting, Separators, Types of clay.		15
III	Oxyacetylene welding, ARC welding MIG/TIG welding, Gravity process metal casting, Flow process metal casting.		15
IV	Acquiring proper knowledge of theory of firing and glazing. Acquiring properknowledge of making several kinds of bodies earthenware and stoneware and glazes, Acquiring proper knowledge about firing methods, different kilns,country kiln, wood firing, gas firing, oil firing, and coal firing kilns.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1 Masterpieces of Indian Bronze& Metal sculpture Rustam J. Mehta			
2 Sculpting in steel and other metals- Arthur Zaidenberg			
3 Modeling a figure in clay –Albert pounteney			
4 Principles of metal casting – Richard W. Heine &Philip C. Rosenthal			
5 Manual of Direct Metal Sculpture – Thames and Hudson			
6 Sculpture of primitive man – Warner Muensterberger			
7 George Segal – Sem hunter/Don howthorne			
8 Early Chola Bronze – Dougles Barrett			
9 Contemporary Stone Sculpture – DonazMeilach			
10 Marino Marini – A.M. Hammacher			
11 Birbhum Terracottas – Lalit kala Academy			
12 Terracottas of Bengal – S.S. Biswas			
13 Masterpieces of Indian Terracottas – M.K. Dhavalikar			
14 Sculpture in plastic arts – Nicholas Roukas			
15 Modern Sculpture – Harbeart Read			
16 The complete sculpture of Barbara Hepworth – Alan			
17 Masterpieces of western sculpture – Howard Hibbar			

Session: 2025-26			
Part A - Introduction			
Name of Programme	Master of Fine Arts		
Semester	Second		
Name of the Course	HISTORY OF WESTERN PRINTMAKING		
Course Code	M25-MFA-205		
Course Type	CC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop to understand the history and techniques of a variety of print processes used in making unique and limited edition fine art prints. CLO 2: Expression is to be supported by mastery of means. Problem solving, critical thinking skills, aesthetic judgment, and self-confidence which comes from accomplishment by this subject. CLO 3: Knowledge about the Master Printmakers of the origin of representational Printmaking in Europe. CLO 4: Analyze the formal, technical characteristic work of art print.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	This Subject provides an in-depth exploration of the history of European printmaking. Students will engage with the development, techniques, and cultural impact of printmaking from the Renaissance to the contemporary era. Through lectures, readings, discussions, and written assignments, students will develop a comprehensive understanding of the evolution and significance of European printmaking. The Origins and Early Development of European Printmaking - Introduction to Early European Printmaking - Overview of printmaking origins in Europe - The role of religious and secular prints in early European society - Techniques and materials used in early woodcuts and engravings	15	

	- The Renaissance and the Rise of Printmaking - The impact of the Renaissance on printmaking practices - Key figures in early European printmaking The development of etching and its artistic implications, Survey of the development of art of printmaking in Europe from early woodcuts and metal engravings during the beginning of the 15th century onwards to the present day including	
II	Masters of original printmaking, master engravers printmaking's for fulfilling religious and social needs as well as that of individual creative expressions. Significance of Durer, Italian Contribution of Chiaroscuro and woodcuts.	15
III	Print Making of 20 th Century, Pablo Picasso's Graphic work, Francisco Goya, Photo Transfer Techniques, Influence of Advertising, Stanley William Hayter, Printmaking Studio Atelier-17.	15
IV	Modern European Printmaking - Modernist Movements and Printmaking - The role of printmaking in Modernist movements (e.g., Impressionism, Expressionism, Cubism) - Key Modernist printmakers (e.g., Henri Toulouse-Lautrec, Edvard Munch, Andy Warhol,) - The experimentation with form, color, and abstraction in Modernist prints - New Trends in European Printmaking - The influence of contemporary art movements on printmaking (e.g., Pop Art, Postmodernism) Prominent printmakers and their innovations, Workshop and Print Editions.	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS: - Graphic Arts Encyclopedia – George A Stevenson - Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen. - Visual Imagination - Prints of Twentieth Century – Phanes - Dictionary of Print Making Terms – Rosemary Simmons. - How to Identify Prints – Bamber Gaspoigne. - The Complete Printmaker (Techniques/Traditions/Innovations)– John Ross/Clave Romano/Tim Ross. - Collecting Original Prints – Rosemary Simmons Hanre - Printmaking Today – Jules Heller. - Contemporary Art (Journal) – Lalit Kala Academy		
Reference Journals: - JOA - Journal of Arts - ShodhKosh: Journal of Visual and Performing Arts - Atishay Kalit- A Bilingual Research Journal of Fine Arts, Culture and Humanities - Atishay Kalit- A Bilingual Research Journal of Fine Arts, Culture and Humanities - Contemporary Art (Journal) – Lalit Kala Academy - Early Graphic Art in Bengal (Journal) – Lalit Kala Academy, Pranabranjan Roy.		

Session: 2025-26			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Second		
Name of the Course	FIGURATIVE DRAWING-II		
Course Code	M25-MFA-206		
Course Type	PC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To develop practical skills in drawing and painting techniques. CLO 2: Students will gain an understanding of contemporary drawing, including current trends, techniques, and influential artists. CLO 3: To explore the relationship between nature, culture, and artistic expression. CLO 4: To cultivate an appreciation for the diverse approaches to representing landscapes.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		18 hours	
Part B - Contents of the Course			
Instruction: Size 30" x 40" Medium: water colour, ink/ oil colour/acrylic colour etc. Number of assignments: 03 canvases Sheet work: 8			
Unit	Topics		Contact Hours
I	Exploration of an individual approach to drawing as an aesthetic exercise of visual sign and symbol and locate your practice in the broader context of contemporary art		15
II	Explore advance drawing in different mediums and techniques- oil, acrylic, watercolors, pen, pastels and ink and photocopy, impression, stencil and any other medium.Exercise of different drawing techniques of traditional and contemporary masters Exercise on application of different mediums both traditional and contemporary as a drawing tool		15
III	Practical exercises focusing on the live study of natural color, texture, composition, perspectives.		15
IV	Observation and Practice of elements of nature like trees, sky, clouds, distant objects etc.		15
Total Contact Hours			60
Practicals			Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practicals>		30

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	
•Class Participation:	5		
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Weekly Submission:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Second		
Name of the Course	COMMERCIAL CAMPAIGN - II		
Course Code	M25-MFA-207		
Course Type	PC – 4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO: 1	Ability to communicate messages visually through a combination of words, artworks, graphic and media.	
	CLO: 2	Ability to sustained artistic engagement with socio-political realities and intensive investigation of contemporary critical issues.	
	CLO: 3	Capable to utilize the art and technology interface for creative outcomes.	
	CLO: 4	Ability to utilize the visual massage as a tool of social, moral and scientific awareness.	
Credits	Theory		Total
	0		4
Teaching Hours per week	0		4
Internal Assessment Marks	0		30
End Term Exam Marks	0		70
Max. Marks	0		100
Examination Time	0		24 hours
Part B – Contents of the Course			
Practical (Social Campaign: Manual)			Total Contact Hours
- Market survey and survey about your selected campaign. - Size: As per requirements Medium: Poster Colors Or other with the permission of the concern teacher. Computer Graphics: Knowledge of basic Computer Application and Knowledge of various software’s mainly Corel Draw, Adobe Page-Maker, Adobe Illustrator, Adobe Photoshop. Microsoft Power-point. Digital Manipulation & its use in advertisement. Total assignments for Sessional work –one campaign (Minimum 14 Assignment per Campaign ie.			60

List of Practical:			
Unit-I Logo - 1 Letter head, Visiting Card, Envelope – 1 Set.			15
Unit-II Posters - 4 Hoarding, Banner - 2			15
Unit-III Press Layout – 2 Magazine Layout – 2			15
Unit-IV Illustration – 2 Calendar, Dangler, Cutouts Free hand Sketches – 200 Drawing - 10 (Full figure human study, portrait, animal study etc.) Report - 1			15
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
• Market survey • Different Social NGOs • Visit Different Advertising Agencies			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	SECOND		
Name of the Course	SCULPTURE COMPOSITION-II		
Course Code	M25-MFA- 208		
Course Type	PC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will learn the pictorial representation of sculptures with differentExpressions and emotionmoods focusing on current scenario CLO 2: The students will understand the indirect depiction of contemporary national-international issues through this artform which will lead to understand the concept of nationalism and many more. CLO 3: Students will learn about the figurative depiction of theirthoughts which will help viewers to connect withthe artist and artwork very easily. CLO 4: The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	Introduction to Sculpture Techniques Overview of Sculpture • Introduction to contemporary sculptural practices and influential modern sculptors • Understanding modern materials and their applications in sculpture3D Printing and Digital Modeling • Basics of digital modeling software (e.g., Tinkercad, Blender) • Introduction to 3D printing technology and techniques • Creating digital models and preparing them for 3D printing Project Development and Contemporary Practices Site-Specific and Installation Art • Understanding the principles of site-specific sculpture and installation art • Techniques for planning and executing large-scale installations • Collaborating and working within a given space or environment		60

Resources: • Modern sculpture studio facilities with access to digital fabrication tools, casting materials, and mixed media resources • Instructor demonstrations and individualized guidance • Recommended readings on contemporary sculptural techniques and notable modern sculptors Note: This syllabus is adaptable to student interests and skill levels. It's essential to provide ample studio time for students to practice techniques and develop their artistic voice within the medium of modern sculpture Note: Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc Minimum Size: 36'' x 36''x 36'' No. of Assignments : 4 sketches : 250 Number of assessments 05			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Deymatie : Fauvism (good introduction also in Encyclopedia of World Art.)			
2. Crespelle – The Fauves.			
3. Razanl, Modern Paining, Skira – Useful references from plates and text.			
4. Lake and Maillard – Dictionary of Modern Painting.			
5. Herbert Read – A concise History of Modern Paining.			
6. William Vaughan – Romantic Art.			
7. European Modern Movements in Encyclopedia of World Art.			
8. Leymarie – Impressionism (Skira).			
9. J. Rewald – History of impressionism – Museum of Modern Art, New York.			
10. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).			
11. Madsen – Art Nouveau.			
12. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.			
13. Rosenblum – Cubism and 20 th Century Art.			
14. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.			
15. Ritchie – German 20 th Century Art – Museum of Modern Art.			
16. Barr – Fantastio Art; Dada and Surrealism.			
17. Scuphor – Dictionary of Abstract Art.			
18. Motherwell Dada Poets and Painters (Anthology of Dada Writings).			
19. Marcel Jean – A History of Surrealist Painting (Comprehensive Study)			
20. Herbert Read – Surrealism (Mainly documents)			

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Second		
Name of the Course	PRINTMAKING ART - II		
Course Code	M25-MFA-209		
Course Type	PC-4		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	1. Develop creative ways to solve problems using a variety of strategies for making prints by utilizing monoprints, relief and basic intaglio processes. 2. Enhancing to Create personal hand-printed artwork, which demonstrate an introductory level of understanding printmaking ideas, and the processes, materials, and techniques associated with different method. 3. Establish self-critiquing skills to develop autonomous expression through printmaking. 4. Scientific and logical knowledge of reproduction of art works.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	This Subject belongs to practical exploration of printmaking techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of printmaking as an art form. Fundamental Techniques and Processes • Introduction to Printmaking • Overview of printmaking history and its significance in contemporary art • Introduction to the printmaking studio, safety protocols, and equipment • Creating multi-block and reduction prints Intaglio Techniques • Etching and Drypoint • Preparing metal plates, applying grounds, and etching in acid baths • Drypoint techniques for direct scratching on plates • Printing processes and paper preparation		60

• Aquatint and Mezzotint • Techniques for creating tonal variations using aquatint • Introduction to mezzotint for rich, velvety blacks and gradients • Combining techniques for complex compositions Planographic and Stencil Techniques • Lithography • Preparing lithographic stones and plates • Drawing and processing images on lithographic surfaces • Printing lithographs with attention to detail and consistency • Screen Printing (Serigraphy) • Screen preparation using photo emulsion and stencil methods • Techniques for multi-color printing and registration • Experimenting with different inks and substrates Advanced Techniques • Exploring collagraphy, mono printing, and mixed media prints • Combining printmaking techniques for unique effects • Using non-traditional materials and methods in printmaking No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)	
Suggested Evaluation Methods	
Internal Assessment: 30	
➤ Practicum	30
• Class Participation:	5
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10
• Mid-Term Exam:	15
End Term Examination: 70	
➤ Practicum	70
Lab record, Viva-Voce, write-up and execution of the practical	
Part C - Learning Resources	
Recommended Books/e-resources/LMS:	
• The Printmaking Ideas Book Paperback – Illustrated, August 20, 2019 • Reddy, Krishna, New ways of color printmaking: signification of materials • Lalit Kala Academy, Graphic Art in India since 1850 • Hoskins, Steve, Water Based Screen Printing • Paul Croft, Stone Lithography • George Whale and Naren Barfield, Digital Printmaking. • John Ross/Clare Romano/Tim Ross, The Complete Printmaker (Techniques/Traditions/Innovations) • John Ross/Clare Romano/Tim Ross • G. Ahlberg and O. Jarneryd. Block and Silk Screen Printing • Kapoor, Geeta, Three Graphic Artist (Journal) – Lalit Kala Academy. • D. Kauffmann., Graphic Art and Craft • Biegeleisen and Cohn, Silk Screen Techniques • Eichenberg, Fritz, The Art of the Print. • Heller, Jules, Print Making Today • Adhemer, Jean Graphic Art of 18th Century. • A Fern, A Half Century of American Print Making • Sattler, Oliver Modern Japanese Prints • Berri, D.C., The Art of Lithography . • Harrap, Charles, Offset Printing from stone and plates.	

Session: 2025-26			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Second		
Name of the Course	CREATIVE PAINTING-II		
Course Code	M25-MFA-210		
Course Type	PC-5		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Capture likeness, expression, and character of the HUMAN EXPRESSION CLO 2: Light and shadow study on the Human Face, 3D facial study, NON - FIGURATIVE FORM OR PATTERN. CLO 3: Techniques: pencil shading, blending, oil color study, acrylic color study, color mixing Medium: Develop, test and employ materials, process and mediums in a way that activates your ideas and concepts. CLO 4: Study of the composition used in figure study by composing objects like vase and other object along with THE DIFFERENT FORM, TEXTURE AND PATTERNS.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		18 hours	
Part B - Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Minimum Size: 30" x 40" (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assignments: 04 canvases (vi) Sheet work: 20			
Unit	Topics		Contact Hours
I	Exploration of an individual approach to drawing as an aesthetic exercise of visual sign and symbol and locate your practice in the broader context of contemporary art		30
II	Explore ADVANCE DRAWING in different mediums and techniques- oil, acrylic, watercolors, pen, pastels and ink and photocopy, impression, stencil and any other medium. Exercise of different drawing techniques of traditional and contemporary masters Exercise on application of different mediums both traditional and contemporary as a drawing tool		30

III	Practical exercises focusing on the live study of natural color, texture, composition, perspectives.	30
IV	Observation and Practice of elements of nature like trees, sky, clouds, distant objects etc.	30
Total Contact Hours		120
Practicals		Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practicals>	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practical	30	➤ Practical
• Class Participation:	5	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Weekly Submission:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Second		
Name of the Course	VISUAL COMMUNICATION - II		
Course Code	M25-MFA-211		
Course Type	PC – 5		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO: 1	Student will be able to Understand the meaning of Social Campaign Design.	
	CLO: 2	Student will be able to Understand the Purpose & Function of Social Campaign.	
	CLO: 3	Student will be able to describe various advantages &disadvantages of Social Campaign.	
	CLO: 4	Student will be able to describe the role of Social Campaign in Modern Society.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	18 hours	
Part B – Contents of the Course			
Practical (Product Campaign: Digital)			Total Contact Hours
- Market survey and about your campaign - Size: As per requirements Medium : Poster Colors Or other with the permission of the concern teacher. Computer Graphics: Knowledge of basic Computer Application and Knowledge of various software’s mainly Corel Draw, Adobe Page-Maker, Adobe Illustrator, Adobe Photoshop. Microsoft Power-point. Digital Manipulation & its use in advertisement. Total assignments for Sessional work –one campaign (Minimum 14 Assignment per Campaign ie.			120

List of Practical			
Unit-I Logo - 1 Letter head, Visiting Card, Envelope – 1 Set.		30	
Unit-II Posters - 4 Hoarding, Banner – 2		30	
Unit-III Press Layout – 2 Magazine Layout – 2 Storybook – 10 Plates		30	
Unit-IV Calendar, Dangler, Cutouts, Counter Display, Folder or any other assignment with permission of concern teacher. Free hand Sketches – 200 Drawing - 10 (Full figure human study, portrait, animal study etc.) Report - 1		30	
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
• "Visual Communication: Images with Messages" by Paul Martin Lester			
• "Graphic Design: The New Basics" by Ellen Lupton and Jennifer Cole Phillips			
• "The Elements of Graphic Design: Space, Unity, Page Architecture, and Type" by Alex W. White			
• "Visual Storytelling: Inspiring a New Visual Language" by Gestalten			
• "Thinking with Type: A Critical Guide for Designers, Writers, Editors, & Students" by Ellen Lupton			
• "Visual Communication: From Theory to Practice" by Jonathan Baldwin and Lucienne Roberts			
• "Meggs' History of Graphic Design" by Philip B. Meggs and Alston W. Purvis			
• "Interaction of Color" by Josef Albers			
• "The Designer's Dictionary of Color" by Sean Adams			
• • "Making and Breaking the Grid: A Graphic Design Layout Workshop" by Timothy Samara			

Session: 2025-26			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	SECOND		
Name of the Course	ADVANCE SCULPTURE COMPOSITION-II		
Course Code	M25-MFA- 212		
Course Type	PC-5		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will learn the pictorial representation of sculptures with different Expressions and emotion moods focusing on current scenario CLO 2: The students will understand the indirect depiction of contemporary national-international issues through this art form which will lead to understand the concept of nationalism and many more. CLO 3: Students will learn about the figurative depiction of their thoughts which will help viewers to connect with the artist and artwork very easily. CLO 4: The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	This Subject belongs to practical exploration of sculpture techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of sculpture as an art form. Exploring Mixed Media Sculpture • Introduction to mixed media sculpture techniques: assemblage, collage, and found object sculpture. • Integration of non-traditional materials such as found objects, textiles, and recycled materials into sculptural compositions. • Creative approaches to combining materials and textures in mixed media sculpture		30
Unit-II	Mold Making and Casting Techniques • Introduction to mold making materials and methods: silicone, plaster, and alginate. • Techniques for creating one-part and multi-part molds for sculptures. • Exploring casting materials and processes: resin, plaster, and metal casting.		30

Unit-III	Large Scale Sculpture Construction • Considerations for scaling up sculptural works for outdoor or architectural settings. • Techniques for working with large-scale materials such as steel, concrete, and stone. • Engineering principles for creating structurally sound and weather-resistant large-scale sculptures.	30
Unit-IV	Installation and Site-Specific Sculpture • Understanding the relationship between sculpture and its environment. • Techniques for site analysis and conceptual development for site-specific sculpture projects. • Installation techniques and considerations for outdoor and indoor exhibition spaces. Note: Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc Minimum Size: 36’’ x 36’’x 36’’ No. of Assignments : 4 sketches : 250 Number of assessments 05	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		
1. J. Rewald – History of impressionism – Museum of Modern Art, New York.		
2. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).		
3. Madsen – Art Nouveau.		
4. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.		
5. Rosenblum – Cubism and 20 th Century Art.		
6. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.		
7. Ritchie – German 20 th Century Art – Museum of Modern Art.		
8. Barr – Fantastio Art; Dada and Surrealism.		
9. Scuphor – Dictionary of Abstract Art.		
10. Motherwell Dada Poets and Painters (Anthology of Dada Writings).		
11. Marcel Jean – A History of Surrealist Painting (Comprehensive Study)		
12. Herbert Read – Surrealism (Mainly documents)		
13. Rubin – Dada & Surrealism.		
14. F.Pepper – Kinetic Art.		

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Second		
Name of the Course	ADVANCE PRINTMAKING COMPOSITION-II		
Course Code	M25-MFA-213		
Course Type	PC-5		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	1 Develops the artistic skill to work interdisciplinary and collaborative discipline that focuses on our relationship with technology, visual culture, emotion, and performance in contemporary art. 2 Enhances the knowledge to find possibilities of creating artwork using emerging technologies within the context of a hands-on studio art environment. 3 This inculcates to execute projects challenge, tradition and embrace new forms of aesthetic thinking. 4 Inculcates the Moral values with emotional intelligence through the knowledge of art and aesthetics.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	This subject provides an in-depth, practical exploration of advanced printmaking techniques. Students will engage with complex methods and materials, refining their skills to produce sophisticated and innovative compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of advanced printmaking as an art form. Advanced Intaglio Techniques - Multi-plate Etching - Techniques for aligning and printing multiple plates - Layering colors and textures for complex compositions - Experimenting with various etching grounds and resists - Photogravure - Introduction to photogravure processes - Preparing photographic images for transfer to metal plates Printing photogravure images with intaglio presses		30
Unit-II	Advanced Lithography and Planographic Methods Color Lithography Techniques for creating multi-color lithographs Understanding registration and overlaying colors		30

	Experimenting with different drawing materials and techniques on lithographic plates Polyester Plate and Photo Lithography Using polyester plates for quick and efficient lithographic prints Exploring photo-lithography techniques for transferring photographic and digital images Combining traditional and digital methods for innovative compositions	
Unit-III	Contemporary and Experimental Techniques • Screen Printing Innovations • Advanced screen printing techniques (e.g., CMYK process printing, split fountains) • Incorporating photographic and digital elements in screen prints • Experimenting with unconventional substrates and inks (e.g., metallic, fluorescent) • Mixed Media and Collagraph • Creating collagraph plates using a variety of textures and materials • Combining collagraph with other printmaking techniques for layered effects Exploring mixed media approaches in printmaking	30
Unit-IV	Professional Practice and Project Development • Large-scale and Installation Printmaking • Techniques for creating large-scale prints and print installations • Planning and executing print-based installations in a gallery setting • Collaborating on group projects and large-format prints No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	

Part C - Learning Resources

Recommended Books/e-resources/LMS:

- The Printmaking Ideas Book Paperback – Illustrated, August 20, 2019
- Reddy, Krishna, New ways of color printmaking: signification of materials
- Lalit Kala Academy, Graphic Art in India since 1850
- Hoskins, Steve, Water Based Screen Printing
- Paul Croft, Stone Lithography
- George Whale and Naren Barfield, Digital Printmaking.
- John Ross/Clare Romano/Tim Ross, The Complete Printmaker (Techniques/Traditions/Innovations) John Ross/Clare Romano/Tim Ross
- G. Ahlberg and O. Jarneryd, Block and Silk Screen Printing
- Kapoor, Geeta, Three Graphic Artist (Journal) – Lalit Kala Academy.
- D. Kauffmann., Graphic Art and Craft
- Biegeleisen and Cohn, Silk Screen Techniques
- Eichenberg, Fritz, The Art of the Print.
- Heller, Jules, Print Making Today
- Adhemer, Jean Graphic Art of 18th Century.
- A Fern, A Half Century of American Print Making
- Sattler, Oliver Modern Japanese Prints
- Berri, D.C., The Art of Lithography .
- Harrop, Charles, Offset Printing from stone and plates.
- UmetaroAzechi, Japanese Woodblock printing.
- Wonder Day Experiments in Wood Cut.
- Hind, A.M, An Introduction to a History of Wood cut
- Mueller, H.A Wood Cut and Wood Engravings and How I make them
- Bernard, David, The Collograph Print
- Arthur Hind, A History of Etching and Engraving
- Roger Marsh, Silk Screen Printing for the Artist
- Bert, Zahn, Silk Screen Method of Reproduction
- Tokuno.s, Mr., Japanese wood cutting and wood cut printing
- Simmons, Rosemary, Dictionary of Print Making Terms

E-Resources:

- The Printmaking Bible: The Complete Guide to Materials and Techniques Hardcover – Import, 1 September 2008 by Ann d'Arcy Hughes (Author), Hebe Verno, Morris (Author)
- <https://www.youtube.com/watch?v=A1LAyCSIAUw>
- <https://www.dailyartmagazine.com/seven-indian-printmakers/>
- <https://www.scribd.com/presentation/437130387/ARTS-6-Elements-of-Art-Printmaking#>
- <https://archive.org/details/printmakingbible0000darc/page/n9/mode/2up>
- <https://journals.indexcopernicus.com/api/file/viewByFileId/288083.pdf>
- <https://impact-journal-cfpr.uwe.ac.uk/index.php/impact/article/view/96/80>

Session: 2025-26			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Second		
Name of the Course	CONCEPTUAL AND DIGITAL ART		
Course Code	M25-MFA-214		
Course Type	PC-6		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1:	Study of compositions from imagination and observation with the help of concepts, theme, statements etc.	
	CLO 2:	Exercises of different painting techniques: texture work, distortion, symbolism, interpretation of themes	
	CLO 3:	Exercises on application of different mediums both traditional and contemporary as a drawing tool/digital tool.	
	CLO 4:	Develop test and employ materials, process, and mediums in a way that activates ideas and concept.	
Credits	Theory	Practical	Total
	3	4	4
Teaching Hours per week	3	4	4
Internal Assessment Marks	20	30	30
End Term Exam Marks	50	70	70
Max. Marks	70	100	100
Examination Time		18 hours	
Part B - Contents of the Course			
Instruction:			
Size:			
➤ Installation (Minimum: 3’x 4’)			
➤ Video Art: 7 Minutes			
Number of assignments: 02			
Sheet work: 8			
Unit	Topics		Contact Hours
I	Study of compositions from imagination and observation with the help of concepts, theme, statements etc.		30
II	Exercises of different painting techniques: texture work, distortion, symbolism, interpretation of themes		30
III	Exercises on application of different mediums both traditional and contemporary as a drawing tool/digital tool.		30
IV	Develop test and employ materials, process, and mediums in a way that activates ideas and concepts.		30
Total Contact Hours			120
Practicals			Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practicals>		30

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Weekly submission:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Second		
Name of the Course	COMMERCIAL PHOTOGRAPHY - II		
Course Code	M25-MFA-215		
Course Type	PC - 6		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO: 1	Student will be able to recognize, analyze, and adapt contemporary themes in art and photography.	
	CLO: 2	Student will be able to produce a cohesive group of photographs that demonstrate aesthetic and conceptual development.	
	CLO: 3	Student will be able to create and maintain a web presence for distributing, promoting, and developing visual art work.	
	CLO: 4	Students will gain hands-on experience and build a diverse portfolio suitable for entering the field of advertising photography.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	12 hours	
Part B – Contents of the Course			
Practical			Total Contact Hours
Instructions: • Size: As per requirements. • Total Assignments -25 to 40 Minimum Assignments			120

List of Practical		
Unit-I		30
Technology Photography		
Shoot a series of images for a tech gadget (e.g., a smartphone, tablet, or smart watch)		
Unit-II		30
Automotive Photography		
Photograph a car from various angles, in different lighting conditions, and possibly in motion.		
Unit-III		30
Conceptual Advertising Photography		
Create a series of images around a central theme or message (e.g., eco-friendly products, a seasonal campaign).		
Unit-IV		30
Portfolio Development		
Select and refine a series of images from all practical assignments to create a cohesive portfolio.		
Report - 1		
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum		➤ Practicum 70
• Class Participation:		Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:		
• Mid-Term Exam:		
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		
• "Light Science & Magic: An Introduction to Photographic Lighting" by Fil Hunter, Steven Biver, and Paul Fuqua		
• "Commercial Photography Handbook: Business Techniques for Professional Digital Photographers" by Kirk Tuck		
• "The Photographer's Guide to Marketing and Self-Promotion" by Maria Piscopo		
• "The Best of Professional Digital Photography" by Bill Hurter		
• "Studio Anywhere: A Photographer's Guide to Shooting in Unconventional Locations" by Nick Fancher		
• "Sketching Light: An Illustrated Tour of the Possibilities of Flash" by Joe McNally		
• "Advertising Photography: A Straightforward Guide to a Complex Industry" by Lou Lesko		
• "Professional Commercial Photography: Techniques and Images from Master Digital Photographers" by Lou Jacobs Jr.		
• "The Photographer's MBA: Everything You Need to Know for Your Photography Business" by Sal Cincotta		
• "Pricing Photography: The Complete Guide to Assignment and Stock Prices" by Michal Heron and David MacTavish		

Session: 2025-26			
Part A – Introduction			
Name of the Programme		Master of Fine Arts	
Semester		SECOND	
Name of the Course		SCULPTURE MURALS–II	
Course Code		M25-MFA- 216	
Course Type		PC-6	
Level of the course		400-499	
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO 1: Students will learn the pictorial representation of sculptures with different Expressions and emotion moods focusing on current scenario. CLO 2: The students will understand the indirect depiction of contemporary national-international issues through this art form which will lead to understand the concept of nationalism and many more. CLO 3: Students will learn about the figurative depiction of their thoughts which will help viewers to connect with the artist and artwork very easily. CLO 4: The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	This Subject belongs to practical exploration of sculpture techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of sculpture as an art form. Introduction to Mural Sculpture Materials - Overview of materials suitable for indoor and outdoor mural sculptures, such as terracotta, concrete, mosaic tiles, and metal. - Safety protocols and best practices for working with mural sculpture materials. - Basic tools and equipment used in mural sculpture: sculpting tools, trowels, mortar, grout, etc.		30
Unit-II	Indoor Mural Sculpture Techniques - Understanding the scale and spatial considerations for indoor mural sculptures. - Techniques for creating relief sculptures using materials like terracotta and plaster. - Hands-on practice sessions: students will create small-scale relief sculptures suitable for indoor murals.		30

Unit-III	Outdoor Mural Sculpture Techniques • Considerations for durability and weather resistance in outdoor mural sculptures. • Techniques for creating outdoor mural sculptures using materials like concrete, mosaic tiles, and metal. • Hands-on practice sessions: students will experiment with outdoor mural sculpture techniques, focusing on scale, texture, and durability.	30
Unit-IV	Installation and Site-Specific Considerations • Understanding the interaction between mural sculptures and their environment, both indoors and outdoors. • Techniques for planning and installing mural sculptures in indoor and outdoor settings. • Collaborative project: students will design and install a mural sculpture, considering site-specific factors such as lighting, architecture, and community engagement. Throughout the course, critique sessions will provide opportunities for students to receive feedback on their work and engage in constructive dialogue. Research assignments will deepen students' understanding of sculptural techniques and historical contexts relevant to mural sculpture. Hands-on practice sessions will allow students to develop their skills through experiential learning, and guest lectures and demonstrations will offer further insight and inspiration for their artistic development in both indoor and outdoor mural sculpture. NOTE Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc Minimum Size: 36” x 36”x 36” No. of Assignments : 1 sketches : 250 Number of assessments 05	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS: 1. Razanl, Modern Paining, Skira – Useful references from plates and text. 2. Lake and Maillard – Dictionary of Modern Painting. 3. Herbert Read – A concise History of Modern Paining. 4. William Vaughan – Romantic Art. 5. European Modern Movements in Encyclopedia of World Art. 6. Leymarie – Impressionism (Skira). 7. J. Rewald – History of impressionism – Museum of Modern Art, New York. 8. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).		

Session: 2025-26			
Part A - Introduction			
Name of the Programme		Master of Fine Arts	
Semester		Second	
Name of the Course		MIXED MEDIA PRINTMAKING -II	
Course Code		M25-MFA-217	
Course Type		PC-6	
Level of the course		400-499	
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		1 Apply skill and thoughts to bring realistic and creative Art work. 2 Demonstrate the thoughts and composition to present the viewer in unique way through their prints. 3 Apply advanced working knowledge of Relief and Planography printing. 4 Execute to work freely and independently, implement artistic skill of Printmaking.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	This subject explores the integration of various printmaking techniques with other media to create innovative and dynamic compositions. Students will engage with multiple processes and materials, refining their skills to produce sophisticated and experimental works. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of mixed media printmaking. Introduction to Mixed Media Printmaking • Overview of Mixed Media Printmaking • Introduction to the concept of mixed media in printmaking • Understanding the potential of combining different printmaking techniques • Safety protocols and studio setup for mixed media processes • Combining Relief and Intaglio Techniques • Techniques for integrating relief (e.g., woodcut, linocut) and intaglio (e.g., etching, drypoint) processes • Experimenting with registration and layering for complex images		30
Unit-II	Exploring different papers and substrates • Advanced Screen Printing • Multi-layer screen printing techniques • Using photographic and hand-drawn imagery in screen prints		30

Unit-III	Digital and Experimental Techniques - Digital Printmaking - Integrating digital tools and processes with traditional printmaking - Techniques for creating digital collages and transferring them to printmaking methods - Using software for designing and manipulating print compositions	30
Unit-IV	- Experimental Approaches - Exploring unconventional materials and techniques in printmaking - Incorporating found objects, textiles, and mixed media elements - Creating 3D prints and sculptural forms No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS: - The Printmaking Ideas Book Paperback – Illustrated, August 20, 2019 - Reddy, Krishna, New ways of color printmaking: signification of materials - Lalit Kala Academy, Graphic Art in India since 1850 - Hoskins, Steve, Water Based Screen Printing - Paul Croft, Stone Lithography - George Whale and Naren Barfield, Digital Printmaking. - John Ross/Clare Romano/Tim Ross, The Complete Printmaker (Techniques/Traditions/Innovations) - John Ross/Clare Romano/Tim Ross G. Ahlberg and O. Jarneryd. Block and Silk Screen Printing - Kapoor, Geeta, Three Graphic Artist (Journal) – Lalit Kala Academy. D. Kauffmann., Graphic Art and Craft - Biegeleisen and Cohn, Silk Screen Techniques - Eichenberg, Fritz, The Art of the Print. - Heller, Jules, Print Making Today - Adhemer, Jean Graphic Art of 18th Century. - A Fern, A Half Century of American Print Making - Sattler, Oliver Modern Japanese Prints - Berri, D.C., The Art of Lithography . - Harrap, Charles, Offset Printing from stone and plates. - UmetaroAzechi, Japanese Woodblock printing. - Wonder Day Experiments in Wood Cut. - Hind, A.M, An Introduction to a History of Wood cut - Mueller, H.A Wood Cut and Wood Engravings and How I make them - Bernard, David, The Collograph Print		

Session: 2025-26			
Part A - Introduction			
Name of the Programme	Common to all PG Programmes		
Semester	Second		
Name of the Course	Constitutional, Human & Moral Values and IPR		
Course Code	M25-CHM-201		
Course Type	CHM		
Level of the course	400-499		
Pre-requisite for the course (if any)	-		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO-1: Learn the different Constitutional Values, Fundamental rights and duties enshrined in the India Constitution. CLO-2: Understand humanism, human virtues and values, and ide of International peace. CLO-3: Grasp the basic concepts of Moral Values and Professional Conduct which are required to become a part of the civil society and for developing professionalism. CLO-4: Understand concepts of Intellectual Property Rights, Copyright, Patent, Trademark etc., and about threats of Plagiarism.		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	2	0	2
Internal Assessment Marks	15	0	15
End Term Exam Marks	35	0	35
Max. Marks	50	0	50
Examination Time	3 hours		
Part B-Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unitand the compulsory question. All questions will carry equal marks.			

Unit	Topics	Contact Hours	
I	Constitutional Values: Historical Perspective of Indian Constitution; Basic Values enshrined in the Preamble of the Indian Constitution; Concept of Constitutional Morality; Patriotic Values and Ingredients Nation Building; Fundamental Rights and Duties; Directive Principles of the State Policy.	8	
II	Humanistic Values: Humanism, Human Virtues and Civic Sense; Social Responsibilities of Human Beings; Ethical ways to deal with human aspirations; Harmony with society and nature; Idea of International Peace and Brotherhood (Vasudhaiv Kutumbkam).	7	
III	Moral Values and Professional Conduct Understanding Morality and Moral Values; Moral Education and Character Building; Ethics of Relations: Personal, Social and Professional; Introduction to Gender Sensitization; Affirmative approach towards Weaker Sections (SCs, STs, OBCs, EWS& DAs); Ethical Conduct in Higher Education Institutions; Professional Ethics.	8	
IV	Intellectual Property Rights: Meaning, Origins and Nature of Intellectual Property Rights (IPRs); Different Kinds of IPRs – Copyright, Patent, Trademark, Trade Secret/Dress, Design, Traditional Knowledge; Infringement and Offences of IPRs – Remedies and Penalties; Basics of Plagiarism policy of UGC.	7	
	Note: Scope of the syllabus shall be restricted to generic and introductory level of mentioned topics.		
Total Contact Hours		30	
Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
➤ Theory	15	➤ Theory	35
•Class Participation:	4	Written Examination	
•Seminar/presentation/assignment/quiz/class test etc.:	4		
•Mid-Term Exam:	7		
Part C-Learning Resources			
Recommended Books/e-resources/LMS:			
- Ahuja, V K. (2017). <i>Law relating to Intellectual Property Rights</i>, India, IN: Lexis Nexis. - Bajpai, B. L., <i>Indian Ethos and Modern Management</i>, New Royal Book Co., Lucknow, 2004. - Basu, D.D., <i>Introduction to the Constitution of India</i> (Students Edition) Prentice Hall of India Pvt. Ltd., New Delhi, 20th ed., 2008. - Dhar, P.L. & R.R. Gaur, <i>Science and Humanism</i>, Commonwealth Publishers, New Delhi, 1990. - George, Sussan, <i>How the Other Half Dies</i>, Penguin Press, 1976. - Govindarajan, M., S. Natarajan, V.S. Sendilkumar (eds.), <i>Engineering Ethics (Including Human Values)</i>, Prentice Hall of India Private Ltd, New Delhi, 2004. - Harries, Charles E., Michael S. Pritchard & Michael J. Robins, <i>Engineering Ethics</i>, Thompson Asia, New Delhi, 2003.			

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Third		
Name of the Course	HISTORY OF MODERN INDIAN ART-I		
Course Code	M25-MFA-301		
Course Type	CC-5		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To develop a keen insight into the contribution of movements and artists in shaping modern art in India. CLO 2: Introduction to postmodern art and theories. Analytical study of some of the prominent artists of post- independence. CLO 3: Identify and analyze the discourse of postmodernism and its relevance to visual art practice. CLO 4: Critical understanding of the work of some of the seminal post-70s artists of Indian Art to develop a critical understanding of the transitions from modernism to postmodernism and Contemporary art trends and enhancement in the knowledge of Folk Art , Tribal Art and Indian Culture.		
Credits	Theory	Tutorial	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Company School: subjects, style, and major artists Impact of British colonialism on Indian art	15	
II	Pre -Independence Art Schools and Institutions- Madras, Bombay, Calcutta Early Modernist Artist – Raja Ravi Verma, Amrita Sher Gill, Rabindranath Tagore, Gaganendranath Tagore, Jamini Roy	15	

III	Bengal School and its philosophy Key figures of Bengal School- Abanindranath Tagore, Nandlal Bose, Benode Bihari Mukherjee, Ram Kinker Baij, Asit Kumar Haldar	15
IV	Calcutta Group- Paritosh Sen, Pradosh Das Gupta, Nirod Majumdar, Bikashbattacharya, Ganesh Pyne, Jogen Chaudhury, Ganesh Haloi Bengal Femine – Chittoprasad, Somnath Hore	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		
1. Aesthetic Meaning by Rekha Jhanji		
2. Introductory Reading in Aesthetics by Hospers John		
3. Art as experience by John Dewey		
4. Aesthetic Meaning by Rekha Jhanji		
5. Philosophy of Art -Aldrich Virgil		
6. Art and Illusion by E. H. Gombrich		

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Third		
Name of the Course	CONTEMPORARY INDIAN ART-1		
Course Code	M25-MFA-302		
Course Type	CC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1:	To discuss the thematic and stylistic characteristics of figurative art in India.	
	CLO 2:	To understand the role of art criticism in shaping the discourse of modern and contemporary Indian art.	
	CLO 3:	To understand the significance of installation art in contemporary Indian art.	
	CLO 4:	To explore contemporary concepts like anti-aesthetics, globalization's impact on art, and theories by critics.	
Credits	Theory	Tutorial	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unitand the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Figurative Artists: Sudhir Patwardhan, Thota Vaikuntam, Shakti Burman, Art Critics: Geeta Kapur, Vinod Bhardwaj, B. N. Goswamy, Partha Mitter		15
II	Female Painter – Nalini Malini, Gogi Saroj Paul, Neeima Sheikh, Anjoli Ela Menon Female Sculptor Artists: Mrinalini Mukherjee, Meera Mukherjee, Piloo Pochkhanawala		15
III	Installation Artists: Sheela Gowda, Reena Saini Kallat, Shilpa Gupta, Shukla Sawant, Mithu Sen		15
IV	Other Female Artists: Arpita Singh, Arpana Caur, Anita Dube, Bharti Kher, Hema Upadhyya, Seema Kohli		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
•Class Participation:	5	Written Examination	
•Seminar/presentation/assignment/quiz/class test etc.:	10		
•Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Art and Visual Culture in India 1857-2007 edited by Gayatri Sinha			
2. Contemporary Art in India: A Perspective by Pran Nath Mago			
3. The Empire Strikes Back: Indian Art Today edited by A. M. Kapoor and N. Malani			
4. Edge of Desire: Recent Art in India edited by Chaitanya Sambrani			
5. India: Contemporary Photographic and New Media Art edited by Steven Evans and Sunil Gupta			

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Third		
Name of the Course	Art of Advertising Photography		
Course Code	M25-MFA-303		
Course Type	CC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understanding of the history of photography and fundamental components of a camera. CLO 2: Identify and differentiate various types of photography and its technic. CLO 3: Familiar with significant Indian photographers and their contributions to the field of photography. CLO 4: Understand the concept and purpose of documentary photography and contribution prominent photographers.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
PartB – Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Introduction and history of Indian Photography, Raja Deen Dyal and Swai Man Singh, Advertising photography, Digital Photography, The digital darkroom,		15
II	Types of Photography, Importance of photography in Advertising. Advertising Photography. Drawing/Illustration vs Photography in advertising.		15
III	Photographers of India; Advertising photography of India, Haradesh Dhingra, Prabudha Das Gupta, Prashant Godbole. Atul Kasbekar.		15
IV	Introduction of Documentary Photography, Documentary Photographers: Raghu Rai,SudharakOlwe, Altaf Qadri.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Foundation of Advertising: S.A Chunnawalla, K.C Sethia.			
2. In Search of Dignity and Justice: <i>SudharakOlwe</i>			
3. <i>Pinney, christophes, photography, Art of India, Encyclopaedia Britannica</i>			
4. <i>Sinha,Gayatri, Curator, Middleages spread imaging, India</i>			
5. Mother Teresa: A Life of Dedication by Raghu Rai			
6. India: Reflections in Black and White by Raghu Rai			
7. Prabuddha Dasgupta 1956 – 2012 by Prabuddha Dasgupta			
8. QksVksxzkQh *rduhd ,oac;ksx * : ujsUnz ;kno			
9. foKkiufMtkbu : ujsUnz ;kno			
10. Nk;kadu : xykcdksBkjh			

Session: 2026-27			
Part A – Introduction			
Name of Programme	Master of Fine Arts		
Semester	THIRD		
Name of the Course	HISTORY OF INDIAN SCULPTURES		
Course Code	M25-MFA-304		
Course Type	CC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will get knowledge about the intense and exaggerated realism during this period. CLO 2: Knowledge of Modern sculptures of western world which leads to understand the difference and similarities between Indian and Western Art. CLO 3: Knowledge will encourage students to understand the value of our Art individualism, ideology Indian sculptors etc. CLO 4: Knowledge of new experiments in Indian contemporary sculpture.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	Development of Modern Sculptures in India, Academic Sculptors: Ram Kinker Baij, D.P. Roy Choudhary, Pardosh Das Gupta Other sculptors: Shanko Choudhary, Dhanraj Bhagat, Nandagopal P.V. Janakiram, Somnath Hore,	15	
II	Compositional Analysis of Modern Sculpture Dhruv Mistry, Satish Gujral, Nagji Patel, Himmat Shah, K.G.Subramaniam, Ankit Patel.	15	
III	Individualism of modern concept and new trends of Experimentation: Chintamani Kar, , Meera Mukherjee, Ravinder Reddy, Mrinalini Mukherjee, M. Pandya	15	

IV	New Trends and concept of monumental sculpture, Critical Analysis of Contemporary Sculptures of India and their Artist, Sculptural Installations: R.V Sutar, Pooja Irrana, JitishKallat, Subodh Gupta, Sudarshan Shetty,	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		
1. Deymatie : Fauvism (good introduction also in Encyclopedia of World Art.)		
2. Crespelle – The Fauves.		
3. Razanl, Modern Paining, Skira – Useful references from plates and text.		
4. Lake and Maillard – Dictionary of Modern Painting.		
5. Herbert Read – A concise History of Modern Paining.		
6. William Vaughan – Romantic Art.		
7. European Modern Movements in Encyclopedia of World Art.		
8. Leymarie – Impressionism (Skira).		
9. J. Rewald – History of impressionism – Museum of Modern Art, New York.		
10. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).		
11. Madsen – Art Nouveau.		
12. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.		
13. Rosenblum – Cubism and 20 th Century Art.		
14. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.		
15. Ritchie – German 20 th Century Art – Museum of Modern Art.		
16. Barr – Fantastio Art; Dada and Surrealism.		
17. Scuphor – Dictionary of Abstract Art.		
18. Motherwell Dada Poets and Painters (Anthology of Dada Writings).		
19. Marcel Jean – A History of Surrealist Painting (Comprehensive Study)		
20. Herbert Read – Surrealism (Mainly documents)		
21. Rubin – Dada & Surrealism.		
22. F.Pepper – Kinetic Art.		

Session: 2026-27			
Part A - Introduction			
Name of Programme	Master of Fine Arts		
Semester	Third		
Name of the Course	HISTORY OF INDIAN PRINTMAKING		
Course Code	M25-MFA-305		
Course Type	CC-6		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will demonstrate a thorough understanding of the historical development of printmaking in India, from its origins to contemporary practices. CLO 2: Students will analyze various printmaking techniques and styles used in different periods, identifying the key characteristics and contributions of prominent Indian printmakers. CLO 3: Students will contextualize the evolution of Indian printmaking within broader cultural, social, and political frameworks, understanding its role and impact in different historical eras. CLO 4: Students will conduct advanced research on significant works and artists in Indian printmaking, presenting their findings through well-structured written and oral presentations that demonstrate critical evaluation and original insights.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics	Contact Hours	
I	This course offers an in-depth exploration of the history and development of printmaking in India. Students will engage with the evolution of printmaking techniques, the influence of colonialism, and the contributions of key figures and regions from the 19th and 20th centuries. Through lectures, readings, discussions, and written assignments, students will gain a comprehensive understanding of the historical and cultural context of Indian printmaking.	15	

	Introduction and Early Developments • Introduction to Indian Printmaking • Overview of the history of printmaking globally and its introduction to India • Early printmaking techniques and materials used in India • The cultural and historical context of printmaking in India • Development in Different Regions of India (19th Century) • Exploration of printmaking in various regions of India during the 19th century • Regional differences and similarities in techniques and styles The influence of local traditions and crafts on printmaking practices	
II	Printmaking and Commercial Printing in the 19th Century • Commercial Printing in the 2nd Half of the 19th Century • The rise of commercial printing and its impact on Indian society • Techniques used in commercial printing, including lithography and woodblock printing • Key figures and businesses involved in commercial printing • Colonial Influences and the Arrival of Lithography • The impact of British colonialism on Indian printmaking practices • Introduction and spread of lithographic techniques in India • The role of colonial printing presses and publications in promoting lithography	15
III	Early 20th Century Developments • Printmaking in Bengal in the Early 20th Century • The Bengal School of Art and its influence on printmaking • Techniques and themes popularized by Bengal printmakers • Notable printmakers from Bengal and their contributions • Key Figures in Indian Printmaking • The contributions of pioneers like the Daniell Brothers, Mukul Dey, and the Tagore Brothers	15
IV	Key Figures of Indian Printmaking • The impact of Raja Ravi Varma's work on Indian printmaking • Contributions of Nandalal Bose, Binode Bihari Mukherjee, and Haren Das • Chittaprosad and Political Printmaking • The role of Chittaprosad in using printmaking for social and political commentary • Techniques and themes in Chittaprosad's work • The influence of political movements on printmaking practices.	15
Total Contact Hours		60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Graphic Arts Encyclopedia – George A Stevenson			
2. Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen.			
3. Visual Imagination			
4. Prints of Twentieth Century – Phanes			
5. Dictionary of Print Making Terms – Rosemary Simmons.			
6. How to Identify Prints – Bamber Gaspoigne.			
7. The Complete Printmaker (Techniques/Traditions/Innovations)– John Ross/Clave Romano/Tim Ross.			
8. Collecting Original Prints – Rosemary Simmons Hanre			
9. Printmaking Today – Jules Heller.			
10. Contemporary Art (Journal) – Lalit Kala Academy			
11. Graphic Art in India since 1850 – Lalit Kala Academy.			
12- Hkkjrh; Nkikfp= dyk : Mk- Luhdydekj			
12. Graphic Art of 18 th Century : Jean Adhemer			
13. A history of Etching and Engraving- Arthur Hind			
14. An Introduction of History of Wood cut – A.M. Hind			
Reference Journals:			
• JOA - Journal of Arts			
• ShodhKosh: Journal of Visual and Performing Arts			
• Atishay Kalit- A Bilingual Research Journal of Fine Arts, Culture and Humanities			
• Atishay Kalit- A Bilingual Research Journal of Fine Arts, Culture and Humanities			
• Contemporary Art (Journal) – Lalit Kala Academy			
• Early Graphic Art in Bengal (Journal) – Lalit Kala Academy, Pranabranjan Roy.			

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Third		
Name of the Course	PICTORIAL COMPOSITION-I		
Course Code	M25-MFA-306		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to comprehend the basic of the fundamental of visual arts. CLO 2: Students will be able to figure out the contents of the fundamental of visual arts. CLO 3: Students will be able to develop the skills of research for higher studies through the techniques of sketching, landscapes, still life, object drawing, composition etc. CLO 4: Students will be able to find new knowledge and areas of their interest. CLO 5: Students will be able to develop of communication, reading and writing through the project/ fundamental of visual arts.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		18 hours	
Part B - Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Medium: water colour, ink/ oil colour/acrylic colour etc. (iv) Number of assignments: 04 canvases (2 X 2 Feet) (v) Sheet work: 25 (quarter imperial)			
Unit	Topics		Contact Hours
I	Fundamentals of Pictorial Composition (Study of Landscape) - Principles of balance, harmony, rhythm, and focal points - Spatial relationships and depth creation - Perspective techniques in composition		30

II	Techniques and Medium Exploration (Study of Indian Miniature) • Application of acrylics, oils, and watercolours in composition • Layering, glazing, and textural effects • Enhancing visual impact through colour and contrast	30
III	Narrative and Expressive Composition (Folk Art) • Developing storytelling through visual elements • Symbolism and conceptual approaches in composition • Creating movement and dynamism in paintings	30
IV	Copy of Great Master’s artwork • Practical exercises in compositional planning and execution • Sketching and preliminary studies for paintings • Creating a series of compositions reflecting individual artistic vision	30
		120
Practicals		Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practical>	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practical	30	➤ Practical
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Weekly Submission:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2026-27			
Part A - Introduction			
Name of Programme	Master of Fine Arts		
Semester	Third		
Name of the Course	GRAPHICS DESIGN – I		
Course Code	M25-MFA-307		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1:	To introduce the basics and its need in communication design.	
	CLO 2:	To understand various aspect of graphic design and using it in designing.	
	CLO 3:	Understanding the relevance of design principals in historic and contemporary art & design.	
	CLO 4:	Enhances scientific temperament by application of Design.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	12 hours	
Part B – Contents of the Course			
Practical			Contact Hours
Instructions: - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal Examiner/ Committee will evaluate the Sessional work. - Size: As per requirements Total Assignments: 8			120
List of Practical			
Unit-I	Stationary Set: Visiting Card, Envelope, Letter Head		30
Unit-II	Logo Design, Symbol, Insignia		30
Unit-III	Illustration (Computer based)		30
Unit-IV	Portfolio Development Select and refine a series of images from all practical assignments to create a cohesive portfolio		30

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	THIRD		
Name of the Course	CLAY MODELING -I		
Course Code	M25-MFA- 308		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop Clay Modeling skills with different medium and handling the techniques CLO 2: Understand to research form, materials and techniques as need by the direction of their sculptural work. CLO 3: Inculcation of visual communication by using Clay Modeling CLO4: Imparting knowledge of using natural and metal materials for execution of mural works.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	Terracotta: Overview of terracotta as a sculptural material: its history, characteristics, and contemporary applications. Safety protocols specific to working with terracotta: handling, firing, and glazing considerations. Basic tools and equipment for terracotta sculpture: clay, sculpting tools, kiln, glazes, etc. Knowledge about technique and using clay modeling tools for portrait & composition (round & relief Knowledge about pottery in clay. Fabrication finishing ,colouring and polishing Introduction to sculpture-basic elements and their relationships-sculptural exerci Knowledge about the clay(preparation of clay Study of medium like clay with animals, birds, human figure (parts of body) and other object.(round & relief) figurative sculpture. Experimentation with materials and textures to enhance expressive qualities in sculptural works. Note: Medium: Clay, plaster, Cement, Terra cotta, etc		120

Minimum Size: 1” x 1”x 1”			
No. of Assignments		4	
sketches		: 250	
Number of assessments 05			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Leymarie – Impressionism (Skira).			
2. J. Rewald – History of impressionism – Museum of Modern Art, New York.			
3. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).			
4. Madsen – Art Nouveau.			
5. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.			
6. Rosenblum – Cubism and 20 th Century Art.			
7. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.			
8. Ritchie – German 20 th Century Art – Museum of Modern Art.			
9. Barr – Fantasio Art; Dada and Surrealism.			
10. Scuphor – Dictionary of Abstract Art.			
11. Motherwell Dada Poets and Painters (Anthology of Dada Writings).			
12. Marcel Jean – A History of Surrealist Painting (Comprehensive Study)			
13. Herbert Read – Surrealism (Mainly documents)			
14. Rubin – Dada & Surrealism.			
15. F.Pepper – Kinetic Art.			

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Third		
Name of the Course	RELIEF COMPOSITION		
Course Code	M25-MFA-309		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop Artistic Ability with tools, materials and techniques inherent to basic printmaking processes. CLO 2: Knowledge of solving visual problems with equal emphasis on combining both concept and physical process of Relief printmaking. CLO 3: Understand and discuss the historical and contemporary role of relief printmaking in art, design & culture building. CLO 4: Enhances the knowledge of Indian print culture & tradition.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	12 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	Importance of relief printmaking in art history		30
	Tools and Materials • Introduction to tools: carving tools, brayers, barens, inks • Different types of surfaces: linoleum, wood, rubber • Paper types and selection		
Unit-II	Basic Techniques • Transferring images to printing surfaces • Basic carving techniques Safety procedures for handling tools		30
	Advanced Techniques and Color Printing • Introduction to reduction printing (multiple colors from one block) • Registration techniques for aligning prints		
Unit-III	Carving for Multi-Color Prints • Detailed carving techniques for reduction prints • Layering colors and creating depth		30
	Experimental and Non-Traditional Techniques • Using non-traditional surfaces for relief prints • Combining different surfaces in one print		
Unit-IV	Professional Practices and Final Portfolio • Matting and framing prints • Writing artist statements and project descriptions		30
	Total Assignments- 2 (Image Size: 8”x 10”)		

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Graphic Arts Encyclopedia – George A Stevenson			
2. Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen.			
3. Visual Imagination			
4. Prints of Twentieth Century – Phanes			
5. Dictionary of Print Making Terms – Rosemary Simmons.			
6. How to Identify Prints – Bamber Gaspoigne.			
7. The Complete Printmaker (Techniques/Traditions/Innovations)– John Ross/Clave Romano/Tim Ross.			
8. Collecting Original Prints – Rosemary Simmons Hanre			
9. Printmaking Today – Jules Heller.			
10. Contemporary Art (Journal) – Lalit Kala Academy			
11. Graphic Art in India since 1850 – Lalit Kala Academy.			
12. Hkkjrh; Nkikfp= dyk : Mk- Luhydekj			
13. Graphic Art of 18 th Century : Jean Adhemer			
14. A history of Etching and Engraving- Arthur Hind			
15. An Introduction of History of Wood cut – A.M. Hind			

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Third		
Name of the Course	CREATIVE DRAWING		
Course Code	M25-MFA-310		
Course Type	PC-7		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To basics of figure drawing materials and techniques like gestural line, contour, value rendering. CLO 2: To study human anatomical structure, proportions, and understand the figure as a three-dimensional form. CLO 3: To compose full figure drawings using sighting, measuring and constructing techniques. CLO 4: To understand concepts like foreshortening, overlap, figure-ground relationships.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		18 hours	
Part B - Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Minimum Size:30" x 40" (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assignments: 03 canvases (vi) Sheet work: 8			
Unit	Topics	Contact Hours	
I	Principles of line, shape, value, and texture Composition and balance in drawing Observational and gesture drawing techniques	30	
II	Explore ADVANCE DRAWING in different mediums and techniques-oil, acrylic, watercolors, pen, pastels and ink and photocopy, impression, stencil and any other medium.Exercise of different drawing techniques of traditional and contemporary masters Exercise on application of different mediums both traditional and contemporary as a drawing tool	30	
III	Practical exercises focusing on the live study of natural color, texture, composition, perspectives.	30	

IV	Working with graphite, charcoal, ink, and pastels Experimentation with unconventional tools and surfaces Mixed media approaches in drawing	30
Total Contact Hours		120
Practicals		Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practicals>	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practical	30	Practical Lab record, Viva-Voce, write-up and execution of the practical
•Class Participation:	5	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
•Weekly Submission:	10	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Third		
Name of the Course	CAMPAIGN DESIGN - I		
Course Code	M25-MFA-311		
Course Type	PC – 7		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO: 1	Ability to communicate messages visually through a combination of words, artworks, graphic and media.	
	CLO: 2	Ability to sustained artistic engagement with socio-political realities and intensive investigation of contemporary critical issues.	
	CLO: 3	Capable to utilize the art and technology interface for creative outcomes.	
	CLO: 4	Ability to utilize the visual message as a tool of social, moral and scientific awareness.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	18 hours	
Part B – Contents of the Course			
Practical (Social Campaign: Digital)			Total Contact Hours
Instructions: - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in a sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal Examiner/ Committee will evaluate the Sessional work. - Market survey and about your campaign - Size: As per requirements Medium: Poster Colors Or other with the permission of the concern teacher. - Minimum Submission for each Advertising Campaign is 10 works. Computer Graphics: Knowledge of basic Computer Application and Knowledge of various software’s mainly Corel Draw, Adobe Page-Maker, Adobe Illustrator, Adobe Photoshop. Microsoft Power-point. Digital Manipulation & its use in advertisement. Total assignments for Sessional work –one campaign (Minimum 12 Assignment per Campaign ie.			120

List of Practical			
Unit-I Logo – 1 Letter head, Visiting Card, Envelope – 1 Set.			30
Unit-II Posters – 4 Hoarding, Banner – 2			30
Unit-III Press Layout – 2 Magazine Layout – 2			30
Unit-IV Illustration – 2 Table Calendar, Dangler and Cutouts Free hand Sketches – 200 Drawing - 10 (Full figure human study, portrait, animal study etc.) Report - 1			30
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of the Programme		Master of Fine Arts	
Semester		THIRD	
Name of the Course		FIGURATIVE SCULPTURE-I	
Course Code		M25-MFA- 312	
Course Type		PC-7	
Level of the course		500-599	
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:		CLO 1: Students will learn the pictorial representation of sculptures with different Expressions and emotion moods focusing on current scenario. CLO 2: The students will understand the indirect depiction of contemporary national-international issues through this artform which will lead to understand the concept of nationalism and many more. CLO 3: Students will learn about the figurative depiction of their thoughts which will help viewers to connect with the artist and artwork very easily. CLO 4: The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	This Subject belongs to practical exploration of sculpture techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of sculpture as an art form. Unit 1: Anatomy and Figure Study Understanding human anatomy through observation and study of the figure. Techniques for sculpting the human form: proportion, gesture, and expression. Analyzing historical and contemporary figurative sculpture for inspiration and		30
Unit-II	Portrait Sculpture Introduction to portrait sculpture techniques: capturing likeness, expression, and character. Techniques for sculpting facial features, including eyes, nose, mouth, and ears. Considerations for portraying emotion and personality in portrait sculpture. Figure in Motion Exploring techniques for sculpting dynamic poses and gestures. Study of movement and balance in figurative sculpture. Techniques for conveying movement and narrative in sculptural compositions		30

Unit-III	Expressive Figurative Sculpture Exploring expressive approaches to figurative sculpture: abstraction, distortion, and symbolism. Techniques for conveying emotion and psychological depth in figurative sculpture. Experimentation with materials and textures to enhance expressive qualities in sculptural works. modern sculpture	30
Unit-IV	Installation and Site-Specific Considerations Understanding the interaction between mural sculptures and their environment, both indoors and outdoors. Techniques for planning and installing mural sculptures in indoor and outdoor settings. Collaborative project: students will design and install a mural sculpture, considering site-specific factors such as lighting, architecture, and community engagement. Throughout the course, critique sessions will provide opportunities for students to receive feedback on their work and engage in constructive dialogue. Research assignments will deepen students' understanding of sculptural techniques and historical contexts relevant to mural sculpture. Hands-on practice sessions will allow students to develop their skills through experiential learning, and guest lectures and demonstrations will offer further insight and inspiration for their artistic development in both indoor and outdoor mural sculpture. NOTE Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc Minimum Size: 36" x 36"x 36" No. of Assignments : 4 sketches : 250 Number of assessments 04	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	

Part C - Learning Resources

Recommended Books/e-resources/LMS:

1. Razanl, Modern Paining, Skira – Useful references from plates and text.
2. Lake and Maillard – Dictionary of Modern Painting.
3. Herbert Read – A concise History of Modern Paining.
4. William Vaughan – Romantic Art.
5. European Modern Movements in Encyclopedia of World Art.
6. Leymarie – Impressionism (Skira).
7. J. Rewald – History of impressionism – Museum of Modern Art, New York.
8. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).
9. Madsen – Art Nouveau.
10. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.
11. Rosenblum – Cubism and 20th Century Art.
12. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.
13. Ritchie – German 20th Century Art – Museum of Modern Art.
14. Barr – Fantastio Art; Dada and Surrealism.

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Third		
Name of the Course	FIGURATIVE PRINTMAKING- I		
Course Code	M25-MFA-313		
Course Type	PC-7		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	1 Students will demonstrate a high level of skill in various printmaking techniques specifically geared towards the representation of the human figure, including line work, shading, and textural detail. 2 Students will exhibit a thorough understanding of human anatomy and proportion, applying this knowledge to create accurate and expressive figurative prints. 3 Students will develop a distinctive personal style in their figurative prints, effectively communicating mood, emotion, and narrative through their depiction of the human form. 4 Students will engage in critical evaluation of their own figurative works and those of their peers, utilizing feedback and self-reflection to enhance their artistic growth and technical proficiency.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	This course focuses on the practical exploration of figurative printmaking techniques, emphasizing drawing methods for the head, full figure, animals, and birds. Students will develop skills in capturing light, shade, and transitioning between semi-abstraction and realism. Through hands-on exercises, projects, and critiques, students will refine their technical abilities and conceptual approaches to figurative art in printmaking. Drawing Foundations and Techniques • Introduction to Figurative Drawing • Overview of anatomical structures and proportions • Basic techniques for drawing the human head and full figure • Capturing gesture and movement in quick sketches • Drawing Animals and Birds • Understanding animal and bird anatomy and proportions • Techniques for capturing the essence and character of animals and birds • Exploring dynamic poses and movements • Light and Shade Techniques • Techniques for shading and creating depth using light and shadow • Understanding light sources and their effects on form		120

	Application of chiaroscuro in figurative drawing Printmaking Techniques for Figurative Art • Techniques for carving detailed figurative imagery in wood and linoleum • Inking and printing methods specific to figurative work • Experimenting with textures and multi-block prints for complex images • Preparing metal plates for detailed etching and drypoint techniques • Focusing on line work and tonal variations to depict the human figure, animals, and birds • Printing processes and achieving fine details in figurative intaglio prints • Preparing lithographic stones and plates for figurative drawing • Techniques for capturing the nuances of the human form, animals, and birds in lithography Multi-color lithography and achieving depth and realism Project Development and Professional Practice • Developing individual projects that integrate multiple figurative printmaking techniques • Concept development, planning, and execution with a focus on figurative imagery • Peer review and critique sessions to refine work Writing artist statements and preparing portfolios with a focus on figurative printmaking. No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)				
Suggested Evaluation Methods					
Internal Assessment: 30			End Term Examination: 70		
➤ Practicum			30	➤ Practicum	70
• Class Participation:			5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:			10		
• Mid-Term Exam:			15		
Part C - Learning Resources					
Recommended Books/e-resources/LMS:					
1. Graphic Arts Encyclopedia – George A Stevenson					
2. Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen.					
3. Visual Imagination					
4. Prints of Twentieth Century – Phanes					
5. Dictionary of Print Making Terms – Rosemary Simmons.					
6. How to Identify Prints – Bamber Gaspoigne.					
7. The Complete Printmaker (Techniques/Traditions/Innovations)– John Ross/Clave Romano/Tim Ross.					
8. Collecting Original Prints – Rosemary Simmons Hanre					
9. Printmaking Today – Jules Heller.					
10. Contemporary Art (Journal) – Lalit Kala Academy					
11. Graphic Art in India since 1850 – Lalit Kala Academy.					
12. Hkkjrh; Nkikfp= dyk : Mk- lquhydekj					
13. Graphic Art of 18 th Century : Jean Adhemer					

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Third		
Name of the Course	CREATIVE PAINTING-III		
Course Code	M25-MFA-314		
Course Type	PC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop skills in storytelling through compositional techniques. CLO 2: Utilize concepts like hierarchy, focal points, rule of third in creating an attractive composition. CLO 3: Developing layouts for composition on particular topic. CLO 4: Understanding color schemes and paint handling techniques to create convincing form and fresh color tones.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		3 hours	
Part B - Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Minimum Size:30" x 40" (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assignments: 02 canvases (vi) Sheet work: 9			
Unit	Topics		Contact Hours
I	Study of compositions from imagination and observation with the help of concepts, theme, statements etc.		30
II	Exercises of different painting techniques: texture work, distortion, symbolism, interpretation of themes		30
III	Exercises on application of different mediums both traditional and contemporary as a drawing tool/digital tool.		30
IV	Develop test and employ materials, process, and mediums in a way that activates ideas and concept		30
Total Contact Hours			120
Practicals			Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practicals>		30

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Weekly submission:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Third		
Name of the Course	PHOTOGRAPHY COMPOSITION - I		
Course Code	M25-MFA-315		
Course Type	PC - 8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO: 1	Students will be able to describe fundamental principles of photographic composition, such as the rule of thirds, leading lines, symmetry, and framing.	
	CLO: 2	Students will be able to describe fundamental principles of photographic composition, leading lines.	
	CLO: 3	Students will be able to describe fundamental principles of photographic composition, symmetry & Pattern	
	CLO: 4	Students will be able to describe fundamental principles of photographic composition, framing.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	12 hours	
Part B – Contents of the Course			
Practical			Total Contact Hours
Instructions: - Themes/Subject matters/topics will be of multiple choices. - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal examiner will evaluate the Sessional work. - Total Assignments:24			120

List of Practical			
Rule of Thirds			
Practical Assignment: Take 6 photographs of different subjects (landscapes, portraits, still life) using the rule of thirds.			
Leading Lines			
Practical Assignment: Capture 6 photographs that utilize leading lines (e.g., roads, pathways, rivers).			
Symmetry and Patterns			
Practical Assignment: Photograph 6 subjects that exhibit symmetry or patterns (e.g., architecture, nature, everyday objects).			
Framing			
Practical Assignment: Capture 6 photographs using different types of frames (e.g., windows, doorways, foliage).			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	THIRD		
Name of the Course	CREATIVE SCULPTURE-I		
Course Code	M25-MFA- 316		
Course Type	PC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will learn the pictorial representation of sculptures with differentExpressions and emotion moods focusing on current scenario CLO 2: The students will understand the indirect depiction of contemporary national-international issues through this artform which will lead to understand the concept of nationalism and many more. CLO 3: Students will learn about the figurative depiction of their thoughts which will help viewers to connect with the artist and artwork very easily. CLO 4: The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	This Subject belongs to practical exploration of sculpture techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of sculpture as an art form. Exploring Mixed Media Sculpture • Introduction to mixed media sculpture techniques: assemblage, collage, and found object sculpture. • Integration of non-traditional materials such as found objects, textiles, and recycled materials into sculptural compositions. • Creative approaches to combining materials and textures in mixed media sculpture Mold Making and Casting Techniques • Introduction to mold making materials and methods: silicone, plaster, and alginate. • Techniques for creating one-part and multi-part molds for sculptures.		120

- Exploring casting materials and processes: resin, plaster, and metal casting. Large Scale Sculpture Construction - Considerations for scaling up sculptural works for outdoor or architectural settings. - Techniques for working with large-scale materials such as steel, concrete, and stone. - Engineering principles for creating structurally sound and weather-resistant large-scale sculptures. Installation and Site-Specific Sculpture - Understanding the relationship between sculpture and its environment. - Techniques for site analysis and conceptual development for site-specific sculpture projects. - Installation techniques and considerations for outdoor and indoor exhibition spaces. Project Development and Contemporary Practices Site-Specific and Installation Art - Understanding the principles of site-specific sculpture and installation art - Techniques for planning and executing large-scale installations - Collaborating and working within a given space or environment Resources: - Modern sculpture studio facilities with access to digital fabrication tools, casting materials, and mixed media resources - Instructor demonstrations and individualized guidance - Recommended readings on contemporary sculptural techniques and notable modern sculptors Note: This syllabus is adaptable to student interests and skill levels. It's essential to provide ample studio time for students to practice techniques and develop their artistic voice within the medium of modern sculpture Note: Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc Minimum Size: 36" x 36"x 36" No. of Assignments : 5 sketches : 250 Number of assessments 05			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		

Part C - Learning Resources

Recommended Books/e-resources/LMS:

1. Leymarie – Impressionism (Skira).
2. J. Rewald – History of impressionism – Museum of Modern Art, New York.
3. J. Rewald – Post Impressionism (Both these books are indispensable for the respective periods).
4. Madsen – Art Nouveau.
5. Golding – Cubism: A history and analysis – See Also : Cubism and Futurism in Encyclopedia of World Art.
6. Rosenblum – Cubism and 20th Century Art.
7. Selz : German Expressionism. For Expressionism See Also Encyclopedia of World Art.
8. Ritchie – German 20th Century Art – Museum of Modern Art.
9. Barr – Fantastic Art; Dada and Surrealism.
10. Scuphor – Dictionary of Abstract Art.
11. Motherwell Dada Poets and Painters (Anthology of Dada Writings).
12. Marcel Jean – A History of Surrealist Painting (Comprehensive Study)
13. Herbert Read – Surrealism (Mainly documents)
14. Rubin – Dada & Surrealism.
15. F.Pepper – Kinetic Art.

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Third		
Name of the Course	EXPERIMENTAL PRINTMAKING- I		
Course Code	M25-MFA-317		
Course Type	PC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	1 Students will demonstrate proficiency in a variety of experimental printmaking techniques, incorporating both traditional and contemporary methods to create unique and innovative prints. 2 Students will develop and articulate original concepts and themes in their printmaking projects, showcasing their ability to convey complex ideas and personal artistic visions through their work. 3 Students will exhibit advanced technical skills in the preparation, execution, and finishing of prints, ensuring high standards of craftsmanship and attention to detail in their completed works. 4 Students will engage in critical analysis of their own work and that of their peers, providing and responding to constructive feedback to foster continuous improvement and deeper understanding of the printmaking process.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	Experimental and Mixed Media Printmaking - Techniques for creating unique prints with mono printing and monotype - Using additive and subtractive methods for image creation - Incorporating drawing, painting, and mixed media elements - Integrating digital tools and processes with traditional printmaking - Techniques for creating digital collages and transferring them to printmaking methods - Exploring software for designing and manipulating print compositions - Experimenting with unconventional materials and techniques - Incorporating found objects, textiles, and other media - Creating 3D prints and sculptural forms		120

	Advanced and Experimental Approaches • Screen preparation using photo emulsion and hand-drawn stencils • Techniques for layering colors and creating dynamic figurative compositions • Experimenting with transparency and blending for realistic effects • Techniques for creating unique figurative prints with mono printing and monotype • Using additive and subtractive methods for expressive imagery • Incorporating drawing, painting, and mixed media elements into prints • Experimenting with unconventional materials and techniques for figurative prints • Blending realistic and semi-abstract approaches to create innovative compositions Developing personal styles through experimentation and mixed media integration. No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)	
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS: 1. Graphic Arts Encyclopedia – George A Stevenson 2. Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen. 3. Visual Imagination 4. Prints of Twentieth Century – Phanes 5. Dictionary of Print Making Terms – Rosemary Simmons. 6. How to Identify Prints – Bamber Gaspoigne. 7. The Complete Printmaker (Techniques/Traditions/Innovations)– John Ross/Clave Romano/Tim Ross. 8. Collecting Original Prints – Rosemary Simmons Hanre 9. Printmaking Today – Jules Heller. 10. Contemporary Art (Journal) – Lalit Kala Academy 11. Graphic Art in India since 1850 – Lalit Kala Academy. 12. Hkkjrh; Nkikfp= dyk : Mk- Luhydekj 13. Graphic Art of 18thCentury : Jean Adhemer 14. A history of Etching and Engraving- Arthur Hind 15. An Introduction of History of Wood cut – A.M. Hind		

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Third		
Name of the Course	Fundamentals of Visual Arts		
Course Code	M25- OEC- 316		
Course Type	OEC		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To develop foundational skills in drawing, understanding the basic elements and principles of visual art. CLO 2: To demonstrate proficiency in color mixing and application, understanding how color interacts within a composition and influences visual impact. CLO 3: To develop theoretical proficiency in drawing and painting techniques specific to portraiture, including line work, shading, blending, and color mixing, to create realistic and expressive representations of the human form. CLO 4: To develop a personal artistic voice in due course.		
Credits	Theory	Practical	Total
	0	2	2
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	0	15
End Term Exam Marks	0	0	35
Max. Marks	0	0	50
Examination Time	-	6 hours	
Part B- Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Introduction to Visual Arts: Overview of visual art forms (drawing, painting, sculpture, etc.) Practical Assignment-1		15
II	Practice of Element of Art (Line, Form, Color, Tone, Texture, Shape etc.) Practical Assignment-1		15
III	Principles of Art: Balance, contrast, emphasis, movement, pattern, rhythm, unity Still Life- Object Drawing (Medium- Pencil, Pastel, Poster Colour)- Practical Assignment-1		15
IV	Color Theory: Primary, secondary, and tertiary colors Nature Drawing -Tree Study, Animal Study etc. (Medium- Pencil, Poster, Pestle) - Practical Assignment-2		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 50	
➤ Practical	30	➤ Practical:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Weekly Submission:	15		
Part C-Learning Resources			
The Fundamentals of Drawing" by Barrington Barber			
The Complete Guide to Drawing" by Giovanni Civardi			
Fundamentals of Art and Design" by Robert L. Wicks			
Drawing for the Absolute Beginner" by Mark Willenbrink and Mary Willenbrink			
Keys to Drawing" by Bert Dodson			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Fourth		
Name of the Course	HISTORY MODERN INDIAN ART-II		
Course Code	M25-MFA-401		
Course Type	CC-7		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: To develop a keen insight into the contribution of movements and artists in shaping modern art in India. CLO 2: Introduction to postmodern art and theories. Analytical study of some of the prominent artists of post- independence. CLO 3: Identify and analyze the discourse of postmodernism and its relevance to visual art practice. CLO 4: Critical understanding of the work of some of the seminal post-70s artists of Indian Art to develop a critical understanding of the transitions from modernism to postmodernism and Contemporary art trends and enhancement in the knowledge of Folk Art, Tribal Art and Indian Culture.		
Credits	Theory	Tutorial	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	PAG Group – M.F. Husain, K.H. Ara, F.N Souza, S.H. Raza, S.K. Bakre Delhi Silpi Chakra – B.C. Sanyal. P.N. Mago, Dhanraj Bhagat, K.S. Kulkarni		15
II	Baroda Group – Bhupen Khakar, N.S. Bendre, K.G. Subramaniyn, Gulam. Mohamad Shaeikh, Jyoti Bhatt		15

	Madras Group – D.P. Roy Chaudhury, K.C.S Panikar, S.Nandagopal, P.V. Jankiram	
III	Group 1890 – Ambadas, J.Swaminathan, Jeyram Patel, Himat Shah Chola mandal – K.Jayapal Panikar, K. Ramanujam	15
IV	Group-8 – Anupam Sud, Jagdish Dey, Jagmohan Chopra Tantric Art- G.R.Santosh, Biren Dey, Sohar Qadri, P.T. Reddy, Shobha Baroota	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		
1. Studies in Modern Indian Art – Ratan Parimoo		
2. Moving Focus – K.G. Subrahmanyam		
3. Pictorial Space – Geeta Kapoor		
4. Modern Indian Art – Keshav Malik		
5. Lalit Kala Contemporary		
6. Lalit Kala Monographs		
7. Contemporary Art in India : P.N. Mago		
8. Contemporary Art – The Flamed Mosaic by Naviel Tuli		
9. Contemporary Indian Art- GaytriSinha		
10. Handbook of Indian Art- Sunil Khosa		
11. Company Painting- Mildred Archer		
12. Art of India- Fredrick M. Asher		
13. Indian Painting for The British 1770-1880- Mildred Archer, W.G. Archer		
14. Indian Miniatures in The India Office Library- Mildred Archer, Toby Falk		
15. Contemporary Indian Art- Other realities- Yashodhara Dalmia		
16. The Making of Modern Indian Art- The Progressives-Yashodhara Dalmia		
17. Memory, Metaphor, Mutarions- Yashodhara Dalmia		
18. Arts of India 1550-1900- John Guy, Deborah Swallow		
19. Essays on contemporary practice in India- Geeta Kapoor		
20. Triumph of Modernism- Partha Mitter		
21. Flamed Mosaic- Neville Tuli		
22. Kala Chitrkala- Vinod Bhardwaj		
23. Char Chitrkaar- Ashok Mitra		
24. Samkalin Kala- Dr. Ramviranjan		
25. ChitrkalakaRasaswadan- RamchandrShukl		
26. Lalit Kala Ki Dhara- Asit Kumar Haldar		

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Fourth		
Name of the Course	CONTEMPORARY INDIAN ART-II		
Course Code	M25-MFA-402		
Course Type	CC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1:	To discuss the thematic and stylistic characteristics of figurative art in India.	
	CLO 2:	To understand the role of art criticism in shaping the discourse of modern and contemporary Indian art.	
	CLO 3:	To understand the significance of installation art in contemporary Indian art.	
	CLO 4:	To explore contemporary concepts like anti-aesthetics, globalization's impact on art, and theories by critics.	
Credits	Theory	Tutorial	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	Printmakers: Jayant Parekh, V Nagdas, Jai Zharotia, Rini Dhumal, Shyam Sharma, Moti Zharotia, Shushant Guha		15
II	Sculptors: Ram V. Sutar, Anish Kapoor, Dhruva Mistry, Subodh Gupta, Ranbir Kaleka, Shanku Chaudhury, Nagji Patel		15
III	Video art: Pushpamala N., Vibha Galhotra, Sudarshan Shetty, Sheba Chhachhi		15
IV	New Media (Performance based) – Piyali Ghosh, Nikhil Chopra, Himali Singh Sain.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Art and Visual Culture in India 1857-2007 edited by Gayatri Sinha			
2. Contemporary Art in India: A Perspective by Pran Nath Mago			
3. The Empire Strikes Back: Indian Art Today edited by A. M. Kapoor and N. Malani			
4. Edge of Desire: Recent Art in India edited by Chaitanya Sambrani			
5. India: Contemporary Photographic and New Media Art edited by Steven Evans and Sunil Gupta			

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Forth		
Name of the Course	Advertising: Ethics And Regulation		
Course Code	M25- MFA -403		
Course Type	CC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Understand the multifaceted role of advertising in society, including its economic, social, and cultural implications. CLO 2: Develop an awareness of ethical considerations in advertising and impact on societal perceptions and behaviours. CLO 3: Students will become familiar with advertising regulations and legal frameworks governing the industry. CLO 4: Explore the social responsibilities of advertisers and its implications for consumer trust.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B – Contents of the Course			
Instructions for Paper- Setter: Nine questions will be set in all. All questions will carry equal marks. Question No. 1, which will be a short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Advertising and Society: Advertising business offers employment, Advertising promotes freedom of press, Information and Freedom of choice, Advertising Creates demand and consequently sales, advertising reduces selling cost, Advertising tries to raise the standard of living.		15
II	Ethics in Advertising, Taste and Advertising, Stereotyping in Advertising: Women in advertisement, racial and ethnic stereotypes, Advertising to children,		15
III	Code of conduct, Advertising controversial products & legal aspects of advertising; Copyright, Trade Mark act, Press act, Female indecent representational act (1986) etc.		15
IV	Social Responsibilities: ASCI (Advertising standard council of India), Advertising and Cultural Value, Justification of expenditure on advertisement, Truth in advertising.		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Foundation of Advertising: S.A Chunnawalla, K.C Sethia.			
2. Advertising and Sales Promotion: S.H.H kazmi, Satish Batra.			
3. Social Dimension of Advertising: S.S Kaptan.			
4. Advertising theory and practice: C.H Sandage, Vernon Fryburger.			
5. Advertising and Promotion AN IMC Approach, Shimp Cengage Learning India Pvt. Ltd., New			
6. Delhi Contemporary Advertising: William F. Arens, Courtland L. Bovee.			
7. foKkiu *rduhd ,oaf\}kUr* : ujsUnz ;kno			
8. foKkiufMtkbu : ujsUnz ;kno			
9. foKkiudyk: ,ds'ojizlkngVoky			
10. foKkiu : v'kksdegktu			

Session: 2026-27			
Part A – Introduction			
Name of Programme	Master of Fine Arts		
Semester	FOURTH		
Name of the Course	HISTORY OF WESTERN SCULPTURE		
Course Code	M25-MFA-404		
Course Type	CC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: CLO 2: CLO 3: CLO 4:	Students will learn about the different sculptorsto new ideas for sculpting. Students will learn about the different area of sculpture making in western world & the individualism artists. American sculptors this will help students to learnwestern world, their transitions and how they are different from us. Knowledge of postmodern contemporary Artist It will develop the skill to identify the importance and beauty of different places around the world including India.	
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unitand the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	19 th & 20 th century Sculptors- Auguste Rodin, Marino Marini, Ernst Barlach, Constantin Brancusi, Marcel Duchamp, Tatlin.		15
II	Individualism and modern Concept, Age of Experimentation,Jacob Epstien, Alexander Caldar, Henry moore, Alberto Giacometti,		15
III	American Sculptors- David Smith, Sol Lewitt, Bruce Nauman, Joseph Cornell, Mark Di Suvero, Claes Oldenburg		15
IV	New Trends and concept of monumental Modernist& Contemporary Sculptors- Anish Kapoor, Jeff Koons, Damien Hirst, Hepworth Barbara		15
Total Contact Hours			60

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. L. Lippart – Pop Art.			
2. J. Rewald – History of impressionism – Museum of Modern Art, New York.			
3. Herbert Road – A concise History of Modern Paining.			
4. William Vaughan – Romantic Art.			
5. Arnason: History of Modern Art.			
6. Hamilton – Painting & Sculpture in Europe – 1880-1940.			
7. Cold water: Primitivism in Modern Art.			
8. Marel Jean – A History of Surrealist Painting (Comprehensive Study)			
9. Roenblum – Cubism and 20 th Century Art.			
10. Sculptor – Dictionary of Abstract Art.			
11. Goodrich and Baur – American Art of the Twentieth Century, 1962.			
12. HH Arnason – History of Modern Art.			

Session: 2026-27			
Part A - Introduction			
Name of Programme	Master of Fine Arts		
Semester	Fourth		
Name of the Course	INDIAN MASTER PRINTMAKERS		
Course Code	M25-MFA-405		
Course Type	CC-8		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will demonstrate a deep understanding of the contributions of key Indian master printmakers, recognizing their influence on the development of printmaking in India. CLO 2: Students will analyze and appreciate the various techniques employed by Indian master printmakers, gaining insights into their methods and creative processes. CLO 3: Students will critically evaluate the works of Indian master printmakers, articulating informed interpretations and contextualizing their art within broader historical, cultural, and artistic movements. CLO 4: Students will conduct advanced research on specific Indian master printmakers, presenting their findings through well-organized written and oral presentations that reflect academic rigor and original thought.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		
Part B - Contents of the Course			
Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.			
Unit	Topics		Contact Hours
I	This course offers an in-depth exploration of the contributions of Indian master printmakers who have pioneered new techniques and methods in printmaking during the 20th and 21st centuries. Students will study the works, innovations, and impact of these artists on the field of printmaking. Through lectures, readings, discussions, and written assignments, students will gain a comprehensive understanding of the evolution of printmaking in India. Pioneers of Modern Indian Printmaking - Introduction to Modern Indian Printmaking - Overview of the historical context and evolution of printmaking in India - Key developments and milestones in Indian printmaking		15

	- Nandalal Bose and the Bengal School - The influence of Nandalal Bose on Indian printmaking - Techniques and themes developed by Bose - Somnath Hore and Social Realism - The role of the Bengal School in promoting printmaking	
II	Mid-20th Century Innovations and Influences - Krishna Reddy and Viscosity Printing - Introduction to Krishna Reddy’s life and work - Development and significance of viscosity printing - Jyoti Bhatt and Experimental Techniques - Jyoti Bhatt’s exploration of traditional and experimental methods The integration of folk art and contemporary practices in Bhatt’s work	15
III	Late 20th to Early 21st Century Developments - Anupam Sud and Figurative Printmaking - Anupam Sud’s approach to figurative and narrative printmaking - Techniques and innovations introduced by Sud Devraj Dakoji, Rini Dhumal, Jagmohan Chopra, Sanat Kar, Shyam Sharma, Laxma Goud, V. Nagdas, and Contemporary Practices.	15
IV	Contemporary Innovators and Future Directions - Different Printmaking Groups, and Printmakers involves - Emerging Trends and Future Directions - Overview of emerging printmakers and their innovations - The role of technology and digital media in contemporary printmaking - Future trends and potential developments in Indian printmaking Modern Developments in Indian Printmaking The evolution of printmaking techniques in the mid to late 20th century The role of art institutions and education in promoting printmaking Contemporary trends and innovations in Indian printmaking In-depth analysis of contemporary Indian printmakers and their work. The future of printmaking in India and emerging trends	15
Total Contact Hours		60
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Theory	30	➤ Theory: 70
• Class Participation:	5	Written Examination
• Seminar/presentation/assignment/quiz/class test etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		
1. Graphic Arts Encyclopedia – George A Stevenson		
2. Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen.		
3. Visual Imagination		
4. Prints of Twentieth Century – Phanes		
5. Dictionary of Print Making Terms – Rosemary Simmons.		
Reference Journals:		
• JOA - Journal of Arts		
• ShodhKosh: Journal of Visual and Performing Arts		
• Atishay Kalit- A Bilingual Research Journal of Fine Arts, Culture and Humanities		
• Atishay Kalit- A Bilingual Research Journal of Fine Arts, Culture and Humanities		

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Fourth		
Name of the Course	PICTORIAL COMPOSITION- II		
Course Code	M25-MFA-406		
Course Type	DEC-II		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will be able to comprehend the basic of the fundamental of visual arts. CLO 2: Students will be able to figure out the contents of the fundamental of visual arts. CLO 3: Students will be able to develop the skills of research for higher studies through the techniques of sketching, landscapes, still life, object drawing, composition etc. CLO 4: Students will be able to find new knowledge and areas of their interest. CLO 5: Students will be able to develop of communication, reading and writing through the making concept and as well as composition.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		18 hours	
Part B - Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Medium: water colour, ink/ oil colour/acrylic colour etc. (iv) Number of assignments: 01 canvases (2 X 2 Feet) (v) Sheet work: 04 (quarter imperial)			
Unit	Topics		Contact Hours
I	Practical exercises on balance, harmony, rhythm, and focal points Creating depth and spatial relationships using perspective Dynamic compositions through movement and tension		15
II	Layering, glazing, and texture-building exercises Combining acrylics, oils, and watercolors for mixed media effects Unconventional materials and tools in composition		15
III	Developing storytelling through composition Exercises in symbolism and conceptual depth		15

IV	Creating a series of interconnected compositions	15
	Total Contact Hours	60
	Practicals	Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practicals>	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practical	10	➤ Practical
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	5	
• Mid-Term Exam:	-	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2026-27			
Part A – Introduction			
Name of Programme	Master of Fine Arts		
Semester	Third		
Name of the Course	GRAPHICS DESIGN – II		
Course Code	M25-MFA-407		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1:	To introduce the basics and its need in communication design.	
	CLO 2:	To understand various aspect of graphic design and using it in designing.	
	CLO 3:	Understanding the relevance of design principals in historic and contemporary art & design.	
	CLO 4:	Enhances scientific temperament by application of Design.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	12 hours	
Part B – Contents of the Course			
Practical			Contact Hours
Instructions: - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal Examiner/ Committee will evaluate the Sessional work. - Size: As per requirements - Total Assignments: 8			60
List of Practical			
Poster: 2 (Social and Product) Hoarding and Banner Catalogue, Folder & Invitation etc. Portfolio Development Select and refine a series of images from all practical assignments to create a cohesive portfolio			

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Theory	30	➤ Theory:	70
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	FOURTH		
Name of the Course	CLAY MODELING-II		
Course Code	M25-MFA- 408		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop Clay Modeling skills with different medium and handling the techniques CLO 2: Understand to research form, materials and techniques as need by the direction of their sculptural work. CLO 3: Inculcation of visual communication by using Clay Modeling CLO4: Imparting knowledge of using natural and metal materials for execution of mural works.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	Terracotta: - Overview of terracotta as a sculptural material: its history, characteristics, and contemporary applications. - Safety protocols specific to working with terracotta: handling, firing, and glazing considerations. - Basic tools and equipment for terracotta sculpture: clay, sculpting tools, kiln, glazes, etc. Cement: - Introduction to cement as a sculptural material: its properties, versatility, and suitability for outdoor installations. - Safety precautions when working with cement: handling, mixing, and curing techniques. - Basic tools and equipment for cement sculpture: trowels, molds, reinforcing materials, etc. POP (Plaster of Paris): - Overview of POP as a sculptural material: its characteristics, ease of use, and limitations. - Safety guidelines for working with POP: mixing ratios, ventilation, and handling precautions. - Basic tools and equipment for POP sculpture: plaster bandages, carving tools, release agents, etc.		120

Sculpting Techniques Terracotta: • Understanding terracotta's plasticity and workability for additive sculpting techniques. • Techniques for modeling, coiling, and slab-building in terracotta. • Hands-on practice sessions: students will create basic forms and study anatomical details in terracotta. Cement: • Understanding cement's suitability for both additive and subtractive sculpting methods. • Techniques for modeling, carving, and casting in cement. • Experimentation with texture and surface treatments in cement sculptures. POP (Plaster of Paris): • Introduction to POP's quick setting properties and its application in both additive and subtractive sculpting. • Techniques for modeling, carving, and casting with POP. Note: Medium: Clay, plaster, Cement, Terra cotta,etc Minimum Size: 1” x 1”x 1” No. of Assignments 4 sketches : 250 Number of assessments 05			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS: 1. L. Lippart – Pop Art. 2. J. Rewald – History of impressionism – Museum of Modern Art, New York. 3. Herbert Road – A concise History of Modern Paining. 4. William Vaughan – Romantic Art. 5. Arnason: History of Modern Art. 6. Hamilton – Painting & Sculpture in Europe – 1880-1940. 7. Cold water: Primitivism in Modern Art. 8. Marel Jean – A History of Surrealist Painting (Comprehensive Study) 9. Roenblum – Cubism and 20th Century Art. 10. Sculptor – Dictionary of Abstract Art. 11. Goodrich and Baur – American Art of the Twentieth Century, 1962.			

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Fourth		
Name of the Course	INTAGLIO COMPOSITION- I		
Course Code	M25-MFA-409		
Course Type	DEC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1:	Develop creative ways to solve problems using a variety of strategies for making prints by intaglio processes.	
	CLO 2:	Enhancing to Create personal hand-printed artwork, which demonstrate an introductory level of understanding the technique, ideas, and the processes, materials, and techniques associated with different manner.	
	CLO 3:	Establish self-critiquing skills to develop autonomous expression through printmaking.	
	CLO 4:	Scientific and logical knowledge of reproduction of art works.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	4	4
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	12 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	Intaglio Printmaking process emphasis on composition and individual technique working in the different surfaces like Plastic and Metals. Only Dry Point technique will be taught in this course, Selection of materials preparations and application of dry on different surfaces, Study of various Tools and application process. Preparation of composition on plate with various experiments for textural and tonal values. Different techniques in Dry Point Printing. Different Printing techniques, with the help of Rollers, Stencils and Inks Total Assignments- 2 (Image Size: 8”x 10”)		60
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		

Part C - Learning Resources

Recommended Books/e-resources/LMS:

1. Graphic Arts Encyclopedia – George A Stevenson
2. Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen.
2. Visual Imagination
3. Prints of Twentieth Century – Phanes
4. Dictionary of Print Making Terms – Rosemary Simmons.
5. How to Identify Prints – Bamber Gaspoigne.
6. The Complete Printmaker (Techniques/Traditions/Innovations)– John Ross/Clave Romano/Tim Ross.
7. Collecting Original Prints – Rosemary Simmons Hanre
8. Printmaking Today – Jules Heller.
9. Contemporary Art (Journal) – Lalit Kala Academy
10. Graphic Art in India since 1850 – Lalit Kala Academy.
11. Hkkjrh; Nkikfp= dyk : Mk- Luhdyekj
12. Graphic Art of 18thCentury : Jean Adhemer
13. A history of Etching and Engraving- Arthur Hind
14. An Introduction of History of Wood cut – A.M. Hind

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Fourth		
Name of the Course	CREATIVE DRAWING - II		
Course Code	M25-MFA-410		
Course Type	PC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop skills in painting accurate likenesses and details for observation of human characteristics. CLO 2: Explore techniques for rendering textures like hair textures, pattern, form for making different surface or visual impact CLO 3: Understand concepts of planes, volumes, and edges for the figure by color mediums and techniques for making form CLO 4: Understand anatomical/non anatomical for shape/form paint application		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		18 hours	
Part B - Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Minimum Size: 30" x 40" (iv) Medium: water colour, ink/ oil colour/ acrylic colour etc. (v) Number of assignments: 04 canvas (vi) Sheet Work: 25			
Unit	Topics		Contact Hours
I	Exploration of an individual approach to drawing as an aesthetic exercise of visual sign and symbol and locate your practice in the broader context of contemporary art		30
II	Explore ADVANCE DRAWING in different mediums and techniques- oil, acrylic, watercolors, pen, pastels and ink and photocopy, impression, stencil and any other medium. Exercise of different drawing techniques of traditional and contemporary masters Exercise on application of different mediums both traditional and contemporary as a drawing tool		30
III	Practical exercises focusing on the live study of natural color, texture, composition, perspectives.		30

IV	Observation and Practice of elements of nature like trees, sky, clouds, distant objects etc.	30
Total Contact Hours		120
Practicals		Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practicals>	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practical	30	➤ Practical
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
•Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS:		

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Fourth		
Name of the Course	CAMPAIGN DESIGN - II		
Course Code	M25-MFA-411		
Course Type	PC - 9		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO: 1	Ability to communicate messages visually through a combination of words, artworks, graphic and media.	
	CLO: 2	Ability to sustained artistic engagement with socio-political realities and intensive investigation of contemporary critical issues.	
	CLO: 3	Capable to utilize the art and technology interface for creative outcomes.	
	CLO: 4	Ability to utilize the visual message as a tool of social, moral and scientific awareness.	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	18 hours	
Part B – Contents of the Course			
Practical (Product Campaign: Manual)			Total Contact Hours
Instructions: - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in a sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal Examiner/ Committee will evaluate the Sessional work. - Market survey and about your campaign - Size: As per requirements Medium: Poster Colors Or other with the permission of the concern teacher. - Total Assignments: 12			120

List of Practical			
Unit-I Logo - 1 Letter head, Visiting Card, Envelope – 1 Set.			30
Unit-II Posters - 4 Hoarding, Banner - 2			30
Unit-III Press Layout – 2 Magazine Layout – 2 Package Design, Window Cut			30
Unit-IV Kiosks, Standy and Bunting Table Calendar, Dangler, Cutouts, Counter display or any other assignment with permission of concern teacher. Free hand Sketches – 200 Drawing - 10 (Full figure human study, portrait, animal study etc.) Report - 1			30
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
•Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
•Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
•Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS: • Market survey • Different Social NGOs • Visit Different Advertising Agencies			

Session: 2026-27			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	FOURTH		
Name of the Course	FIGURATIVE SCULPTURE-II		
Course Code	M25-MFA- 412		
Course Type	PC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will learn the pictorial representation of sculptures with different Expressions and emotionmoods focusing on current scenario CLO 2: The students will understand the indirect depiction of contemporary national-international issues through this art form which will lead to understand the concept of nationalism and many more. CLO 3: Students will learn about the figurative depiction of their thoughts which will help viewers to connect withthe artist and artwork very easily. CLO 4: The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
Unit-I	This Subject belongs to practical exploration of sculpture techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of sculpture as an art form. Unit 1: Anatomy and Figure Study - Understanding human anatomy through observation and study of the figure. - Techniques for sculpting the human form: proportion, gesture, and expression. Analyzing historical and contemporary figurative sculpture for inspiration and		30
Unit-II	Portrait Sculpture Introduction to portrait sculpture techniques: capturing likeness, expression, and character.		30

	- Techniques for sculpting facial features, including eyes, nose, mouth, and ears. - Considerations for portraying emotion and personality in portrait sculpture. Figure in Motion - Exploring techniques for sculpting dynamic poses and gestures. - Study of movement and balance in figurative sculpture. Techniques for conveying movement and narrative in sculptural compositions	
Unit-III	Expressive Figurative Sculpture - Exploring expressive approaches to figurative sculpture: abstraction, distortion, and symbolism. - Techniques for conveying emotion and psychological depth in figurative sculpture. - Experimentation with materials and textures to enhance expressive qualities in sculptural works. modern sculpture	30
Unit-IV	Installation and Site-Specific Considerations - Understanding the interaction between mural sculptures and their environment, both indoors and outdoors. - Techniques for planning and installing mural sculptures in indoor and outdoor settings. - Collaborative project: students will design and install a mural sculpture, considering site-specific factors such as lighting, architecture, and community engagement. Throughout the course, critique sessions will provide opportunities for students to receive feedback on their work and engage in constructive dialogue. Research assignments will deepen students' understanding of sculptural techniques and historical contexts relevant to mural sculpture. Hands-on practice sessions will allow students to develop their skills through experiential learning, and guest lectures and demonstrations will offer further insight and inspiration for their artistic development in both indoor and outdoor mural sculpture. NOTE Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc. Minimum Size: 36" x 36" x 36" No. of Assignments : 5 sketches : 250 Number of assessments 05	30
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	

Part C - Learning Resources

Recommended Books/e-resources/LMS:

1. Hindu Medieval Sculpture-, by Raymond Burnia, Paris, 1950
2. Art : a history of Painting, Sculpture and Architecture, by F. Harett, Prentice Hall Press, New York : 1995
3. Paintings and Sculpture in Europe, 1880-1940, by George Heard Hamilion, Pelican Art History Series.
4. Folk Art and Culture of Gujarat, Dr Jyotindra Jain, India, 1980
5. Art and Crafts of Tamilnadu, by Nanditha Krishnan, Phaidon, New York , 1992
6. Unknown India : Ritual Art in tribe and Village, by Stella Kramrisch, focal Press, New York, 1968
7. The Myth & Reality Studies in the Formation of Indian Culture, by D.D. k Kosambi, Bombay, 1962
8. The Art of India : Traditions of Indian Sculpture, Painting and Architecture, by Stella Kramrisch, Phaidon, New York, 1954
9. Hindu Temples (2volumes)- Stella Kramrich, South Asia Books, 2002 Indian Sculpture- by Stella Kramrisch, Calcutta, India, 1933

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Fourth		
Name of the Course	FIGURATIVE PRINTMAKING- II		
Course Code	M25-MFA-413		
Course Type	PC-9		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	1 Students will demonstrate a high level of skill in various printmaking techniques specifically geared towards the representation of the human figure, including line work, shading, and textural detail. 2 Students will exhibit a thorough understanding of human anatomy and proportion, applying this knowledge to create accurate and expressive figurative prints. 3 Students will develop a distinctive personal style in their figurative prints, effectively communicating mood, emotion, and narrative through their depiction of the human form. 4 Students will engage in critical evaluation of their own figurative works and those of their peers, utilizing feedback and self-reflection to enhance their artistic growth and technical proficiency.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	This course focuses on the practical exploration of figurative printmaking techniques, emphasizing drawing methods for the head, full figure, animals, and birds. Students will develop skills in capturing light, shade, and transitioning between semi-abstraction and realism. Through hands-on exercises, projects, and critiques, students will refine their technical abilities and conceptual approaches to figurative art in printmaking. Drawing Foundations and Techniques • Introduction to Figurative Drawing • Overview of anatomical structures and proportions • Basic techniques for drawing the human head and full figure • Capturing gesture and movement in quick sketches • Drawing Animals and Birds • Understanding animal and bird anatomy and proportions • Techniques for capturing the essence and character of animals and birds • Exploring dynamic poses and movements • Light and Shade Techniques • Techniques for shading and creating depth using light and shadow • Understanding light sources and their effects on form Application of chiaroscuro in figurative drawing		120

Printmaking Techniques for Figurative Art • Techniques for carving detailed figurative imagery in wood and linoleum • Inking and printing methods specific to figurative work • Experimenting with textures and multi-block prints for complex images • Preparing metal plates for detailed etching and drypoint techniques • Focusing on line work and tonal variations to depict the human figure, animals, and birds • Printing processes and achieving fine details in figurative intaglio prints • Preparing lithographic stones and plates for figurative drawing • Techniques for capturing the nuances of the human form, animals, and birds in lithography Multi-color lithography and achieving depth and realism Project Development and Professional Practice • Developing individual projects that integrate multiple figurative printmaking techniques • Concept development, planning, and execution with a focus on figurative imagery • Peer review and critique sessions to refine work Writing artist statements and preparing portfolios with a focus on figurative printmaking. No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS: 1. Graphic Arts Encyclopedia – George A Stevenson 2. Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen. 3. Visual Imagination 4. Prints of Twentieth Century – Phanes 5. Dictionary of Print Making Terms – Rosemary Simmons. 6. How to Identify Prints – Bamber Gaspoigne. 7. The Complete Printmaker (Techniques/Traditions/Innovations)– John Ross/Clave Romano/Tim Ross. 8. Collecting Original Prints – Rosemary Simmons Hanre 9. Printmaking Today – Jules Heller. 10. Contemporary Art (Journal) – Lalit Kala Academy 11. Graphic Art in India since 1850 – Lalit Kala Academy. 12. Hkkjrh; Nkikfp= dyk : Mk- lquhydekj 13. Graphic Art of 18thCentury : Jean Adhemer 14. A history of Etching and Engraving- Arthur Hind 15. An Introduction of History of Wood cut – A.M. Hind			

Session: 2026-27			
Part A – Introduction			
Name of Programme	MASTER OF FINE ARTS		
Semester	Fourth		
Name of the Course	CONTEMPORARY PAINTING		
Course Code	M25-MFA-414		
Course Type	PC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Develop skills in painting accurate likenesses and details for observation of human characteristics CLO 2: Explore techniques for rendering textures like hair textures, pattern,form for making different surface or visual impact CLO 3: Understand concepts of planes, volumes, and edges for the figure by color mediums and techniques for making form CLO 4: Understand anatomical/non anatomical for shape/form paint application		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time		18 hours	
Part B - Contents of the Course			
Instruction: (i) The examiner will evaluate the work of examinee in the end of the semester. (ii) Internal examiner/committee will evaluate the Sessional work/internal assessment. (iii) Minimum Size:30" x 40" (iv) Medium: water colour, ink/ oil colour/acrylic colour etc. (v) Number of assignments: 04 canvas (vi) Sheet Work: 25			
Unit	Topics		Contact Hours
I	Study of compositions from imagination and observation with the help of concepts, theme, statements etc.		30
II	Exercises of different painting techniques: texture work, distortion, symbolism, interpretation of themes		30
III	Exercises on application of different mediums both traditional and contemporary as a drawing tool/digital tool.		30
IV	Develop test and employ materials, process, and mediums in a way that activates ideas and concept		30
Total Contact Hours			120
Practicals			Contact Hours
	<Instruction regarding practical><Syllabus/ List of Practicals>		30

Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practical	30	➤ Practical	Lab record, Viva-Voce, write-up and execution of the practical
• Class Participation:	5		
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Fourth		
Name of the Course	PHOTOGRAPHY COMPOSITION - II		
Course Code	M25-MFA-415		
Course Type	PC - 10		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO: 1	Students will demonstrate the ability to create a sense of depth and perspective in their photographs using various techniques.	
	CLO: 2	Students will showcase creativity and innovation in their use of compositional techniques to produce visually compelling photographs.	
	CLO: 3	Students will effectively communicate visual ideas through their photographs by strategically using compositional elements.	
	CLO: 4	Students will curate a professional portfolio that showcases a range of compositional techniques and demonstrates their mastery of photographic composition	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	12 hours	
Part B – Contents of the Course			
Practical			Total Contact Hours
Instructions: - Themes/Subject matters/topics will be of multiple choices. - The examiner will evaluate the work of examinee on the last day of the examination and if the examiner did not turn up on the last day, the art work will be kept in sealed lock custody and as and when the examiner comes as his/her convenient date can evaluate the practical paper. - Internal examiner will evaluate the Sessional work. - Total Assignments: 24			120

List of Practical			
Unit-I			30
Depth and Perspective			
Practical Assignment: Take 8 photographs that showcase depth and perspective.			
Unit-II			30
Golden Ratio and Fibonacci Spiral			
Practical Assignment: Capture 8 photographs incorporating these principles.			
Unit-III			30
Minimalism			
Practical Assignment: Take 8 minimalist photographs, focusing on simplicity and negative space.			
Unit-IV			30
Portfolio Development			
• Select your best work from previous assignments, ensuring a variety of compositional techniques are represented. • Editing and Refinement: Edit and refine the selected images to ensure they meet professional standards. • Organization: Organize the images into a cohesive portfolio. • Presentation: Present your portfolio, explaining the compositional techniques used in each image and their impact.			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
• Market survey • Different Social NGOs • Different Advertising Agencies			

Session: 2026-27			
Part A – Introduction			
Name of the Programme	Master of Fine Arts		
Semester	FOURTH		
Name of the Course	CREATIVE SCULPTURE-II		
Course Code	M25-MFA- 416		
Course Type	PC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1:	Students will learn the pictorial representation of sculptures with differentExpressions and emotionmoods focusing on current scenario	
	CLO 2:	The students will understand the indirect depiction of contemporary national-international issues through this art form which will lead to understand the concept of nationalism and many more.	
	CLO 3:	Students will learn about the figurative depiction of their thoughts which will help viewers to connect withthe artist and artwork very easily.	
	CLO 4:	The realistic, idealist and naturalistic depiction will enhance the skills and esthetic sense of the student	
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	This Subject belongs to practical exploration of sculpture techniques. Students will engage with traditional and contemporary methods, refining their skills to produce sophisticated compositions. Through hands-on practice, critiques, and projects, students will develop a comprehensive understanding of sculpture as an art form. Exploring Mixed Media Sculpture • Introduction to mixed media sculpture techniques: assemblage, collage, and found object sculpture. • Integration of non-traditional materials such as found objects, textiles, and recycled materials into sculptural compositions. Creative approaches to combining materials and textures in mixed media sculpture Mold Making and Casting Techniques • Introduction to mold making materials and methods: silicone, plaster, and alginate. • Techniques for creating one-part and multi-part molds for sculptures.		120

- Exploring casting materials and processes: resin, plaster, and metal casting. Large Scale Sculpture Construction - Considerations for scaling up sculptural works for outdoor or architectural settings. - Techniques for working with large-scale materials such as steel, concrete, and stone. - Engineering principles for creating structurally sound and weather-resistant large-scale sculptures. Installation and Site-Specific Sculpture - Understanding the relationship between sculpture and its environment. - Techniques for site analysis and conceptual development for site-specific sculpture projects. - Installation techniques and considerations for outdoor and indoor exhibition spaces. Project Development and Contemporary Practices Site-Specific and Installation Art - Understanding the principles of site-specific sculpture and installation art - Techniques for planning and executing large-scale installations - Collaborating and working within a given space or environment Resources: - Modern sculpture studio facilities with access to digital fabrication tools, casting materials, and mixed media resources - Instructor demonstrations and individualized guidance - Recommended readings on contemporary sculptural techniques and notable modern sculptors Note: This syllabus is adaptable to student interests and skill levels. It's essential to provide ample studio time for students to practice techniques and develop their artistic voice within the medium of modern sculpture Note: Medium: Clay, plaster, Wood, Stone, Metal, Terra cotta, etc Minimum Size: 36" x 36"x 36" No. of Assignments : 2 sketches : 250 Number of assessments 05			
Suggested Evaluation Methods			
Internal Assessment: 30		End Term Examination: 70	
➤ Practicum	30	➤ Practicum	70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical	
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10		
• Mid-Term Exam:	15		

Part C - Learning Resources

Recommended Books/e-resources/LMS:

1. Hindu Medieval Sculpture-, by Raymond Burnia, Paris, 1950
2. Art : a history of Painting, Sculpture and Architecture, by F. Harett, Prentice Hall Press, New York : 1995
3. Paintings and Sculpture in Europe, 1880-1940, by George Heard Hamilion, Pelican Art History Series.
4. Folk Art and Culture of Gujarat, Dr Jyotindra Jain, India, 1980
5. Art and Crafts of Tamilnadu, by Nanditha Krishnan, Phaidon, New York , 1992
6. Unknown India : Ritual Art in tribe and Village, by Stella Kramrisch, focal Press, New York, 1968
7. The Myth & Reality Studies in the Formation of Indian Culture, by D.D. k Kosambi, Bombay, 1962
8. The Art of India : Traditions of Indian Sculpture, Painting and Architecture, by Stella Kramrisch, Phaidon, New York, 1954
9. Hindu Temples (2volumes)- Stella Kramrich, South Asia Books, 2002 Indian Sculpture- by Stella Kramrisch, Calcutta, India, 1933

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Fourth		
Name of the Course	EXPERIMENTAL PRINTMAKING- II		
Course Code	M25-MFA-417		
Course Type	PC-10		
Level of the course	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	1 Students will demonstrate proficiency in a variety of experimental printmaking techniques, incorporating both traditional and contemporary methods to create unique and innovative prints. 2 Students will develop and articulate original concepts and themes in their printmaking projects, showcasing their ability to convey complex ideas and personal artistic visions through their work. 3 Students will exhibit advanced technical skills in the preparation, execution, and finishing of prints, ensuring high standards of craftsmanship and attention to detail in their completed works. 4 Students will engage in critical analysis of their own work and that of their peers, providing and responding to constructive feedback to foster continuous improvement and deeper understanding of the printmaking process.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0	24 hours	
Part B - Contents of the Course			
Practicals			Contact Hours
	Experimental and Mixed Media Printmaking - Techniques for creating unique prints with mono printing and monotype - Using additive and subtractive methods for image creation - Incorporating drawing, painting, and mixed media elements - Integrating digital tools and processes with traditional printmaking - Techniques for creating digital collages and transferring them to printmaking methods - Exploring software for designing and manipulating print compositions - Experimenting with unconventional materials and techniques - Incorporating found objects, textiles, and other media - Creating 3D prints and sculptural forms		120

	Advanced and Experimental Approaches • Screen preparation using photo emulsion and hand-drawn stencils • Techniques for layering colors and creating dynamic figurative compositions • Experimenting with transparency and blending for realistic effects • Techniques for creating unique figurative prints with mono printing and monotype • Using additive and subtractive methods for expressive imagery • Incorporating drawing, painting, and mixed media elements into prints • Experimenting with unconventional materials and techniques for figurative prints • Blending realistic and semi-abstract approaches to create innovative compositions Developing personal styles through experimentation and mixed media integration. No. of Practical Assignments: = Total – 04 (minimum size of work image will be 12 inches X 18 inches)	
Suggested Evaluation Methods		
Internal Assessment: 30		End Term Examination: 70
➤ Practicum	30	➤ Practicum 70
• Class Participation:	5	Lab record, Viva-Voce, write-up and execution of the practical
• Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
• Mid-Term Exam:	15	
Part C - Learning Resources		
Recommended Books/e-resources/LMS: 1. Graphic Arts Encyclopedia – George A Stevenson 2. Photo mechanics and Printing – J.S. Mertle and Gordon L. Monsen. 3. Visual Imagination 4. Prints of Twentieth Century – Phanes 5. Dictionary of Print Making Terms – Rosemary Simmons. 6. How to Identify Prints – Bamber Gaspoigne. 7. The Complete Printmaker (Techniques/Traditions/Innovations)– John Ross/Clave Romano/Tim Ross. 8. Collecting Original Prints – Rosemary Simmons Hanre 9. Printmaking Today – Jules Heller. 10. Contemporary Art (Journal) – Lalit Kala Academy 11. Graphic Art in India since 1850 – Lalit Kala Academy. 12. Hkkjrh; Nkikfp= dyk : Mk- Luhydekj 13. Graphic Art of 18thCentury : Jean Adhemer 14. A history of Etching and Engraving- Arthur Hind 15. An Introduction of History of Wood cut – A.M. Hind		

Session: 2026-27			
Part A - Introduction			
Name of the Programme	Master of Fine Arts		
Semester	Fourth		
Name of the Course	EXHIBITION AND PRESENTATION		
Course Code	M25-MFA-418		
Course Type	EEC		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Students will gain comprehensive skills in planning and executing art exhibitions. CLO 2: Students will learn to create effective artist statements, portfolios, and promotional materials. They will develop public speaking skills. CLO 3: Students will acquire hands-on experience in installation practices, including health and safety considerations. CLO 4: Student will document their work effectively, update professional portfolios, and plan for future career opportunities, including residencies, grants, and further exhibitions.		
Credits	Theory	Practical	Total
	1	1	2
Teaching Hours per week	1	1	2
Internal Assessment Marks	10	5	15
End Term Exam Marks	20	15	35
Max. Marks	30	20	50
Examination Time	3 hours	3 hours	
Part B – Contents of the Course			
Instructions for Paper- Setter: The Examination will conduct as Viva- Voce.			
Unit	Topics	Contact Hours	
I	Fundamentals of Display and Presentation Introduction to Exhibition Planning Importance of display and presentation in the visual arts Overview of different types of art exhibitions (solo, group, thematic) Principles of Curation Developing a coherent theme for an exhibition Selection criteria for artworks Arranging artworks for visual impact and narrative flow Technical Aspects of Display Lighting techniques and their effects on artworks Use of space and layout design Mounting and framing techniques	7	
II	Professional Presentation Techniques Documentation and Artist Statements Writing effective artist statements Preparing artwork documentation (titles, descriptions, techniques)	7	

	Importance of artist CVs and portfolios Digital Presentation Creating digital portfolios and online galleries Use of social media for promoting exhibitions Designing promotional materials (posters, invitations, catalogs) Public Speaking and Critique Techniques for presenting and discussing your work Handling feedback and criticism Conducting artist talks and gallery tours	
III	Exhibition Planning and Execution Project Proposal Development Crafting a detailed exhibition proposal Budgeting and funding strategies for exhibitions Collaborating with galleries and curators Installation Practices Hands-on installation techniques Health and safety considerations Problem-solving during setup Running the Exhibition Opening night and event planning Engaging with the audience Managing the exhibition throughout its duration	8
IV	Reflective Practice and Professional Development Reflective Critique Analyzing the success of the exhibition Gathering and utilizing visitor feedback Self-assessment and peer reviews Portfolio Development Documenting the exhibition Updating professional portfolios with exhibition content Future opportunities: residencies, grants, and further exhibitions Capstone Project Final presentation and critique of individual projects Peer evaluations and discussions Planning for post-graduation exhibitions and career development	8
Total Contact Hours		30

Suggested Evaluation Methods			
Internal Assessment: 15		End Term Examination: 35	
➤ Theory	10	➤ Theory	20
•Class Participation:	4	Viva Voce	
•Seminar/presentation/assignment/quiz/class test etc.:	0		
•Mid-Term Exam:	6		
➤ Practicum	5	➤ Practicum	15
•Class Participation:	0	Display/ Exhibition Conduct	
•Seminar/presentation/assignment/quiz/class test etc.:	5		
•Mid-Term Exam:	0		
Part C - Learning Resources			
Recommended Books/e-resources/LMS:			
1. Exhibit Labels: An Interpretive Approach" by Beverly Serrell			
2. Curatorial Activism: Towards an Ethics of Curating" by Maura Reilly			
3. The Artist's Guide: How to Make a Living Doing What You Love" by Jackie Battenfield			
4. Exhibition Design" by David Dernie			
5. Art/Work: Everything You Need to Know (and Do) As You Pursue Your Art Career" by Heather Darcy Bhandari and Jonathan Melber			

Session: 2026-27		
Part A – Introduction		
Name of Programme	MASTER OF FINE ARTS	
Semester	Forth	
Name of the Course	Dissertation/Project work	
Course Code	M25-MFA-419	
Course Type	Dissertation/Project work	
Level of the course	500-599	
Pre-requisite for the course (if any)		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: Comprehend the basic of the Dissertation proposal. CLO 2: Figure out the contents of the Dissertation proposal. CLO 3: Develop the skills of research for higher studies like Doctorate. CLO 4: Find new knowledge and areas of their interest. CLO 5: Develop of communication, reading and writing through the project/ dissertation proposals.	
Credits	12	Total
		12
Max. Marks	300	300
Examination Time	6 hours	
Part B - Contents of the Course		
Instruction: 1. Students have to choose any new/unique topic of Project/Dissertation. 2. They must include appropriate images according to their choice of topics. 3. Only 10% Plagiarism will be accepted in the Project/Dissertation. 4. Students have to complete the project/dissertation under the guidance of the teacher.		

Syllabus of Under Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-301, पालिभाषा साहित्यं च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	CC-11		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 301.1 – पालिसंग्रहे संकलितजातकैः सुन्दरीसुत्त-मज्झिम पटिपदादिपाठानां माध्यमेन छात्राः बौद्धधर्मस्य मूलसिद्धान्तैः परिचिता भविष्यन्ति । CLO : 301.2 – पालिसंग्रहे संकलितानां चरियापिटकथेरगाथा-पब्बासुत-धम्मपदादि-पद्यबद्धरचनानां माध्यमेन भिक्षुभिक्षुणीनां जीवनेन वयं नैतिकशिक्षां प्राप्नुमः । CLO : 301.3 – पालिसाहित्यस्य माध्यमेन छात्रान् बौद्धग्रन्थेन सह मध्यकालीनानां सम्प्रदायानां धार्मिकसिद्धान्तानां ज्ञानं बौद्धकालीनसमाजस्य च ज्ञानं कार्यते । CLO : 301.4 – भाषायाः अवगमनाय व्याकरणस्यावश्यकता भवति । अस्मिन् घटके छात्राः पालिव्याकरणस्य अध्ययनं करिष्यन्ति ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60

Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.
Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	पालिसाहित्यम्, पालिसंग्रहः अधोनिर्दिष्टाः एव पाठाः 1-6, 11-12, 17-18, सप्रसंगं संस्कृतमाध्यमेन गद्यांशव्याख्या 2x7 = 14 अङ्काः	15
II	पालिसाहित्यम् : पालिसंग्रहः, अधोनिर्दिष्टाः एव पाठा - 21-23, 25-29, 36 - सप्रसंगं श्लोकव्याख्या 2x7 = 14 अङ्काः	15
III	पालिसाहित्यस्य इतिहासः पालिभाषायाः उद्भवः विकासश्च, भारतीय-आर्यभाषाणां विकासक्रमे पालिभाषायाः अवदानम्, त्रिपिटकसाहित्यम्, भारतीय-इतिहासस्य निर्माणे पालिभाषाध्ययनस्य पालिसाहित्यस्यध्ययनस्य च महत्त्वम्, पालि-प्राकृत-वैदिकसंस्कृतलौ- किकसंस्कृतभाषाणां वैज्ञानिकं साम्यम्/वैषम्यम् । द्वौ निबन्धात्मकौ प्रश्नौ 2x7=14 अङ्काः	15
IV	पालिव्याकरणम् 14 अङ्काः (क) सन्धिः, समासः, कारकम् (7 अङ्काः) (ख) संज्ञारूपाणि, धातुरूपाणि (7 अङ्काः) (i) संज्ञारूपाणि-बुद्ध, मुनि, अग्नि, भिक्षु, राया, अत्ता (ii) धातुरूपाणि-भू, गम, पठ, ठा, दिस्स, कर, पुच्छ कथ (केवलं	15

लट्-लङ्-लृट्-लोट्-विधिलिङ्-लकारेषु)	
Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: - पालि-संग्रह, सम्पा. डा. पी. वी. बापट, साहित्य अकादमी, नई दिल्ली - पालिप्पदीपिका, वीरेन्द्रकुमार अलंकार, वागाम्भृणी, पिंजौर (पंचकूला) - पालिमहाव्याकरण, भिक्षु जगदीश कश्यप, मोतीलाल बनारसीदास, दिल्ली - कच्चायनव्याकरण, सम्पा. एस. एन. तिवारी, तारा बुक एजेन्सी, वाराणसी - पालिसाहित्य का इतिहास, भरतसिंहउपाध्याय, हिन्दी साहित्य सम्मेलन, प्रयाग - पालि साहित्य का इतिहास, पं. राहुल सांकृत्यायन । - हिस्ट्री आप पालि लिटरेचर (वॉल्यूम-2) एम. विण्टरनिट्स	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-302, ऋक्संहिता यजुस्संहिता च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-I		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 302.1 – एतस्मिन् घटके संकलितकतिपय- ऋग्वेदीयसूक्तानां माध्यमेन वयं देवतानां स्वरूपं ज्ञास्यामः । CLO : 302.2 – ऋग्वेदीय-पूषन्-वास्तोष्पति-सरस्वती- अक्षादिसूक्तानां माध्यमेन वयम् इहलौकिक-पारलौकिकज्ञानं प्राप्स्यामः । CLO : 302.3 – यजुर्वेदस्य एकत्रिंशत्तमेऽध्याये यज्ञपुरुषस्य माध्यमेन विराट्पुरुषस्य समाजपुरुषस्य व्यक्तिरूपपुरुषस्य च ज्ञानं प्राप्यते । अस्मिन् कथितं यत् शरीरस्य यदि सर्वेऽवयवाः सम्यक्तया कार्यं कुर्वन्ति चेत् मानवः उन्नतिं प्राप्नोति । तथैव समाजस्य सर्वे वर्गाः मिलित्वा स्वकर्तव्यं पालयेयुश्चेत् समाज- राष्ट्रौ उन्नतिं कुर्वतः । द्वात्रिंशत्तमेऽध्याये अनेकनामभिः बहुदेववादस्य वर्णनं विद्यते । CLO : 302.4 – यजुर्वेदस्य त्रयस्त्रिंशत्तमेऽध्याये अग्नि-इन्द्र-सूर्या- दिदेवानां स्वरूपस्याध्यापनं विशदतया कार्यते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60

Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.
Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	निम्नसूक्तानां पारम्परिक-पाश्चात्यभाष्यकारानुसारेण गहनाध्ययनम् (संस्कृतमाध्यमेन) - ऋग्वेदः- अग्निः (1-19), सूर्यः (1-115), ब्रह्मणस्पतिः (2.23), मित्रः (3.59), उषाः (3.61), पर्यन्यः (5.83)। मन्त्रव्याख्या 2x7 = 14 अङ्काः	15
II	निम्नसूक्तानां पारम्परिक-पाश्चात्यभाष्यकारानुसारेण गहनाध्ययनम् - ऋग्वेदः - पूषन् (6.53), वास्तोष्पतिः (7.54), सरस्वती (7.95), मण्डूकः (7.103), अक्षः (10.34), ज्ञानम् (10.71) । (क) मन्त्रव्याख्या 2x4=8 अङ्काः (ख) आलोचनात्मकः प्रश्नः 1x6= 6 अङ्काः	15
III	निम्नलिखितस्याध्यायस्य उव्वटमहीधरभाष्यसहितं गहनमध्ययनम् - यजुर्वेदः (माध्यन्दिन-वाजसनेयी), अध्याय 31-32 (सम्पूर्णम्) मन्त्रव्याख्या : 2x7= 14अङ्काः	15
IV	निम्नलिखितस्याध्यायस्य उव्वटमहीधरभाष्यसहितं गहनमध्ययनम्- यजुर्वेदः (माध्यन्दिन-वाजसनेयी), अध्याय : 33 (1-50 मन्त्रपर्यन्तम्)। (क) मन्त्रव्याख्या : 2x7= 14 अङ्काः	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - ऋग्वेद, सायणभाष्य सहित । - ऋक्सूक्तमणिमाला, व्रजबिहारी चौबे । - ऋक्सूक्तसंग्रह, कृष्णकुमार एवं हरिदत्तशास्त्री, साहित्य भण्डार मेरठ । - बृहद्ऋक्सूक्त संग्रह, प्रो. देवेन्द्रनाथ पाण्डेय, श्री जगदीश संस्कृत पुस्तकालय, जयपुर । - उव्वटमहीधरकृत, शुक्लयजुर्वेदभाष्य । - उव्वटमहीधरकृत शुक्लयजुर्वेदभाष्य, मोतीलाल बनारसीदास, दिल्ली । - Vedic Reader for Students, A. A. Macdonell. - Hymns from the Rgveda, Peterson, B.O.R.I., Pune, 1938		

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-303, व्याकरणपरंपरा (1)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-I		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 303.1 – घटकेऽस्मिन् प्रमुखाष्टवैयाकरणानां शाकटायनः, आपिशलिः, काशकृत्स्नः, व्याडिः, पाणिनिः, कात्यायनः, पतञ्जलिः इत्येतेषां परिचयः छात्रान् कार्यते । CLO : 303.2 - अस्मिन् खण्डे काशिकाकारयोः वामनजयादित्ययोः, न्यासकारस्य जिनेनद्रबुद्धिनः, पदमञ्जरीकारस्य हरदत्तस्य, प्रक्रियाकौमुदीकारस्य रामचन्द्रस्य, सिद्धान्तकौमुदीकारयोः भट्टोजिदीक्षितवरदराजयोः परिचयः प्रदीयते । CLO : 303.3 – कस्यापि ग्रन्थस्यावबोधाय तस्य पारिभाषिकशब्दानां ज्ञानमपेक्षते । अस्मादेवस्मिन् घटके अष्टाध्यायाः प्रथमाध्यायस्य प्रथमपादस्य कतिपयप्रमुखाभिः संज्ञाभिः वृद्धिगुणसंयोगसवर्णप्रगृह्यघुघादीभिः छात्राः परिचिताः भवन्ति । CLO : 303.4 – अस्मिन् भागे वैयाकरणसिद्धान्तकौमुद्याः अनुसारं उणादिप्रकरणस्य प्रथमः पादः पाठ्यते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60

Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.
Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	वैयाकरणाः- शाकटायनः, आपिशलिः, काशकृत्स्नः, व्याडिः, पाणिनिः, कात्यायनः, पतञ्जलिः 14 अङ्काः एकः समीक्षात्मकः प्रश्नः। 1x14= 14 अङ्काः	15
II	वैयाकरणाचार्याः रचनाः च 14 अङ्काः जयादित्यः (काशिकाकारः), वामनः (काशिकाकारः), जिनेन्द्रबुद्धिः (न्यासकारः), हरदत्तः (पदमञ्जरीकारः), रामचन्द्रः (प्रक्रियाकौमुदीकारः), भट्टोजिदीक्षितः (सिद्धान्तकौमुदीकारः), वरदराजः (मध्य/लघु-सिद्धान्तकौमुदीकारः) एकः समीक्षात्मकः प्रश्नः। 1x14= 14 अङ्काः	15
III	पाणिनिः, अष्टाध्यायी-प्रथमोऽध्यायः, प्रथमः पादः । 14 अङ्काः संज्ञाविधायकसूत्राणि (काशिकादिशा) संस्कृतमाध्यमेन वृद्धिः (1.1.1), गुणः (1.1.2), संयोगः (1.1.7) अनुनासिकः (1.1.8), सवर्णम् (1.1.9), प्रगृह्यम् (1.1.11) घु (1.1.20), घ (1.1.22) (क) संज्ञाद्वयस्य व्याख्या 2x4= 8 अङ्काः (ख) टिप्पणी 1x6= 6 अङ्काः	15
IV	वैयाकरणसिद्धान्तकौमुदी उत्तरार्द्धम् उणादिप्रकरणम्, प्रथमः पादः 14 अङ्काः (क) सूत्रव्याख्या 2x3= 6 अङ्काः (ख) रूपसिद्धिः 2x4= 8 अङ्काः	15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः 1. संस्कृत-व्याकरणशास्त्र का इतिहास (भाग 1-2), युधिष्ठिर मीमांसक, रामलाल कपूर ट्रस्ट, रेवली, सोनीपत । 2. संस्कृत व्याकरण का उद्भव और विकास, सत्यकाम वर्मा, मोतीलाल बनारसीदास, दिल्ली । 3. संस्कृतव्याकरणदर्शन, रामसुरेश त्रिपाठी, राजकमल प्रकाशन, दिल्ली, 1972 4. पाणिनीय व्याकरण का अनुशीलन, रामशंकर भट्टाचार्य, इण्डोलोजिकल हाउस, वाराणसी, 1966 5. व्याकरणशास्त्रेतिहासः, वी० त्रिपाठी । 6. Belvalkar, Shripada Krishna, An Account of the Different Existing Systems of Sanskrit Grammar, Bharatiya Vidya Prakashan, Varanasi. 7. George Cardona, Panini : A Survey of Research, Motilal Banarsidass, Delhi. 8. Hartmnt Scharfe, Wiesbaden; A History of Grammatical Literature, Otta Marrasowitz, 1977 9. काशिकावृत्ति (न्यास-पदमञ्जरी-सहित), सम्पा० एवं हिन्दी टीकाकार- डॉ० जयशंकरलाल त्रिपाठी एवं सुधाकर मालवीय, तारा पब्लिकेशन, वाराणसी । 10. काशिका, हिन्दी टीकाकार-श्रीनारायण मिश्रा । 11. अष्टाध्यायी (भाष्य) प्रथमावृत्ति (प्रथम भाग), पं० ब्रह्मादत्त जिज्ञासु, रामलाल कपूर ट्रस्ट, रेवली (सोनीपत) 12. अष्टाध्यायी-काशिका (प्रथमाध्यायः), वेदपाल विद्याभास्कर, साहित्य भण्डार, मेरठ, 1985 13. वैयाकरणसिद्धान्तकौमुदी (उत्तरार्द्ध), भट्टोजिदीक्षित, मोतीलाल बनारसीदास, दिल्ली ।	

14. उणादिकोषः, स्वामी दयानन्द, सम्पा. युधिष्ठिर मीमांसक ।
15. पाणिनीयशिक्षा, व्याख्याकार-श्रीनारायण मिश्रद्व गोकुलदास संस्कृत ग्रन्थमाला ।
16. Paniniyasiksa, Ed. & Tr. by M. M. Ghosh, Delhi, 1986

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-304, न्यायदर्शनम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-I		
Level of the course (As per Annexure-I	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 304.1 –सिद्धान्तमुक्तावल्याः प्रत्यक्षखण्डस्य अध्ययनेन न्यायदर्शनानुसारं प्रत्यक्षप्रमाणस्य तत्त्वमीमांसायाः च ज्ञानम् भवति। CLO : 304.2 – सिद्धान्तमुक्तावल्याः कारिकानां सप्रसंगव्याख्यापद्धतेः ज्ञानम् वर्धते । CLO : 304.3 – सिद्धान्तमुक्तावल्याः पङ्क्तीनां व्याख्यानेन निमित्तं मूलपाठस्य सूक्ष्मम् अध्ययनम् क्रियते । CLO : 304.4 – न्यायदर्शनस्य प्रमुखसिद्धांतानां टिप्पणीलेखनद्वारा छात्राणाम् वस्तुनिष्ठं ज्ञानम् परीक्ष्यते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			
Instructions for Paper-Setter			

1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।
3. द्वितीयतृतीयचतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।

Unit	Topics	Contact Hours
I	विश्वनाथपञ्चाननः, भाषापरिच्छेदः मुक्तावलीसहितः, प्रत्यक्षखण्डः (1-65 1/2 कारिकाः) 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 10 अङ्काः (ख) लक्षणव्याख्या/टिप्पणी 4 अङ्काः	15
II	भाषापरिच्छेदः मुक्तावलीसहितः, प्रत्यक्षखण्डः (1-65 1/2 कारिकाः) 14 अङ्काः सप्रसंग-मूलकारिकाव्याख्या 2x7= 14 अङ्काः	15
III	भाषापरिच्छेदः मुक्तावलीसहितः प्रत्यक्षखण्डः 14 अङ्काः (1-65 1/2 कारिकाः) सप्रसंग-मुक्तावली-पंक्ति-व्याख्या 2x7=14 अङ्काः	15
IV	भाषापरिच्छेदः मुक्तावलीसहितः, प्रत्यक्षखण्डः (1-65 1/2 कारिकाः) 14 अङ्काः विशदटिप्पण्यात्मक प्रश्नः 2x7= 14 अङ्काः	15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. न्यायसिद्धान्तमुक्तावली, दिनकरी-रामरुद्री-टीकासहिता, चौखम्बा, वाराणसी । 2. न्यायसिद्धान्तमुक्तावली, व्या० चन्द्रधारी सिंह, भारतीय विद्या प्रकाशन, दिल्ली । 3. न्यायसिद्धान्तमुक्तावली, प्रत्यक्षखण्डः, व्या० धर्मेन्द्रनाथ शास्त्री, मोतीलाल बनारसीदास, दिल्ली । 4. न्यायसिद्धान्तमुक्तावली, प्रत्यक्षखण्डः, व्या० गजानन शास्त्री मुसलगांवकर, चौखम्बा, वाराणसी । 5. Bhasaparinicheda with Muktaavali, Eng. Tr. & Notes, Swami Madhavananda, Advaita Ashram, Calcutta.	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-305, नाट्यसाहित्यम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-1		
Level of the course (As per Annexure-I	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 305.1 – कविपरिचयेन साहित्यं समृद्धं भवति । ग्रन्थाध्यनेन अवस्थानुकृतिर्नाट्यत्वात्प्रकरणस्य वैशिष्ट्यं ज्ञायते । CLO : 305.2 – प्रकरणकथानकं तत्सम्बद्धाश्च प्रश्नाः ग्रन्थस्य वैशिष्ट्यं प्रमाणीकुर्वन्ति । CLO : 305.3 – काव्यनाट्यवैशिष्ट्यसहितं व्युत्पत्तिपरं ज्ञानमुपलभ्यते। CLO : 305.4 – अत्र ग्रन्थस्य ऐतिहासिकप्रमाणपुरस्सरं पात्रविशेषाणां वैशिष्ट्यं परिचीयते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			
Instructions for Paper-Setter			

1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।
3. द्वितीयतृतीयचतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।

Unit	Topics	Contact Hours
I	मृच्छकटिकम् संस्कृतमाध्यमेन द्वयोः श्लोकयोः व्याख्या । 2x7 = 14 अङ्काः	15
II	मृच्छकटिकम् एकः आलोचनात्मकः प्रश्नः।	15
III	रत्नावली नाटिका काव्यसौष्टवनिर्देशपूर्वकं श्लोकव्याख्या । 2x7=14अङ्काः	15
IV	रत्नावली नाटिका एकः आलोचनात्मकः प्रश्नः।	15
Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. मृच्छकटिकम्, शूद्रकः, सम्पा. डॉ. श्रीनिवास शास्त्री, साहित्य भण्डार, सुभाष बाजार, मेरठ।
2. मृच्छकटिकम् नाटक, पृथ्वीधर-कृत व्याख्या-सहित, चौखम्बा संस्कृत संस्थान, वाराणसी ।
3. मृच्छकटिकम्, गंगा संस्कृत-हिन्दी व्याख्या-सहित, सम्पा. गंगासागर राय, चौखम्बा संस्कृत संस्थान, वाराणसी ।
4. Mrcchakatika of Sudraka (A Critical and Cultural study), S. K. Sharma, Parimal Publications, Delhi.
5. रत्नावलीनाटिका, श्रीहर्षः, सम्पा. डॉ. शिवराज शास्त्री, साहित्य भण्डार, सुभाष बाजार, मेरठ।
6. रत्नावली नाटिका, किरणावली संस्कृत-हिन्दी-व्याख्योपेता, सम्पा. पं. राजेश्वर शास्त्री मुसलगाँवकर, चौखम्बा संस्कृत संस्थान, वाराणसी ।

Syllabus of Post Graduate Course

Session: 2025-26	
Part A – Introduction	
Subject	Sanskrit
Semester	III
Name of the Course	M.A.
Course Code	M24-SKT-306, ब्राह्मणसाहित्यम्
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-2
Level of the course (As per Annexure-I)	500-599
Pre-requisite for the course (if any)	
Course Learning Outcomes(CLO):	CLO : 306.1 – महिदास-ऐतरेयविरचितं ऐतरेयब्राह्मणस्य चतुस्त्रिंशत्तमाद् अध्यायाद् यज्ञस्य चतुर्वर्णानां ज्योत्पत्तिं, यज्ञस्य पात्रैः स्फय-कपाल-अग्निहोत्र-हवणी-सूप-कृष्णाजिनादिभिः सह अनुष्ठानस्य विधेः ज्ञानं प्राप्यते । CLO : 306.2 – ऐतरेयब्राह्मणस्य पञ्चत्रिंशत्तमाद् अध्यायाद् छात्राः राजाविश्वन्तरमृगवपुत्ररामयोः सम्वादेन राजसूययज्ञे क्षत्रियेण सोमपानं कर्तव्यं न वा इति सविस्तरेण ज्ञास्यन्ते । एतेन सार्धं न्यग्रोध-उदुम्बरअश्वत्थादीनां भक्षणस्य लाभाः उल्लिखिताः सन्ति। CLO : 306.3 – एतस्मिन् घटके चरकसौत्रामणीयज्ञस्य स्वरूपं प्राप्यते । अश्विनीकुमाराभ्यां सोमविहीनेन्द्रस्य रक्षणकारणाद् एतस्य नाम सौत्रामणी सञ्जातः । CLO : 306.4 – शतपथब्राह्मणे वर्णितानेकाख्यानेषु मनुमत्स्याख्यानमप्येकं विद्यते । एतस्मिन् मनोः कथा अत्यन्ता मार्मिकी सरसा च वर्तते । मत्स्यावतारस्य बीजाः अस्यामेव कथायां सन्ति यत् केन प्रकारेण आप्लवाद् मनुना मत्स्यस्य सहाय्येन मानवीसृष्टिः रक्षिता । मानवानां नाशे सति संचितबीजेभ्यः यज्ञमाध्यमेन मानवस्य पुनः प्रादुर्भावः अस्मिन्

	भूतले अभवत् ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.	
Part B- Contents of the Course			
Instructions for Paper-Setter			
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।			
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।			
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।			
Unit	Topics		Contact Hours
I	निर्दिष्टग्रन्थस्य पारम्परिकभाष्यानुसारेण अध्ययनम् (संस्कृतमाध्यमेन) – ऐतरेयब्राह्मणम्, अध्यायः 34 । व्याख्याद्वय/टिप्पणीद्वय 2x7 = 14 अङ्काः		15
II	निर्दिष्टग्रन्थस्य पारम्परिकभाष्यानुसारेण अध्ययनम् ऐतरेयब्राह्मणम्, अध्यायः 35 व्याख्याद्वय/टिप्पणीद्वय 2x7 = 14 अङ्काः		15
III	निर्दिष्टग्रन्थस्य पारम्परिकभाष्यानुसारेण अध्ययनम् – शतपथ-ब्राह्मणम्, काण्डः 5 (चरकसौत्रामणी) । (क) व्याख्याद्वयम् 2x4=8 अङ्काः (ख) टिप्पणीद्वयम् 2x6=6 अङ्काः		15

IV	निर्दिष्टग्रन्थस्य पारम्परिकभाष्यानुसारेण अध्ययनम् शतपथ-ब्राह्मणम्, काण्डः 1, अध्याय-8, ब्राह्मणम् 1-2, मनु-मत्स्याख्यानम् (क) व्याख्याद्वयम् 2x4=8 अङ्काः (ख) आलोचनात्मकः प्रश्नः 1x6=6 अङ्काः	15
Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - ऐतरेय-ब्राह्मणम् (सायणभाष्यं एवं सरल हिन्दी व्याख्या), सम्पा. डॉ. सुधाकर मालवीय, तारा प्रिंटिंग वर्क्स, वाराणसी । - ऐतरेयालोचनम्, सत्यव्रत सामश्रमी । ए. वी. कीथ, द ऋग्वैदिक ब्राह्मणाज् । - शतपथ-ब्राह्मण, सम्पा. गंगाप्रसाद उपाध्याय (भाग 1 तथा 3) । - शतपथ-ब्राह्मण, (सायणभाष्य), नाग प्रकाशन, दिल्ली । - शतपथ-ब्राह्मण : एक सांस्कृतिक अध्ययन, उर्मिला देवी शम्भू, मेहरचन्द लक्ष्मण पब्लिकेशन्स, नई दिल्ली ।		

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-307, व्याकरणदर्शनम् (1)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-2		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 307.1 – घटकेऽस्मिन् पतञ्जलिमुनिविरचितमहाभाष्यस्य प्रथमाह्निकं पस्पशाह्निकमध्याप्यते । CLO : 307.2 भर्तृहरिणा प्रणीतस्य वाक्यपदीयस्य ब्रह्मकाण्डस्य दार्शनिकसिद्धान्तैः छात्राः परिचिताः भवन्ति । CLO : 307.3 – नागेशभट्टस्य वैयाकरणसिद्धान्तपरमलघुमञ्जूषायाः अनुसारं शक्तिनिरूपणं लक्षणानिरूपणञ्च छात्रान् कार्यते । CLO : 307.4 – अस्मिन् खण्डे छात्रान् वैयाकरणसिद्धान्तपरमलघुमञ्जूषायाः धात्वर्थनिर्णयो नाम विषयोऽध्याप्यते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			

Instructions for Paper-Setter

1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।

Unit	Topics	Contact Hours
I	महाभाष्यम् (पतञ्जलिः) संस्कृतमाध्यमेन महाभाष्यं, प्रथमम् आह्निकम् (पस्पशाह्निकम्) 14 अङ्काः (क) वार्तिकद्वयस्य व्याख्या । 2x4=8 अङ्काः (ख) एकः समीक्षात्मकः प्रश्नः । 1x6=6 अङ्काः	15
II	वाक्यपदीयम् (भर्तृहरिः) 14 अङ्काः वाक्यपदीयम्-ब्रह्मकाण्डम्, कारिका - (1-73) (क) कारिकाद्वयस्य व्याख्या । 2x4= 8 अङ्काः (ख) एकः निबन्धात्मकः प्रश्नः । 1x6= 6 अङ्काः	15
III	वैयाकरणसिद्धान्तपरमलघुमञ्जूषा (नागेशभट्टः) 14 अङ्काः वैयाकरणसिद्धान्तपरमं शक्तिनिरूपणम्, लक्षणानिरूपणम् अवतरणद्वयस्य व्याख्या अथवा एकः समीक्षात्मकः प्रश्नः।	15
IV	वैयाकरणसिद्धान्तपरमलघुमञ्जूषा वैयाकरणसिद्धान्तपरमलघु-धात्वर्थनिर्णयः 14 अङ्काः अवतरणद्वयस्य व्याख्या अथवा एक : समीक्षात्मकः प्रश्नः।	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः - व्याकरणभाष्यम् (भाग-1), सम्पा. वेदव्रत, हरियाणा साहित्य संस्थान, गुरुकुल झज्जर, 1962 - महाभाष्यम् (प्रथमो भागः), व्याख्या. युधिष्ठिर मीमांसक, रामलाल कपूर ट्रस्ट, रेवली, सोनीपत। - व्याकरणमहाभाष्य (कैयट-कृत 'प्रदीप' तथा नागेश-कृत 'उद्घोत' सहित,, भाग-1) सम्पा. आर. के. शास्त्री तथा डी. कुदाल, वाराणसी, 1987 - व्याकरणमहाभाष्यम् (आह्निक 1-5), व्याख्या. तथा सम्पा. मथुराप्रसाद मिश्र, चौखम्बा विद्याभवन, वाराणसी । - व्याकरणमहाभाष्य (आह्निक 1-2), संस्कृत व्याख्याकार माधव शास्त्री भण्डारी, हिन्दी व्याख्या. वेदप्रकाश विद्यावाचस्पति, मेहरचन्द लक्ष्मणदास पब्लिकेशन्स, दिल्ली । - पातञ्जल महाभाष्य में प्रत्याख्यात सूत्र : एक समीक्षात्मक अध्ययन, भीमसिंह वेदालंकार, निर्मल बुक एजेन्सी, कुरुक्षेत्र, 1987 - पातञ्जल महाभाष्य में अपूर्व कल्पनाएँ, भीमसिंह वेदालंकार, परिमल प्रकाशन, दिल्ली, 1988 - व्याकरणशास्त्रीय लोकन्यायरत्नाकर, भीमसिंह वेदालंकार, पेनमैन पब्लिशर्स, दिल्ली, 2001 - संस्कृतव्याकरणदर्शन, भीमसिंह वेदालंकार, विद्यानिधि शोध संस्थान, शीला कॉलोनी, कुरुक्षेत्र 2006 - व्याकरणमहाभाष्य : विद्यानिधि हिन्दी व्याख्या, भीमसिंह वेदालंकार, विद्यानिधि शोध संस्थान, शीला कॉलोनी, कुरुक्षेत्र, 2004 - वाक्यपदीयम् (ब्रह्मकाण्डम्), हिन्दी व्याख्या रामगोविन्द शुक्ल, काशी संस्कृत ग्रन्थमाला । - वाक्यपदीयम् (ब्रह्मकाण्डम्), व्याख्या वामदेवाचार्य, कृष्णदास अकादमी, वाराणसी ।		

13. वाक्यपदीयम् (ब्रह्मकाण्डम्), हिन्दी व्याख्या। शिवशंकर अवस्थी, चौखम्बा विद्याभवन, वाराणसी, 1990
14. भाषातत्त्व और वाक्यपदीय, सत्यकाम वर्मा, भारतीय प्रकाशन, दिल्ली, 1983
15. Vakyapadiya of Bhartrhari, Ed. K.A.S. Iyer, Delhi, 1964
16. Vakyapadiya of Bhartrhari (with the Comms : Vrtti & Paddhati), Ed. K.A.S. Iyer, Pune, 1995
17. परमलघुमञ्जूषा, संस्कृत व्याख्याकार पं. कालिकाप्रसाद शुक्ल, बडौदा, 1961
18. वैयाकरणसिद्धान्तपरमलघुमञ्जूषा, व्याख्याकार तथा सम्पा. डॉ. कपिलदेव शास्त्री, कुरुक्षेत्र विश्वविद्यालय प्रकाशन, कुरुक्षेत्र, 1975
19. परमलघुमञ्जूषा, सम्पा. जे. एल. त्रिपाठी, वाराणसी, 1985
20. परमलघुमञ्जूषा (टिप्पणीसहित), सम्पा. अलखदेव शर्मा, वाराणसी, 1981
21. P. C. Chakravarti, The Philosophy of Sanskrit Grammar, Kolkata.
22. Gaurinath Shastri, The Philosophy of Word and Meaning, Kolkata.
23. Gaurinath Shastri, A Study in the Dialectics of Sphota, Motilal Banarsidass, Delhi. 1980
24. व्याकरणदर्शनभूमिका रामाज्ञा पाण्डेय, सम्पूर्णानन्द संस्कृत विश्वविद्यालय, वाराणसी ।
25. व्याकरण की दार्शनिक भूमिका, सत्यकाम वर्मा, मुंशीराम मनोहरलाल, दिल्ली, 1971

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-308, पूर्वमीमांसादर्शनम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-2		
Level of the course (As per Annexure-I	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 308.1 –मानमेयोदयग्रन्थस्य अध्ययनेन मीमांसादर्शनस्य प्रमुखसिद्धान्तानां पदार्थानां च ज्ञानं भवति । CLO : 308.2 – मानमेयोदयग्रन्थस्य कारिकानां महत्त्वं अवगम्यते व्याख्यापद्धतेः च ज्ञानं जायते । CLO : 308.3 – मानमेयोदयग्रन्थस्य पङ्क्तीनां व्याख्यायाः निमित्तं मूलपाठस्य सूक्ष्मम् अध्ययनं क्रियते । CLO : 308.4 – पूर्वमीमांसादर्शनस्य प्रमुखसिद्धान्तानां टिप्पणीलेखनद्वारा वस्तुनिष्ठं ज्ञानं भवति ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			
Instructions for Paper-Setter			

1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।
3. द्वितीयतृतीयचतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।

Unit	Topics	Contact Hours
I	नारायणद्वयी, मानमेयोदयः (केवलं मेयभागः) 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 10 अङ्काः (ख) लक्षणव्याख्या/टिप्पणी 4 अङ्काः	15
II	मानमेयोदयः (केवलं मेयभागः) 14 अङ्काः सप्रसंगमूलकारिकाव्याख्या 2x7= 14 अङ्काः	15
III	मानमेयोदयः (केवलं मेयभागः) 14 अङ्काः सप्रसङ्गगद्यपंडितव्याख्या । 2x7= 14 अङ्काः	15
IV	मानमेयोदयः (केवलं मेयभागः) 14 अङ्काः विशदटिप्पण्यात्मकः प्रश्नः 2x7= 14 अङ्काः	15

Suggested Evaluation Methods

Internal Assessment: 30 Marks

> Theory

- Class Participation: 5 Marks
- Seminar/presentation/assignment/quiz/class test etc.: 5+5=10
- Mid-Term Exam: 15 Marks

End Term Examination: 70 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. मानमेयोदयःनारायणद्वयीप्रणीतः, व्या० स्वामी योगीन्द्रानन्दः, वाराणसी ।
2. Mānameyodaya, Eng. Tr. & Comm., Surya Narayan shastri, Adyar.
3. मीमांसादर्शनविमर्शः, वाचस्पति उपाध्यायः, भारतीयविद्याप्रकाशन, दिल्ली ।
4. मीमांसादर्शन का उद्भव और विकास, डॉ० प्रेमा अवस्थी, सुरभारती प्रकाशन, कानपुर ।
5. Studies in the schools of Pūrva Mimamsa, Ganganath Jha.
6. मानमेयोदयः व्या० डॉ० (श्रीमती) विजय रानी, परिमल पब्लिकेशन्स दिल्ली ।

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-309, काव्यशास्त्रम् (1)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	DEC-2		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 309.1 – एतेन संस्कृतमाध्यमेन काव्यशास्त्रीयाणामाचार्याणां व्याख्यापुरस्सरं काव्यलक्षणभेदप्रयोजनं सम्यगवाप्यते ।। CLO : 309.2 – अत्र शब्दार्थयोः स्वरूपं, अर्थात् अभिधां लक्षणां तद्भेदांश्च विद्यार्थिनः स्पष्टतया अवगच्छन्ति । प्रश्नान् अपि साधयन्ति तत्सम्बद्धान् । CLO : 309.3 – घटकेऽस्मिन् छात्राः सारल्येन शाब्दीव्यञ्जनां च सोद्धरणमवगच्छन्ति । छात्राः आलोचनात्मकान् प्रश्नान् विस्तारयन्ति विषयमधिगच्छन्ति च । CLO : 309.4 – अस्मिन् घटके रससूत्रस्य व्याख्यापूर्वकं चतुर्णां रससिद्धान्तानां ज्ञानं भवति । भेदसहिताः नवरसाः, भावध्वनयः, रसाभासाः, भावाभासाश्च ज्ञानगोचराः भवन्ति छात्रेभ्यः ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	साहित्यदर्पणः, प्रथमः परिच्छेदः 14 अङ्काः संस्कृतमाध्यमेन द्वयोः कारिकयोः व्याख्या । अथवा संस्कृतमाध्यमेन एकः आलोचनात्मकः प्रश्नः ।	15
II	काव्यप्रकाशः, द्वितीयः उल्लासः, लक्षणानिरूपणपर्यन्तम् 14 अङ्काः द्वयोः कारिकयोः व्याख्या । अथवा एकः सैद्धान्तिकः प्रश्नः ।	15
III	काव्यप्रकाशः, द्वितीयः उल्लासः, व्यञ्जनानिरूपणतः समाप्तिपर्यन्तम् । तृतीयः उल्लासः । 14 अङ्काः द्वयोः कारिकयोः व्याख्या अथवा एकः सैद्धान्तिकः/आलोचनात्मकः प्रश्नः	15
IV	काव्यप्रकाशः, चतुर्थः उल्लासः। 14 अङ्काः द्वयोः कारिकयोः व्याख्या अथवा एकः सैद्धान्तिकः प्रश्नः	15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: - काव्यप्रकाश, मम्मट, टीकाकार-वामन झलकीकर, भाण्डरकर ओरियण्टल रिसर्च इन्स्टीट्यूट, पूना। - काव्यप्रकाश, व्याख्याकार-आचार्य विश्वेश्वर, ज्ञानमण्डल लि०, वाराणसी । - काव्यप्रकाश, सम्पा० श्रीनिवास शास्त्री, साहित्य भण्डार, मेरठ । - साहित्यदर्पण, व्या० श्री शालग्रामशास्त्री, भारतीय कला प्रकाशन, दिल्ली ।	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-310, कल्पसाहित्यम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-3		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 310.1- कात्यायनश्रौतसूत्रं शुक्लयजुर्वेदस्य माध्यन्दिनशाखायाः महत्त्वपूर्णो ग्रन्थो वर्तते । श्रौतसूत्रेषु अग्नौ सम्पाद्यमानानां यज्ञयागा दनुष्ठानानां वर्णनं विद्यते । एतस्माद् घटकाद् छात्राः दर्शपौर्णमासस्य नियमव्रतान्, वेदिपरिग्रहं, समिद्होमपात्रस्थापनं, हविषां संस्कारः, पुरोडाशार्थं तण्डुलानां पेषणम् इत्यादीभिः एतेषां अलौकिकफलस्य ज्ञानं लप्स्यन्ते । CLO : 310.2 – पुरोडाशानां पाकविधिः, वेदिनिर्माणं, पत्नीसन्नहनं, प्रस्तरास्तरणम् इत्येतेषां विधीनां सूक्ष्मतया अध्ययनं कार्यते । CLO : 310.3 – पारस्करगृह्यसूत्रं शुक्लयजुर्वेदस्य महत्त्वपूर्णं गृह्यसूत्रं विद्यते । एतस्य प्रथमकाण्डेन वयं आवस्थ्याग्नेः आधानविधिं, विवाहगर्भाधानपुंसवनादिसंस्काराणां ज्ञानं प्राप्स्यामः । CLO : 310.4 – शुल्बसूत्रेभ्यः वेदिनिर्माणं, विविधवेदीनां मानप्रक्रिया, मण्डपानां निर्माणविधिः इत्येतैः सार्धं छात्राः आधुनिकज्यामितेः वास्तुशास्त्रस्य च ज्ञानं प्राप्स्यन्ति ।		
Credits – 4	Theory	Practical	Total
	4	--	4

Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			
Instructions for Paper-Setter			
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।			
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।			
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।			
Unit	Topics	Contact Hours	
I	निम्नलिखितश्रौतसूत्रस्य कर्कभाष्यानुसारेण विशदम् अध्ययनम् (संस्कृतमाध्यमेन) - कात्यायनश्रौतसूत्रम्-अध्यायः 2, कण्डिका 1-4 (दर्शपौर्णमासः)। (क) व्याख्या 4x3.5= 14 अङ्काः	15	
II	निम्नलिखितश्रौतसूत्रस्य कर्कभाष्यानुसारेण विशदम् अध्ययनम् - कात्यायनश्रौतसूत्रम्, अध्यायः 2, कण्डिका 5-8 (दर्शपौर्णमासः)। (क) व्याख्या 4x3.5= 14 अङ्काः	15	
III	निम्नगृह्यसूत्रस्य हरिहर-गदाधर-कर्क-भाष्यानुसारेण अध्ययनम् - पारस्करगृह्यसूत्रम्, प्रथमः, काण्डः । (क) सूत्रव्याख्या 3x3=9 अङ्काः (ख) आलोचनात्मकः प्रश्नः 1x5=5 अङ्काः	15	
IV	निम्नशुल्बसूत्रस्य विशदम् अध्ययनम् - कात्यायनशुल्बसूत्रम्, प्रथमः अध्यायः । सूत्रद्वयस्य व्याख्या अथवा एकः आलोचनात्मकः प्रश्नः।	14 अङ्काः	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. कात्यायन-श्रौतसूत्रम्, विद्याधर शर्मा-कृत सरलावृत्ति, अच्युत ग्रन्थमाला, वाराणसी । 2. कात्यायनश्रौतसूत्रम् (भाग 1-2), नित्यानन्द पन्त और गोपालशास्त्री नेने, चौखम्बा संस्कृत सीरीज, वाराणसी । 3. कात्यायनश्रौतसूत्रम्, कर्कभाष्य, डॉ. ए.वेबर, चौखम्बा संस्कृत सीरीज, वाराणसी, 1972 4. पारस्करगृह्यसूत्र, अनुवादक डॉ. सुधाकर मालवीय, तारा प्रिंटिंग वर्क्स, वाराणसी । 5. पारस्करगृह्यसूत्र, खेमराज श्रीकृष्णदास, बॉम्बे । 6. पारस्करगृह्यसूत्र (हरिहरगदाधर-भाष्य), सम्पा. डॉ. जगदीशचन्द्र, चौखम्बा संस्कृत सीरीज, वाराणसी। 7. पारस्करगृह्यसूत्र (हरिहरभाष्य सहित), डॉ. हरिदत्त शास्त्री, भारतीयविद्या प्रकाशन, दिल्ली । 8. कातीयशुल्बसूत्र, विद्याधरगौड-कृत सरलावृत्ति, अच्युत ग्रन्थमाला, वाराणसी । 9. कातीयशुल्बसूत्र, कर्क-महीधर-वृत्ति-सहित, चौखम्बा, वाराणसी । 10. पारस्करगृह्यसू., व्याख्याकार, डॉ. वेदपाल, सत्यार्थ प्रकाशन न्यास, कुरुक्षेत्र, 2008		

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-311, व्याकरणप्रक्रिया (1)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-3		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 311.1 – अस्मिन् घटके भट्टोजिदीक्षितविरचितस्य वैयाकरणसिद्धान्त-कौमुद्याः पूर्वार्धस्य अजन्तपुल्लिङ्गप्रकरणा- दारभ्य अजन्तनपुंसकलिङ्गप्रकरणस्य सूत्रोल्लेखपूर्वकं रूपसिद्धि- प्रक्रिया अध्याप्यते । CLO : 311.2 अस्मिन् भागे छात्राः वैयाकरणसिद्धान्तकौमुद्याः पूर्वार्धस्य स्त्रीप्रत्ययप्रकरणं सोदाहरणं सूत्रव्याख्यापूर्वकं पठिष्यन्ति। CLO : 311.3 – अस्मिन् खण्डे वैयाकरणसिद्धान्तकौमुद्यानुसारं अव्ययीभावसमासप्रकरणं तत्पुरुषसमासप्रकरणञ्च रूपसिद्धिप्रक्रियापूर्वकं सम्यक् अवगमिष्यन्ति । CLO : 311.4 – अस्मिन् घटके वैयाकरणसिद्धान्तकौमुद्यानुसारं तद्धितेष्वपत्याधिकरणस्य ज्ञानं छात्रान् कार्यते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		

Part B- Contents of the Course		
Instructions for Paper-Setter		
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	सुबन्तप्रकरणम् (वैयाकरणसिद्धान्तकौमुदी पूर्वार्धम्) (बालमनोरमा-तत्त्वबोधिनीसहिता) 14 अङ्काः अजन्तपुलिङ्ग प्रकरणाद् आरभ्य अजन्तनपुंसकलिङ्गप्रकरणं यावत्- (क) सूत्रव्याख्या 2x3= 6 अङ्काः (ख) रूपसिद्धिः 2x4= 8 अङ्काः	15
II	स्त्रीप्रत्ययप्रकरणम् संस्कृतमाध्यमेन (वैयाकरण सिद्धान्तकौमुदी पूर्वार्धम्) (बालमनोरमा-तत्त्वबोधिनीसहिता) 14 अङ्काः (क) सूत्रव्याख्या 2x3= 6 अङ्काः (ख) रूपसिद्धिः 2x4= 8 अङ्काः	15
III	समासप्रकरणम् - (वैयाकरणसिद्धान्तकौमुदी पूर्वार्धम्) (बालमनोरमा-तत्त्वबोधिनीसहिता) 14 अङ्काः अव्ययीभावसमासप्रकरणम्, तत्पुरुषसमासप्रकरणम् (क) सूत्रव्याख्या 2x3= 6 अङ्काः (ख) रूपसिद्धिः 2x4= 8 अङ्काः	15
IV	तद्धितप्रकरणम् - (वैयाकरणसिद्धान्तकौमुदी-पूर्वार्धम्) (बालमनोरमातत्त्वबोधिनी सहिता) 14 अङ्काः अपत्याधिकारप्रकरणे 'समर्थानां प्रथमाद् वा' (सूत्रसंख्या 1072) इति सूत्राद् आरभ्य 'क्षुद्राभ्यो वा' (सूत्र संख्या 1137) इति सूत्रं यावत्।	15

	(क) सूत्रव्याख्या (ख) रूपसिद्धिः	2x3= 6 अङ्काः 2x4= 8 अङ्काः	
Suggested Evaluation Methods			
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks			End Term Examination: 70 Marks
Part C-Learning Resources			
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः 1. वैयाकरणसिद्धान्तकौमुदी (बालमनोरमा-तत्त्वबोधिनी-सहिता) (पूर्वार्द्धम्), भट्टोजिदीक्षित, मोतीलाल बनारसीदास, दिल्ली । 2. वैयाकरणसिद्धान्तकौमुदी (भाग 1-2), व्याख्या. गोपालदत्त पाण्डेय, चौखम्बा सुरभारती, वाराणसी। 3. वैयाकरणसिद्धान्तकौमुदी (समासप्रकरणम्) व्याख्या. आचार्य जगदीश शास्त्री तथा मधुबाला शर्मा, मोतीलाल बनारसीदास, दिल्ली । 4. Siddhantakaumudi, (Vol. I), Eng. Tr. S. C. Vasu, Motilal Banarsidass, Delhi			

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-312, चार्वाकदर्शनम् जैनदर्शनम् च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-3		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 312.1 –सर्वदर्शनसंग्रहग्रन्थस्य प्रथमस्य तृतीयस्य च अध्यायद्वयस्य अध्ययनद्वारा चार्वाकजैनदर्शनयोः प्रमुखसिद्धान्तानां ज्ञानं प्राप्यते । CLO : 312.2 – कारिकानां सप्रसंगव्याख्या करणेन लेखनकौशलस्य विकासः भवति । CLO : 312.3 – गद्यपङ्क्तीनां व्याख्यया विषयस्य सूक्ष्मम् अध्ययनं भवति । CLO : 312.4 – चार्वाक-जैन-दर्शन-द्वयम् अधिकृत्य टिप्पणीलेखनद्वारा वस्तुनिष्ठं ज्ञानम् अभिवर्धते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थपञ्चम-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	माधवाचार्यः, सर्वदर्शनसंग्रहः, चार्वाकदर्शनं जैन दर्शनञ्च (प्रथम-तृतीययाध्यायौ) 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 10 अङ्काः (ख) टिप्पणी 4 अङ्काः	15
II	सर्वदर्शनसंग्रहः चार्वाकदर्शनं जैनदर्शनञ्च (प्रथम-तृतीयाध्यायौ) 14 अङ्काः सप्रसंगकारिकाव्याख्या 2x7=14 अङ्काः	15
III	सर्वदर्शनसंग्रहः, चार्वाकदर्शनं जैनदर्शनञ्च (प्रथम-तृतीयाध्यायौ) 14 अङ्काः सप्रसंगगद्यपङ्क्तिव्याख्या । 2x7=14 अङ्काः	15
IV	सर्वदर्शनसंग्रहः, चार्वाकदर्शनं जैनदर्शनञ्च (प्रथम-तृतीयाध्यायौ) 14 अङ्काः विशदटिप्पण्यात्मकः प्रश्नः 2x7=14 अङ्काः	15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: - माधवाचार्यकृतः सर्वदर्शनसंग्रहः, संस्कृतटीका, काशीनाथ वासुदेवअभ्यङ्करः, पुणे । - सर्वदर्शनसंग्रहः, आनन्दाश्रम, पुणे । - सर्वदर्शनसंग्रहः, व्या० उमाशंकर शर्मा ऋषि, चौखम्बा विद्याभवन, वाराणसी । - SarvadarshananaIngraha, Eng. Tr.E. B. Lowell and A. E. Gough, Parimal Pub. Delhi - चार्वाकदर्शन की शास्त्रीय समीक्षा, सर्वानन्द पाठक । - Lokayata, D. P. Chattopadhyaya - जैनदर्शन, मनन और मीमांसा, मुनि नथमल, चुरु । - जैनदर्शन, महेन्द्र कुमार शास्त्री, वाराणसी । - जैनदर्शन और प्रमाणशास्त्र-परिशीलन, दरबारी लाल कौठिया । - जैन धर्म, कैलाशचन्द्र शास्त्री, मथुरा ।	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-313, काव्यं काव्यशास्त्रस्य च इतिहासः		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-3		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 313.1 – अस्मिन् घटके छात्राः ग्रन्थस्य परिचयपुरस्सरं व्युत्पत्तिपरां साहित्यिकी व्याख्यामधिगच्छन्ति । CLO : 313.2 – अत्र ग्रन्थस्य संस्कृतमाध्यमेन निर्धारितानां श्लोकानां व्युत्पत्तिपरां व्याख्यां सम्यगवधारयन्ति । CLO : 313.3 – अस्मिन् घटके छात्राः कवेः, तत्सम्बद्धञ्च ग्रन्थमवगत्य काव्यसौष्टवनिर्देशपूर्वकं व्युत्पत्तियुतां व्याख्यामधिगच्छन्ति। CLO : 313.4 – अस्मिन् घटके निर्धारिताः काव्यशास्त्रिणः छात्रैः पठ्यन्ते । तेषां काव्यशास्त्रे योगदानं जानन्ति ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.	

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	नैषधीयचरितम्, प्रथमः सर्गः, 1-75 श्लोकाः 14 अङ्काः काव्यसौष्टवनिर्देशपूर्वकं सप्रसङ्गं श्लोकव्याख्या। 2x7=14 अङ्काः	15
II	नैषधीयचरितम्, प्रथमः सर्गः, 76-145 श्लोकाः 14 अङ्काः संस्कृतमाध्यमेन सप्रसङ्गश्लोकव्याख्या । 2x7=14अङ्काः	15
III	हर्षचरितम्, पञ्चमोच्छ्वासः 14 अङ्काः काव्यसौष्टवनिर्देशपूर्वकं सप्रसङ्गं गद्यव्याख्या 2x7=14अङ्काः	15
IV	काव्यशास्त्रस्य इतिहासः 14 अङ्काः भामहः, दण्डी, वामनः, आनन्दवर्धनः, अभिनवगुप्तः, मम्मटः, विश्वनाथः, जगन्नाथः। काव्यशास्त्रे आचार्याणां योगदानं तेषां च अभिमतानि आश्रित्य- एकः आलोचनात्मकः प्रश्नः अथवा टिप्पणीद्वयम्	15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः - नैषधचरितम्, सम्पा०, आचार्य शेषराज शर्मा रेग्मी, वाराणसी । - नैषधचरितम्, 'जीवतु' 'मणिप्रभा' संस्कृत-हिन्दी-टीका सहित, वाराणसी । - नैषधचरितम्, सम्पा० शिवराज शास्त्री, साहित्य भण्डार, मेरठ । - हर्षचरितम्, सम्पा० जगन्नाथ पाठक, चौखम्बा विद्याभवन, वाराणसी । - हर्षचरितम्, अंग्रेजी अनुवाद एवं टिप्पणियों सहित, सम्पा० पी० वी० काणे, दिल्ली । - हर्षचरित, बाणभट्ट, शङ्करकविवरित सङ्केत टीका, भावप्रकाशिका हिन्दी व्याख्या, सम्पा० डॉ० केशवराव मुसलगाँवकर, चौखम्बा संस्कृत संस्थान, वाराणसी । - हर्षचरितम् - एक सांस्कृतिक अध्ययन, वासुदेवशरण अग्रवाल । - संस्कृत काव्यशास्त्र, एम० के० डे । - History of Sanskrit Poetics, P. V. Kane, Motilal Banarsidass, Delhi - History of Sanskrit Literature, A. B. Keith, Delhi - अलंकारशास्त्र का इतिहास, कृष्ण कुमार, साहित्य भण्डार, मेरठ ।	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-314, ऋक्प्रातिशाख्यं छन्दांसि च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 314.1 – आचार्यशौनकेन विरचितं ऋक्प्रातिशाख्यं प्राचीनतया प्रामाणिकतया च महत्त्वपूर्ण स्थानं भजते । कस्यापि ग्रन्थस्य अवबोधाय पारिभाषिकशब्दानां ज्ञानमत्यन्तावश्यकं भवति। अस्मिन् घटके छात्रेभ्यः अनेकविधपारिभाषिकशब्दानां-स्वर-व्यंजन-स्वरभक्ति-रक्त-नामि इत्यादीनां बोधः कारयिष्यते । CLO : 314.2 – ऋक्प्रातिशाख्यस्य द्वितीये पटले प्रश्लिष्ट-क्षैप्र-उद्ग्राहादि-स्वरसन्धीनां तृतीयपटले च उदात्त-अनुदात्त-स्वरित-कम्पादिस्वराणां परिचयः कार्यते । CLO : 314.3 – अस्मिन् घटके वयं व्यंजनसन्धिविसर्जनीय-सन्धीनां ज्ञानं प्राप्स्यामः । CLO : 314.4 – वेदमन्त्राणामुच्चारणार्थं छन्दसां ज्ञानं महदावश्यकं भवति । अस्मिन् घटके छन्दसां सूक्ष्मदृष्ट्या अध्ययनं कारयिष्यते।		
Credits – 4	Theory	Practical	Total
	4	--	4

Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			
Instructions for Paper-Setter			
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।			
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।			
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।			
Unit	Topics		Contact Hours
I	ऋक्प्रातिशाख्यम्-पटलम्-1 14 अङ्काः संस्कृतमाध्यमेन सोदाहरणं सूत्रव्याख्या । 4x3.5= 14 अङ्काः		15
II	ऋक्प्रातिशाख्यम्-पटलम् 2-3 14 अङ्काः (i) सोदाहरणं सूत्रव्याख्या - 3x3=9 अङ्काः (ii) टिप्पणीद्वयम् - 2x2.5=5 अङ्काः		15
III	ऋक्प्रातिशाख्यम्-पटलम्-4 14 अङ्काः सोदाहरणं सूत्रव्याख्या । 4x3.5=14 अङ्काः		15
IV	प्रमुखवैदिकच्छन्दांसि (ऋक्प्रातिशाख्यानुसारेण) 14 अङ्काः लक्षणोदाहरणपूर्वकं छन्दद्वयस्य व्याख्या - 2x7=14 अङ्काः		15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. ऋक्प्रातिशाख्यम्, सम्पा० तथा अनुवादक मंगलदेव शास्त्री, चौखम्बा वाराणसी 2. ऋक्प्रातिशाख्यम्, (उत्पट-भाष्यसहितम्) सम्पा०, अनु० वीरेन्द्रकुमारवर्मा चौखम्बा संस्कृत प्रतिष्ठान, दिल्ली 3. ऋग्वेदप्रातिशाख्यम्- डा० ब्रजबिहारी चौबे (पटल 1-4), भारतीय विद्या प्रकाशन, दिल्ली 4. वैदिक छन्दोमीमांसा, पं० युधिष्ठिर मीमांसक, रामलाल कपूर ट्रस्ट, रेवली, सोनीपत 5. छन्दःशास्त्रम्, पिंगल, हलायुधभट्टकृत मृतसंजीवनी व्याख्या एवं वृत्तिसहित, चौखम्बा ओरियण्ट	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-315, व्याकरणप्रक्रिया (2)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	DEC-4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 315.1 – घटकेऽस्मिन् वैयाकरणसिद्धान्तकौमुद्याः उत्तरार्धस्य भ्वादिगणस्य भू-एध-व्रज-कमु-जि-वृत् इत्येतेषां धातूनां सूत्रवार्तिकपूर्वकं रूपसिद्धिप्रक्रिया बालान् बोध्यते । CLO : 315.2 अत्रापि वैयाकरणसिद्धान्तकौमुद्याः उत्तरार्धस्य भ्वादिगणस्य हृज्-णीज्-गै-पा-घ्रा-ष्ठा-दाण्-डुलभष्-गम्लृ-दृशिर्-डुपचष्-यज-वस-वद एतेषां धातूनां रूपसिद्धिप्रक्रियायाः बोधो छात्रान् भवति । CLO : 315.3 – वैयाकरणसिद्धान्तकौमुद्याः उत्तरार्धस्य अदादिप्रकरणस्य दुह्-आस्-शीङ्-इण् धातूनां, जुहोत्यादिप्रकरणस्य ओहाक्-डुधाञ् धातूनाञ्च ससूत्रवार्तिकोल्लेखपूर्वकं रूपसिद्धिप्रक्रियां छात्राः अवगमिष्यन्ति । CLO : 315.4 – अस्मिन् भागे छात्राः वैयाकरणसिद्धान्तकौमुद्यानुसारं णिच्प्रकरणं सन्प्रकरणमनु णिजन्त-सनन्तशब्दानां सिद्धिं साधयिष्यन्ति ।		
Credits – 4	Theory	Practical	Total
	4	--	4

Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			
Instructions for Paper-Setter			
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।			
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।			
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।			
Unit	Topics	Contact Hours	
I	वैयाकरणसिद्धान्तकौमुदी (उत्तरार्धम्) तिङन्तप्रकरणम् 14 अङ्काः भ्वादिप्रकरणम् - भू, एध, व्रज, कमु, जि, वृत् । (क) संस्कृतमाध्यमेन रूपसिद्धिः 2x3= 6 अङ्काः (ख) संस्कृतमाध्यमेन सूत्रव्याख्या 2x4= 8 अङ्काः	15	
II	वैयाकरणसिद्धान्तकौमुदी (उत्तरार्धम्) तिङन्तप्रकरणम् 14 अङ्काः भ्वादिप्रकरणम्-हृ, णी, गै, पा, घ्रा, ष्टा, दाण्, डुलभष्, गम्लृ, दृशिर्, डुपचष्, यज, वस, वद (क) सूत्रव्याख्या 2x3= 6 अङ्काः (ख) रूपसिद्धिः 2x4= 8 अङ्काः	15	
III	वैयाकरणसिद्धान्तकौमुदी (उत्तरार्धम्) तिङन्तप्रकरणम् 14 अङ्काः अदादिप्रकरणम् - दुह, आस, शीङ्, इण्, जुहोत्यादिप्रकरणम् - ओहाक्, डुधाञ् (क) सूत्रव्याख्या 2x3= 6 अङ्काः (ख) रूपसिद्धिः 2x4= 8 अङ्काः	15	
IV	वैयाकरणसिद्धान्तकौमुदी (उत्तरार्धम्) 14 अङ्काः णिच्प्रकरणम्, सन्प्रकरणम्	15	

	(क) सूत्रव्याख्या (ख) रूपसिद्धिः	2x3= 6 अङ्काः 2x4= 8 अङ्काः	
Suggested Evaluation Methods			
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks			End Term Examination: 70 Marks
Part C-Learning Resources			
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः 1. वैयाकरणसिद्धान्तकौमुदी (उत्तरार्धम्), भट्टोजिदीक्षित, (बालमनोरमा-तत्त्वबोधिनी-सहिता) मोतीलाल बनारसीदास, दिल्ली । 2. आख्यातिकः, स्वामी दयानन्द, वैदिक यन्त्रालय, अजमेर । 3. Siddhantakaumudi, (Vol. 2), Eng. Tr. S. C., Vasu, Motilal Banarsidass, Delhi			

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-316, बौद्धदर्शनम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC – 4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 316.1 – बौद्धदर्शनस्य सिद्धान्ताः आर्यसत्याः, अष्टाङ्गिकमार्गः इत्यादीनां अवबोधः अनेन घटकेन छात्रान् कार्यते। CLO : 316.2 – बौद्धदर्शनस्य अनीश्वरवादः, अनात्मवादः, निर्वाणम् इत्यादीनां सिद्धान्तानां ज्ञानं अस्मिन् घटके प्राप्यते। CLO : 316.3 – सर्वदर्शनसंग्रहस्य तृतीयाध्यायान्तर्गतानां सम्प्रदायानां सिद्धान्तानामवबोधः अस्य घटकस्य उद्देश्यः वर्तते। CLO : 316.4 – सर्वदर्शनसंग्रहस्य तृतीयाध्यायस्य सम्प्रदायानां सिद्धान्तानां ज्ञानमस्मिन् घटके भवति।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks: Internal Assessment Marks: End Term Exam Marks:	100 30 70	Time: 3 Hrs.	

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	बौद्धदर्शनस्य प्रमुखसिद्धान्ताः-आर्यसत्याः, अष्टाङ्गिकमार्गः, 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 10 अङ्काः (ख) टिप्पणी 4 अङ्काः	15
II	बौद्धदर्शनस्य प्रमुखसिद्धान्ताः अनीश्वरवादः, अनात्मवादः निर्वाणम् 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 10 अङ्काः (ख) टिप्पणी 4 अङ्काः	15
III	सर्वदर्शनसंग्रहः, तृतीयाध्यायः, बौद्धदर्शनस्य सम्प्रदायानां परिचयः सिद्धान्ताश्च 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 10 अङ्काः (ख) टिप्पणी 4 अङ्काः	15
IV	सर्वदर्शनसंग्रहः, तृतीयाध्यायः, बौद्धदर्शनस्य सम्प्रदायानां 14 अङ्काः परिचयः सिद्धान्ताश्च विशदटिप्पण्यात्मकः प्रश्नः 2x7= 14 अङ्काः	15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks

Part C-Learning Resources
Recommended Books/e-resources/LMS: - माधवाचार्यकृतः सर्वदर्शनसंग्रहः, संस्कृतटीका, काशीनाथ वासुदेव अभ्यङ्करः, पुणे । - सर्वदर्शनसंग्रहः, व्या० उमाशंकर शर्मा ऋषि, चौखम्बा विद्याभवन, वाराणसी । - न्यायबिन्दुटीका, व्या० श्रीनिवासशास्त्री, मेरठ । - बौद्धदर्शनमीमांसा, बलदेव उपाध्याय, वाराणसी । - बौद्धदर्शन, राहुल सांकृत्यायन । - Buddhist Logic (Vos I & II), Theodore Stchervatsky. - वाचस्पति मिश्र द्वारा बौद्ध दर्शन का विवेचन, श्रीनिवास शास्त्री, कुरुक्षेत्र । - अभिधर्मदेशना : बौद्ध सिद्धान्तों का विवेचन, धर्मचन्द्र जैन, कुरुक्षेत्र । - Buddhist Philosophy as Presented in Mimamsaslokavartika, Vijaya Rani, Parimal Pub. Delhi

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-SKT-317, ऐतिहासिककाव्यं खण्डकाव्यं च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-4		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 317.1 – अस्मिन् घटके निर्धारितानां श्लोकानां व्युत्पत्तिपरां व्याख्यां छात्राः ग्रन्थपरिचयपूर्वकमधिगच्छन्ति । CLO : 317.2 – अस्मिन् घटके निर्धारितैः श्लोकैः व्युत्पत्तिपरया व्याख्यया च विद्यार्थिनः संवर्द्धिताः जायन्ते । CLO : 317.3 – अस्मिन् घटके कवेः परिचयपूर्वकं निर्धारितानां श्लोकानां व्युत्पत्तिपरां व्याख्यां छात्राः समधिगच्छन्ति । CLO : 317.4 – अस्मिन् घटके छात्राः खण्डकाव्ये परिचिताः भूत्वा ग्रन्थस्य निर्धारितानां श्लोकानां व्युत्पत्तिपरां संस्कृतव्याख्यां सम्यगवधरयन्ति ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.	

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	विक्रमाङ्कदेवचरितम्, प्रथमः सर्गः, 1-60 श्लोकाः 14 अङ्काः छन्दोऽलङ्कारनिर्देशपूर्वकं सप्रसङ्गं श्लोकव्याख्या। 2x7=14 अङ्काः	15
II	विक्रमाङ्कदेवचरितम्, प्रथमः सर्गः, 61-118 श्लोकाः 14 अङ्काः छन्दोऽलङ्कारनिर्देशपूर्वकं सप्रसङ्गं श्लोकव्याख्या । 2x7=अङ्काः	15
III	भामिनीविलासः, प्रास्ताविकविलासः, 1-50 श्लोकाः। 14 अङ्काः काव्यसौष्टवनिर्देशपूर्वकं सप्रसङ्गं श्लोकव्याख्या 2x7= अङ्काः	15
IV	मेघदूतम्, पूर्वमेघः, 1-33 श्लोकाः 14 अङ्काः संस्कृतमाध्यमेन सप्रसङ्गं श्लोकव्याख्या 2x7= अङ्काः	15
Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

अनुशंसितग्रन्थाः

1. विक्रमाङ्कदेवचरित, बिल्हण, सम्पा. विश्वनाथ शास्त्री भारद्वाज, बनारस हिन्दू विश्वविद्यालय, वाराणसी ।
2. विक्रमाङ्कदेवचरित, रमा संस्कृत-हिन्दी टीका सहित, वाराणसी ।
3. विक्रमाङ्कदेवचरित, व्या. प्रतापनारायण पाण्डेय, भारतीय विद्या प्रकाशन, जवाहर नगर, दिल्ली।
4. विक्रमाङ्कदेवचरित, एक सांस्कृतिक अध्ययन, डॉ. ऋचा शुक्ला, नाग पब्लिशर्स, जवाहर नगर, दिल्ली ।
5. भामिनीविलास, जगन्नाथ, सम्पा. श्री राधेश्याममिश्र, चौखम्बा संस्कृत संस्थान, वाराणसी ।
6. मेघदूत, सम्पा. एम. आर. काले, मोतीलाल, बनारसीदास, दिल्ली ।
7. मेघदूत, संजीवनी टीका सहित, निर्णय सागर प्रैस, मुम्बई ।
8. मेघदूत (उत्तरमेघ), 'संजीवनी' टीकासहित, विमर्श, सहित हिन्दी व्याख्याकार-डॉ. राजेश्वर प्रसाद मिश्र, अक्षयवट प्रकाशन, इलाहाबाद (उ. प्र.) ।

Syllabus of Under Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	III		
Name of the Course	M.A.		
Course Code	M24-OEC-344, प्रयोगात्मक-संस्कृत		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	OEC		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 344.1 – अस्मिन् घटके छात्राः सामान्यसंस्कृतज्ञानद्वारा सामान्यसम्भाषणं करिष्यन्ति । CLO : 344.2 – एतत्घटकद्वारा छात्राः संस्कृतभाषायां दैनिक-वाक्यप्रयोगे समर्थाः भविष्यन्ति । CLO : 344.3 – अस्मिन् घटके विद्यार्थिनः संस्कृतभाषायाः फलशाकादिनामानि ज्ञास्यन्ति, गीतायाः श्लोकोच्चारणमपि करिष्यन्ति। CLO : 344.4 – एतद्घटकद्वारा छात्राः राज्यसंस्थानां राष्ट्रीयसंस्थानानां ध्येयवाक्यानि तेषामर्थं च ज्ञास्यन्ति ।		
Credits – 4	Theory	Practical	Total
	2	--	2
Contact Hours	30	--	30
Max. Marks: Internal Assessment Marks: End Term Exam Marks:	50 15 35	Time: 3 Hrs.	

Part B- Contents of the Course		
Instructions for Paper-Setter		
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः 7 अङ्कानाम् भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीय चतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	सामान्यसंस्कृतभाषा ज्ञानम् (संस्कृत सम्भाषणम्) आत्मपरिचयः 7अङ्काः	8
II	हिन्दीतः संस्कृते अनुवादः अथवा संस्कृतात् हिन्दी/अंग्रेजी भाषायाम् अनुवादः *दैनन्दिनप्रयुक्तवाक्यानाम् अनुवादः 7अङ्काः	7
III	(क) फलशाकादिनामानि, (ख) श्रीमद्भगवद्गीतायाः द्वयोः श्लोकयोः कण्ठस्थीकरणम् 7अङ्काः	8
IV	ध्येयवाक्यानि राज्यसंस्थानानां राष्ट्रीयसंस्थानानां ध्येयवाक्यानि 7अङ्काः	7

Suggested Evaluation Methods	
Internal Assessment: 15 Marks > Theory - Class Participation: 4 Marks - Seminar/presentation/assignment/quiz/class test etc.: 4marks - Mid-Term Exam: 7 Marks	End Term Examination: 35 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: - प्रारम्भिक रचनानुवाद कौमुदी, डॉ. कपिलदेव द्विवेदी, विश्वविद्यालय प्रकाशन, वाराणसी - बृहदनुवादचन्द्रिका, चबुधर हंस नौटियाल, मोतीलाल बनारसीदास, दिल्ली - श्रीमद्भगवद्गीता, गीताप्रेस, गोरखपुर	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-401, प्राकृतभाषा साहित्यं च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	CC-12		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 401.1 – प्राकृतप्रवेशिकायां संकलित-पाठानां माध्यमेन प्राकृतलेखकानां जीवनपरिचयः, तेषां कृतिभिः सह अस्मान् जैनधर्मस्य सिद्धान्तानां ज्ञानमपि प्राप्यते । CLO : 401.2 – प्राकृतप्रवेशिकायां संकलितपाठानां माध्यमेन तत्कालीनसमाजव्यवस्था-राजनैतिकव्यवस्था-धार्मिकव्यवस्थानां परिचयः प्राप्यते । । CLO : 401.3 – प्राकृतसाहित्यस्यैतिहासेन प्राकृतभाषायाः उत्पत्तिविकासयोश्च, जैनधर्मस्य आगमप्रवचनसारदिग्रन्थानां ज्ञानं प्राप्यते सार्धमेव, श्रमण-श्रमणिका-उपसकादिनां नियमानां बोधो भवति । CLO : 401.4 – प्राकृतभाषायाः अवबोधार्थं अस्मिन् घटके प्राकृत व्याकरणस्य ज्ञानं कार्यते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60

Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.
Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	प्राकृत प्रवेशिका, अधोनिर्दिष्टाः एव पाठाः 14 अङ्काः 1-8, 15-16, 18-19 : संस्कृतमाध्यमेन गद्यांशद्वयोः व्याख्या - 2x7=14 अङ्काः	15
II	प्राकृतप्रवेशिका-अधोनिर्दिष्टाः एव पाठाः 14 अङ्काः 9-14, 17, 27-28 सप्रसङ्गं श्लोकद्वयस्य व्याख्या - 2x7=14 अङ्काः	15
III	प्राकृतसाहित्यस्य इतिहासः 14 अङ्काः प्राकृतभाषायाः उद्भवः विकासश्च, भारतीय-साहित्यभाषाणां विकासक्रमे प्राकृतभाषाणाम् अवदानम्, आगमसाहित्यम्, भारतीय-इतिहासस्य निर्माणे प्राकृत भाषाणां प्राकृत साहित्यस्य च महत्त्वम् । द्वौ निबन्धात्मकौ प्रश्नौ । 2x7= 14 अङ्काः	15
IV	प्राकृत व्याकरणम् - 14 अङ्काः (क) सन्धिः, समासः कारकम् (7 अङ्काः) (ख) संज्ञारूपाणि, धातुरूपाणि (i) संज्ञारूपाणि-देव, मुणी, गुरु, पिआ, बुद्धि, राया (4 अङ्काः) (ii) धातुरूपाणि - कर, भू, हस, कथ, गम, दह, पुच्छ, ठा 3 अङ्काः (केवलं लट्, लृट्, लोट् एवं विधिलिङ्)	15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. प्राकृतप्रवेशिका, वाल्यूम-1, आल्फ्रेड सी वूल्लर (बनारसीदास जैन कृत हिन्दी अनुवाद) 2. अभिनव प्राकृत-व्याकरण, नेमिचन्द्र शास्त्री, वाराणसी, 1963 3. प्राकृत साहित्य का इतिहास-जगदीश चन्द्र जैन, वाराणसी । 4. प्राकृत साहित्य और उसका आलोचनात्मक इतिहास, नेमिचन्द्र शास्त्री 5. प्राकृत व्याकरण, हेमचन्द्र कृत सिद्धहेमशब्दानुशासन के आठवें अध्याय क हिन्दी अनुवाद, प्रो० डा० के० वा० आपटे (चौखम्बा संस्कृत भारती, 8)	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-402, अथर्वसंहिता सामसंहिता च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-5		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 402.1 –अथर्ववेदीयसूक्तैः राष्ट्रस्योन्नतिः, कृमीनां नाशः, दीर्घायोः प्राप्तिः कथम् भवेत् एतेषां विषयाणां ज्ञानं अस्माभिः प्राप्यते । CLO : 402.2 – अथर्ववेदस्य शौनकीयशाखायाः निर्दिष्टसूक्तैः राज्ञः चयनम्, संगठनम्, राष्ट्रसभायाः ज्ञानं कारयिष्यते । CLO : 402.3 – सामवेदीयपवमानकाण्डस्य मंत्रैः छात्रान् सोमदेवतः सोमरसस्वरूपस्य च ज्ञानं कार्यते सार्धमेव योगीनां कृते ज्ञानरूपीसोमरसस्य बोधोऽपि प्राप्यते । CLO : 402.4 – सायणकृत-ऋग्वेदभाष्यभूमिकायाः माध्यमेनवेदस्य सत्ता, मन्त्राणां सार्थक्यानर्थक्यं, वेदपौरुषेय-अपौरुषेयादि विषयाणां ज्ञानं प्राप्यते । आचार्यशौनकविरचितबहद्देवतयां देवतानां ज्ञानं प्राप्यते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60

Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.
Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	अथर्ववेदः (शौनकीयः) – मेधाजनन (1.1), राष्ट्राभिवर्धनम् (1.29), महद्ब्रह्म (1.32), कृमिनाशनम् (2.32), दीर्घायुप्राप्तिः (3.11) ब्रह्मौदनम् (4.34) कालः (19.53) । संस्कृतमाध्यमेन सप्रसंगं व्याख्या 2x7=14 अङ्काः	15
II	अथर्ववेदः (शौनकीय) 14 अङ्काः राज्ञः संवरणम् (3.4), सांमनस्य (6.64), राष्ट्रसभा (7.13), विवाहप्रकरण (14, 1-15) रोहित (13.1-15) मन्त्रद्वयस्य व्याख्या 2x7=14 अङ्काः	15
III	निम्नमन्त्राणां पारम्परिक-पाश्चात्यभाष्यकारानुसारेण गहनमध्ययनम् सामवेदः (कौथुमः), पूर्वार्चिकः, पवमानकाण्डः, अध्यायः-5 मन्त्रद्वयस्य व्याख्या 2x7=14 अङ्काः	15
IV	(क) सायणः, ऋग्वेदभाष्यभूमिका (अपौरुषेयविवेचनपर्यन्तम्) 14अङ्काः एकः आलोचनात्मकः प्रश्नः – 1x7=7 अङ्काः (ख) शौनकीय-बृहद्देवता, प्रथमोऽध्यायः-55 श्लोकाः (1-21, 42-45, 61-80, 91-100 पर्यन्तम्) श्लोकद्वयस्य व्याख्या- 2x3.5=7 अङ्काः	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. सायणकृत अथर्ववेदभाष्य, सम्पा. विश्वेश्वरानन्द वैदिक शोध-संस्थान, होशियारपुर (पंजाब) 2. अथर्ववेद का सुबोधभाष्य:, पं. श्रीपाद दामोदर सातवलेकर (पारडी) 3. अथर्ववेद-संहिता (भाग 1-2), डब्ल्यू डी. ह्मिटने । 4. अथर्ववेद (अध्यात्मभाष्य) भाग 1-9, विश्वनाथ वेदालंकार रामलाल कपूर ट्रस्ट, रेवली, सोनीपत 5. सामवेद का सुबोध भाष्य, पं. दामोदर सातवलेकर, पारडी 6. सामवेदसंहिता, डा. रामनाथ वेदालंकार, हरिद्वार 7. ऋग्वेदभाष्य भूमिका, 8. बृहद्देवता (शौनक) रामकुमार राय, चौखम्बा संस्कृत सीरिज ऑफिस 1963 9. बृहद्देवता (अध्याय-2), सम्पादक एवं अनुवादक, रामकुमार राय, चौखम्बा संस्कृत संस्थान, वाराणसी		

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-403, व्याकरणपरंपरा (2)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-5		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 403.1 – अस्मिन् घटके छात्राः भर्तृहरि-कैयट-कौण्डभट्ट-नागेशभट्टः इत्येतेषां व्यक्तित्वकृतित्वेन परिचिताः भवन्ति । CLO : 403.2 छात्राः अष्टाध्यायी-महाभाष्य-काशिकावृत्ति-वाक्यपदीयशब्दकौस्तुभवैयाकरणभूषणसार-वैयाकरणसिद्धान्तपरमलघु-मञ्जूषा इत्येतेषां ग्रन्थानां विषयवस्तुना अवगताः भवन्ति। CLO : 403.3 – अस्मिन् खण्डे अष्टाध्याय्याः प्रथमाऽध्यायस्य प्रथमपादान्तर्गताः निष्ठा-सर्वनाम-सर्वनामस्थान-सम्प्रसारण-लोप-टि-उपधा-वृद्धम् इत्येते संज्ञाः छात्रान् अध्याप्यन्ते । CLO : 403.4 – अस्मिन् भागे पाणिनीयशिक्षायां वर्णानामुत्पत्तिः वर्णानां विभागः, वर्णानामुच्चारणस्थानं छात्रान् अवबोध्यते।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		

Part B- Contents of the Course

Instructions for Paper-Setter

1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।

Unit	Topics	Contact Hours
I	वैयाकरणाः, व्यक्तित्वं कृतित्वं च 14 अङ्काः भर्तृहरिः, कैयटः, कौण्डभट्टः, नागेशभट्टः । एकः समीक्षात्मकः प्रश्नः । 1x14= 14 अङ्काः	15
II	वैयाकरणाचार्याणां रचनाः, अष्टाध्यायी, महाभाष्यम्, काशिकावृत्तिः, वाक्यपदीयम्, शब्दकौस्तुभः, वैयाकरणभूषणसारः, वैयाकरणसिद्धान्तपरमलघुमञ्जूषा । एकः समीक्षात्मकः प्रश्नः 1x14= 14 अङ्काः	15
III	पाणिनिः, अष्टाध्यायी-प्रथमोऽध्यायः, प्रथमः पादः संज्ञाविधायकसूत्राणि। काशिकादिशा संस्कृतमाध्यमेन निष्ठा (1.1.26), सर्वनाम (1.1.27), सर्वनामस्थानम् (1.1.42-43), सम्प्रसारणम् (1.1.45), लोपः (1.1.60), टि (1.1.64), उपधा (1.1.65), वृद्धम् (1.1.73) । 14 अङ्काः (क) संज्ञाद्वयस्य व्याख्या 2x4 =8 अङ्काः (ख) संस्कृतभाषायां टिप्पणी 1x6 =6 अङ्काः	15
IV	पाणिनीय शिक्षा (सम्पूर्णा) 14 अङ्काः कारिका/श्लोकद्वयस्य व्याख्या 2x7= 14 अङ्काः	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks ➤ Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः 1. संस्कृत-व्याकरणशास्त्र का इतिहास (भाग 1-2), युधिष्ठिर मीमांसक, रामलाल कपूर ट्रस्ट, रेवली, सोनीपत । 2. संस्कृत व्याकरण का उद्भव और विकास, सत्यकाम वर्मा, मोतीलाल बनारसीदास, दिल्ली । 3. संस्कृतव्याकरणदर्शन, रामसुरेश त्रिपाठी, राजकमल प्रकाशन, दिल्ली, 1972 4. पाणिनीय व्याकरण का अनुशीलन, रामशंकर भट्टाचार्य, इण्डोलोजिकल हाउस, वाराणसी, 1966 5. व्याकरणशास्त्रेतिहासः, वी. त्रिपाठी । 6. Belvalkar, shripada Krishna, An Account of the Different Existing Systems of Sanskrit Grammar, Bharatiya Vidya Prakashan, Varanasi. 7. George Cardona, Panini : A Survey of Research, Motilal Banarsidass, Delhi 8. Hartmnt Scharfe, Wiesbaden; A History of Grammatical Literature, Otta Marrasowitz, 1977 9. काशिकावृत्ति (न्यास-पदमञ्जरी-सहित), सम्पा. एवं हिन्दी टीकाकार-डॉ. जयशंकरलाल त्रिपाठी एवं सुधाकर मालवीय, तारा पब्लिकेशन, वाराणसी । 10. काशिका, हिन्दी टीकाकार-श्रीनारायण मिश्र । 11. अष्टाध्यायी (भाष्य) प्रथमावृत्ति (प्रथम भाग), पं. ब्रह्मदत्त जिज्ञासु, रामलाल कपूर ट्रस्ट, रेवली (सोनीपत) । 12. अष्टाध्यायी-काशिका (प्रथमाध्यायः), वेदपाल विद्याभास्कर, साहित्य भण्डार, मेरठ, 1985 13. वैयाकरणसिद्धान्तकौमुदी (उत्तरार्द्ध), भट्टोजिदीक्षित, मोतीलाल बनारसीदास, दिल्ली । 14. उणादिकोषः, स्वामी दयानन्द, सम्पा. युधिष्ठिर मीमांसक ।		

15. पाणिनीयशिक्षा, व्याख्याकार-श्रीनारायण मिश्र, गोकुलदास संस्कृत ग्रन्थमाला ।
16. Paniniyasiksa, Ed. & Tr. M. M. Ghosh, Delhi, 1986

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-404, योगदर्शनम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-5		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 404.1 –पातञ्जलयोगसूत्रस्य समाधिपादस्य अध्ययनेन योगस्य स्वरूपं महत्त्वं च अवगम्यते । CLO : 404.2 – छात्राः योगसूत्रव्यासभाष्यस्य अध्ययनेन सूत्राणाम् गूढार्थम् अवगन्तुं पारयन्ति । CLO : 404.3 – गद्यपङ्क्तीनां व्याख्या विषयस्य सूक्ष्माध्ययनार्थं प्रेरयति । CLO : 404.4 – योगदर्शनस्य सिद्धान्तानामोपरि टिप्पणीलेखनद्वारा वस्तुनिष्ठं ज्ञानम् अभिवर्धते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks: Internal Assessment Marks: End Term Exam Marks:	100 30 70	Time: 3 Hrs.	

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	योगसूत्रम्, व्यासभाष्यसहितम्, समाधिपादः। 14 अङ्काः (क) निबन्धात्मकप्रश्नः । 10 अङ्काः (ख) टिप्पणी 4 अङ्काः	14 अङ्काः 15
II	योगसूत्रम्, व्यासभाष्यसहितम्, समाधिपादः 14अङ्काः सप्रसङ्गसूत्रव्याख्या 2x7= 14 अङ्काः	15
III	योगसूत्रम्, व्यासभाष्यसहितम्, समाधिपादः 14 अङ्काः -सप्रसङ्गभाष्यपङ्क्तिव्याख्या 2x7= 14 अङ्काः	15
IV	योगसूत्रम्, व्यासभाष्यसहितम्, समाधिपादः 14 अङ्काः -विशदटिप्पणी 2x7= 14 अङ्काः	15
Suggested Evaluation Methods		
Internal Assessment: 30 Marks ➤ Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. पातञ्जल योगदर्शन, व्या० ब्रह्मलीन मुनि, चौखम्बा, वाराणसी ।
2. पाञ्जल योगदर्शन, व्या० स्वामी हरिहरानन्द आरण्य, मोतीलाल बनारसीदास, दिल्ली ।
3. Studies in Patanjali, S. N. Dasgupta.
4. पातञ्जल योगप्रदीप, ओमानन्द तीर्थ, गीताप्रेस, गोरखपुर ।

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-405, नाट्यशास्त्रम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-5		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 405.1 – अस्मिन् घटके छात्राः पारिभाषिकनाट्यशब्दावलीमथ च सिद्धान्तानभिजानन्ति । सिद्धान्तसम्बद्धां व्याख्यां समधिगच्छन्ति । CLO : 405.2 – अत्र टिप्पण्यात्मकान् प्रश्नान् संस्कृतमाध्यमेनावगच्छन्ति । CLO : 405.3 – अस्मिन् घटके कारिकाणां व्याख्यां प्रश्नानां साधनञ्च जानन्ति । CLO : 405.4 – अत्र नाट्यशास्त्रस्य निर्धारितानामाचार्याणां योगदानेन छात्राः सुपरिचिताः भवन्ति।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	दशरूपकम्, प्रथमः प्रकाशः, 14 अङ्काः द्वयोः कारिकयोः व्याख्या। अथवा एकः आलोचनात्मकः प्रश्नः ।	15
II	दशरूपकम्, तृतीयः प्रकाशः । 14 अङ्काः संस्कृतमाध्यमेन टिप्पणीद्वयम् । 2x7=अङ्काः	15
III	दशरूपकम्, चतुर्थः प्रकाशः । 14 अङ्काः द्वयोः कारिकयोः व्याख्या अथवा एकः आलोचनात्मकः प्रश्नः ।	15
IV	नाट्यशास्त्रस्य इतिहासः । 14 अङ्काः भरतः, रामचन्द्रगुणचन्द्रौ, सागरनन्दी, धनञ्जयः, विश्वनाथः, शिङ्गभूपालः, रूपगोस्वामी, शारदातनयः । नाट्यशास्त्रे आचार्याणां योगदानं तेषां च व्यक्तित्वं कृतित्वं चाधृत्य- एकः आलोचनात्मकः प्रश्नः अथवा टिप्पणीद्वयम् ।	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः 1. दशरूपक, धनञ्जय, सम्पा. डॉ. श्रीनिवास शास्त्री, साहित्य भण्डार, मेरठ । 2. दशरूपक, सम्पा. भोलाशंकर व्यास, चौखम्बा प्रकाशन, वाराणसी । 3. दशरूपक, सम्पा. श्रीचरणतीर्थ महाराज, चौखम्बा प्रकाशन, वाराणसी । 4. संस्कृत काव्यशास्त्र का इतिहास, डॉ. एस. के. डे., बिहार हिन्दी ग्रन्थ अकादमी, पटना । 5. संस्कृत काव्यशास्त्र का इतिहास, पी. वी. काणे, मोतीलाल बनारसीलाल, दिल्ली । 6. संस्कृत नाट्यसिद्धान्त, रमाकान्त त्रिपाठी, चौखम्बा विद्याभवन, वाराणसी । 7. अलंकारशास्त्र का इतिहास, कृष्णकुमार, साहित्य भण्डार, सुभाष बाजार, मेरठ । 8. संस्कृत ड्रामा, ए. बी. कीथ । 9. D. R. Mankad, Types of Sanskrit Dramas 10. C. V. Vaidya, History of Sanskrit Literature, Parimal Publications, Delhi		

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-406, आरण्यकोपनिषद्साहित्यम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-6		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 406.1 –अरण्ये पठनात् ऐते आरण्यकाः कथ्यन्ते । तैत्तिरीयारण्यकस्य द्वितीयप्रपाठकस्य प्रथमदशानुवाकानां माध्यमेन छात्राः यज्ञोवीतस्य सव्यप्राचीनवीति-भेदान्, संध्योपासनायाः विधिं, प्रायश्चित्तस्वरूपं, कुष्माण्डहोम, स्वाध्यायं, पंचयज्ञानां च ज्ञानं प्राप्स्यन्ते । CLO : 406.2 – एतस्मिन्घटके अयाजनीयेन यज्ञकरणे दक्षिणायाः आदान-प्रदानेसति, प्रायश्चित्तं स्वाध्यायः, ध्रुवध्यानं, दिगुपस्थानादिविषयाणां माध्यमेन कर्मकाण्डस्य गूढता अवबोध्यते। CLO : 406.3 – वेदस्यान्तिमभागकारणाद् सारभूतसिद्धान्तानां प्रतिपादकत्वात् उपनिषदेव वेदान्तनाम्ना विख्यातमस्ति तैत्तिरीयोपनिषदा वयं शिक्षयाः स्वरूपं, दीक्षान्ते विद्यार्थिनं प्रदीयमानं उपदेशं, पंचविद्यासहितोपासना इत्यादीनां ज्ञानं प्राप्नुमः। CLO : 406.4 – मुण्डकोपनिषदा छात्राः विद्यायाः परा-अपरा स्वरूपं, अग्नेः सप्तजिह्वाः, अक्षराविनाशी ब्रह्मणः स्वरूपं, मोक्षप्राप्तेः साधनानां ज्ञानं प्राप्स्यन्ते ।		
Credits – 4	Theory	Practical	Total
	4	--	4

Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			
Instructions for Paper-Setter			
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।			
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।			
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।			
Unit	Topics		Contact Hours
I	तैत्तिरीयारण्यकम्, प्रपाठकः 2, अनुवाकाः 1-10 14 अङ्काः प्रकरणद्वयस्य संस्कृतेन माध्यमेन व्याख्या- 2x7 = 14 अङ्काः		15
II	तैत्तिरीयारण्यकम्, प्रपाठकः 2, अनुवाकाः 11-20 14 अङ्काः (क) प्रकरणद्वयस्य व्याख्या - 2x5=10 (ख) टिप्पणी - 1x4=4		15
III	शांकरभाष्यानुसारेण गहनम् अध्ययनम् तैत्तिरीयोपनिषद् 14 अङ्काः (क) प्रकरणद्वयस्य व्याख्या - 2x5=10 (ख) टिप्पणी/प्रश्नः - 1x4=4		15
IV	निम्नलिखितोपनिषदः शांकरभाष्यानुसारेण गहनम् अध्ययनम् 14 अङ्काः मुण्डकोपनिषद् (क) मन्त्रद्वयस्य व्याख्या - 2x4=8 अङ्काः (ख) आलोचनात्मक प्रश्नः 1x6=6 अङ्काः		15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: - तैत्तिरयारण्यकम्, सायण भाष्य, आनन्दाश्रम, पूना - तैत्तिरयारण्यकम्, भाष्यकार-भट्टभास्कर - तैत्तिरीयोपनिषद् (शांकरभाष्य), गीता प्रेस गोरखपुर - मुण्डकोपनिषद् (शांकरभाष्य), गीताप्रेस गोरखपुर - ईशादि नौ उपनिषद्, गीताप्रेस, गोरखपुर - उपनिषद् दर्शन का रचनात्मक सर्वेक्षण, रामचन्द्र दत्तात्रेय रानाडे, अनु०. रामानन्द तिवार	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-407, व्याकरणदर्शनम् (2)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-6		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 407.1 – घटकेऽस्मिन् पतञ्जलिमुनिविरचितमहाभाष्यस्य द्वितीयाह्निकं प्रत्याहाराह्निकं पाठ्यते । अनेन छात्राः प्रत्याहारसूत्राणां वैज्ञानिकपक्षमवगमिष्यन्ति । CLO : 407.2 भर्तृहरिणा विरचितं वाक्यपदीयस्य ब्रह्मकाण्डस्य चतुःसप्ततिकारिकातः पञ्चपञ्चाशदधिकशतं कारिकापर्यन्तं अध्याप्यते । अनेन छात्राः स्फोटसिद्धान्तेन ध्वनिसिद्धान्तेन च परिचिताः भवन्ति । CLO : 407.3 – एतस्मिन् वैयाकरणसिद्धान्तपरमलघुञ्जूषायाः व्यञ्जनानिरूपणं स्फोटनिरूपणञ्च विषयं पाठ्यते । CLO : 407.4 – अस्मिन् घटके वैयाकरणसिद्धान्तपरमलघुमञ्जूषायाः कारकनिरूपणप्रकरणेन क्रियायाः निवर्तकं कारकम् अयं बिन्दुः सार्थको भविष्यति ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60

Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.
Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	पतञ्जलिः, महाभाष्यम् द्वितीयम् आह्निकम्(प्रत्याहाराह्निकम्) 14 अङ्काः (क) वार्तिकद्वयस्य व्याख्या 2x4= 8 अङ्काः (ख) एकः समीक्षात्मकः प्रश्नः 1x6 =6 अङ्काः	15
II	वाक्यपदीयम् (भर्तृहरिः) 14 अङ्काः ब्रह्मकाण्डम्-कारिकाः (74-155) (क) कारिकाद्वयस्य व्याख्या 2x4= 8 अङ्काः (ख) एकः निबन्धात्मकः प्रश्नः 1x6= 6 अङ्काः	15
III	नागेशभट्टः, वैयाकरणसिद्धांतपरमलघुमञ्जूषा, व्यञ्जनानिरूपणम्, स्फोटनिरूपणम् । 14 अङ्काः अवतरणद्वयस्य व्याख्या अथवा एकः समीक्षात्मकः प्रश्नः ।	15
IV	वैयाकरणसिद्धांतपरलघुमञ्जूषा (नागेशभट्टः)कारकनिरूपणम् 14 अङ्काः अवतरणद्वयस्य व्याख्या अथवा एकः समीक्षात्मकः प्रश्नः ।	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks ➤ Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः - व्याकरणमहाभाष्यम् (भाग-1), सम्पा. वेदव्रत, हरियाणा साहित्य संस्थान, गुरुकुल झज्जर, 1962 - महाभाष्यम् (प्रथमो भागः), व्याख्या. युधिष्ठिर मीमांसक, रामलाल कपूर ट्रस्ट, रेवली, सोनीपत। - व्याकरणमहाभाष्य (कैयट-कृत 'प्रदीप' तथा नागेश-कृत 'उद्घोत' सहित, भाग-1) सम्पा. आर. के. शास्त्री तथा डी. कुदाल, वाराणसी, 1987 - व्याकरणमहाभाष्यम् (आह्निक 1-5), व्याख्या. तथा सम्पा. मथुराप्रसाद मिश्र, चौखम्बा विद्याभवन, वाराणसी । - व्याकरणमहाभाष्य (आह्निक 1-2), संस्कृतव्याख्याकार-माधव शास्त्री भाण्डारी, हिन्दी व्याख्या. वेदप्रकाश विद्यावाचस्पति, मेहरचन्द लछमनदास पब्लिकेशन्स, दिल्ली । - पातञ्जल, महाभाष्य में प्रत्याख्यात सूत्र : एक समीक्षात्मक अध्ययन, भीमसिंह वेदालंकार, निर्मल बुक एजेन्सी, कुरुक्षेत्र, 1987 - पातञ्जल महाभाष्य में अपूर्व कल्पनाएँ, भीमसिंह वेदालंकार, परिमल प्रकाशन, दिल्ली, 1988 - व्याकरणशास्त्रीय लोकन्यासरत्नाकर, भीमसिंह वेदालंकार, पेनमैन पब्लिशर्स, दिल्ली, 2001 - संस्कृतव्याकरणदर्शन, भीमसिंह वेदालंकार, विद्यानिधि शोध संस्थान, शीला कॉलोनी, कुरुक्षेत्र 2004 - व्याकरणमहाभाष्य, विद्यानिधि हिन्दी व्याख्या-भीमसिंह वेदालंकार, विद्यानिधि शोध संस्थान, शीला कॉलोनी, कुरुक्षेत्र 2006 - वाक्यपदीयम् (ब्रह्मकाण्डम्), हिन्दी व्याख्या. रामगोविन्द शुक्ल, काशी संस्कृत ग्रन्थमाला । - वाक्यपदीयम् (ब्रह्मकाण्डम्), व्याख्या. वामदेवाचार्य, कृष्णदास अकादमी, वाराणसी ।		

13. वाक्यपदीयम् (ब्रह्मकाण्डम्), हिन्दी व्याख्या। शिवशंकर अवस्थी, चौखम्बा विद्या भवन, वाराणसी, 1990
14. भाषातत्त्व और वाक्यपदीय, सत्यकाम वर्मा, भारतीय प्रकाशन, दिल्ली, 1983
15. Vakyapadiya of Bhartrhari, Ed. K.A.S. Iyer, Delhi, 1964
16. Vakyapadiya of Bhartrhari (with the Comms : Vitti & Paddhati), Ed. K.A.S. Iyer, Pune, 1995
17. परमलघुमञ्जूषा, संस्कृतव्याख्याकार पं० कालिकाप्रसाद शुक्ल, बडौदा, 1961
18. वैयाकरणसिद्धान्तपरमलघुमञ्जूषा, व्याख्याकार तथा सम्पा० डॉ० कपिलदेव शास्त्री, कुरुक्षेत्र विश्वविद्यालय प्रकाशन, कुरुक्षेत्र 1975
19. परमलघुमञ्जूषा (टिप्पणीसहित), सम्पा० अलेखदेव शर्मा, वाराणसी, 1981
20. P. C. Chakravarti, The Philosophy of Sanskrit Grammar, Kolkata.
21. Gaurinath Shastri, The Philosophy of Word and Meaning, Kolkata
22. Gaurinath Shastri, A Study in the Dialectics of Sphota, Motilal Banarsidass, Delhi 1980
23. व्याकरणदर्शनभूमिका, रामाज्ञा पाण्डेय, सम्पूर्णानन्द संस्कृत विश्वविद्यालय, वाराणसी ।
24. व्याकरण की दार्शनिक भूमिका, सत्यकाम वर्मा, मुंशीराम मनोहरलाल, दिल्ली, 1971

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-408, अद्वैतवेदान्तदर्शनम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-6		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 408.1 – ब्रह्मसूत्र-शांकरभाष्यम् अद्वैतवेदान्तदर्शनस्य आधारभूतग्रन्थः अस्ति, यस्य समन्वयाध्यासस्य चतुःसूत्र्याः अध्ययनं भारतीयवेदान्तदर्शनपरम्परायाःपरिचयं ददाति । CLO : 408.2 – चतुःसूत्र्योपरि शाङ्करभाष्यस्य पङ्क्तिव्याख्या ब्रह्मजिज्ञासायाः ब्रह्मणः तटस्थलक्षणास्य शास्त्राप्रमाणकस्य च विषयाणां स्वरूपम् उद्घाटयति । CLO : 408.3 – धर्मराजाध्वरीन्द्र-विरचित-वेदान्तपरिभाषा अद्वैतवेदान्तदर्शनस्य प्रमाणमीमांसाम् उद्घाटयति, तस्य प्रत्यक्षखण्डस्य अध्ययनं वेदान्ताभिमतप्रमाणपरिचयसहितं नव्यन्यायशैल्याः ज्ञानमपि ददाति ।। CLO : 408.4 – वेदान्तपरिभाषायाः प्रत्यक्षखण्डः, प्रमालक्षणम्, प्रत्यक्षलक्षणम्, प्रत्यक्षस्य प्रयोजकान् इत्यादिविषयान् प्रतिपादयति ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60

Max. Marks: 100 Internal Assessment Marks: 30 End Term Exam Marks: 70		Time: 3 Hrs.
Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	ब्रह्मसूत्रम्, चतुःसूत्री, शाङ्करभाष्य-भामतीसहिता : 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 10 अङ्काः (ख) टिप्पणी 4 अङ्काः	15
II	ब्रह्मसूत्रम्, चतुःसूत्री, शाङ्करभाष्य-भामतीसहिता 14 अङ्काः प्रसंगपुरःसरं सूत्र-भाष्य-भामती-पङ्क्ति-व्याख्या 2x7=14 अङ्काः	15
III	धर्मरजाध्वरीन्द्रः, वेदान्तपरिभाषा, प्रत्यक्षपरिच्छेदः 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 10 अङ्काः (ख) टिप्पणी 4 अङ्काः	15
IV	वेदान्तपरिभाषा, प्रत्यक्षपरिच्छेदः 14 अङ्काः सप्रसङ्गं पङ्क्तिव्याख्या 2x7=14 अङ्काः	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - ब्रह्मसूत्रशाङ्करभाष्यम्, भामतीसहितम्, व्या० स्वामी योगीन्द्रानन्दः, वाराणसी । - ब्रह्मसूत्र, चतुःसूत्री, कामेश्वरप्रसाद झा, चौखम्बा, वाराणसी । - ब्रह्मसूत्र, चतुःसूत्री, व्या० आचार्य विश्वेश्वर । - Brahmasutrabhasya of Sankaracarya, Eng. Tr. & Notes Swami Gambhirananda, Advaita Ashram, Kolkata. - वेदान्तपरिभाषा, धर्मराजाध्वरीन्द्र, संस्कृतटीका अनन्तकृष्ण शास्त्री, कोलकाता । - वेदान्तपरिभाषा, व्या० गजानन शास्त्री मुसलगाँवकर, चौखम्बा, वाराणसी । - Vedanta Paribhasa, Eng. Tr. & Notes, Swami Madhavananda, Advaita Ashram, Kolkata. - Paul Deussen, The Vedanta System, हिन्दी अनु० संगमलाल पाण्डेय ।		

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-409, काव्यशास्त्रम् (2)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-6		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 409.1 – अस्मिन् घटके छात्राः काव्यदोषैः सम्यक्परिचिताः भवन्ति तत्सम्बद्धां कारिकाव्याख्यां प्रश्नसाधनञ्च जानन्ति । CLO : 409.2 – अस्मिन् घटके छात्राः गुणानां वैशिष्ट्यं प्रश्नसाधनञ्च सम्यगवगच्छन्ति । CLO : 409.3 – घटकेऽस्मिन् निर्धारितानामलङ्काराणां लक्षणोदाहरणस्पष्टीकरण-रूपैः परिचिताः भवन्ति । CLO : 409.4 – अत्र ध्वन्यालोकस्य लोचनसहितां व्याख्यां छात्राः समधिगच्छन्ति । ध्वनेः खण्डन-मण्डनपरम्परामपि जानन्ति ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		

Part B- Contents of the Course

Instructions for Paper-Setter

1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।
3. द्वितीयतृतीयचतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।

Unit	Topics	Contact Hours
I	काव्यप्रकाशः, सप्तमः उल्लासः, (पददोषाः, अर्थदोषाः, रसदोषाश्च) 14 अङ्काः द्वयोः कारिकयोः व्याख्या अथवा एकः आलोचनात्मकः/सैद्धान्तिकः प्रश्नः	15
II	काव्यप्रकाशः, अष्टमः उल्लासः। 14 अङ्काः द्वयोः कारिकयोः व्याख्या अथवा एकः सैद्धान्तिकः प्रश्नः	15
III	काव्यप्रकाशः, नवमदशमौ उल्लासौ । 14 अङ्काः निम्नलिखिताः अलङ्काराः :- वक्रोक्तिः, अनुप्रासः, यमकः, श्लेषः, उपमा, रूपकम्, उत्प्रेक्षा, समासोक्तिः, अपह्नुतिः, निदर्शना, अर्थान्तरन्यासः, दृष्टान्तः, विभावना विशेषोक्तिः, स्वभावोक्तिः, विरोधाभासः, संकरः, संसृष्टिः चतुर्णाम् अलङ्काराणां संस्कृतमाध्यमेन व्याख्या 4x3½=14	15
IV	ध्वन्यालोकः (लोचनसहितः), प्रथम उद्योतः । 14 अङ्काः द्वयोः कारिकयोः व्याख्या अथवा एकः आलोचनात्मकः/सैद्धान्तिकः प्रश्नः।	15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः - काव्यप्रकाश, टीका। वामन झलकीकर, भाण्डारकर ओरियण्टल रिसर्च इन्स्टीट्यूट, पूना । - काव्यप्रकाश, व्याख्या। आचार्य विश्वेश्वर, ज्ञानमण्डल लिमिटेड, वाराणसी । - काव्यप्रकाश, सम्पा। श्रीनिवास शास्त्री, साहित्य भण्डार, मेरठ । - ध्वन्यालोक, (लोचनसहित), व्याख्या। रामसागर त्रिपाठी, दिल्ली । - ध्वन्यालोक, (लोचनसहित), व्याख्या। आचार्य जगन्नाथ पाठक, चौखम्भा विद्याभवन, वाराणसी । - ध्वन्यालोक, व्याख्या। आचार्य विश्वेश्वर । - आनन्दवर्धन, रेवाप्रसाद द्विवेदी, मध्यप्रदेश अकादमी, भोपाल । V. Raghavan, Some Concepts of Alamkarasastra. P. C. Lahiri, Concepts of Riti and Guna. V. Raghavan, The Number of Rasas. S. K. De, Sanskrit, Poetics.	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-410, वेदव्याख्यापद्धतयः वेदभाष्यकाराश्च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-7		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 410.1 –एतस्मिन् घटके पारम्परिकभाष्यं, पदपाठस्य नियमाः, अनुक्रमणीसाहित्यस्य परिचयः, बृहद्देवताग्रन्थानां ज्ञानं लभ्यते । CLO : 410.2 – एतस्माद् घटकाद् वयं कल्पसूत्रं, निरुक्तं स्कन्दमहेश्वरभाष्यं माधवसायणयोः कृतीनां परिचयं प्राप्स्यामः । CLO : 410.3 – अस्मिन् घटके वेदानां भाष्यकर्तृणां पाश्चात्यविदुषां जीवनपरिचयं तेषां वेदभाष्यपद्धतेः ज्ञानं प्राप्यते। CLO : 410.4 – एतस्मिन् घटके वेदेषु भाष्यकर्तृणां भारतीयविदुषां जीवनपरिचयेन तैः लिखितभाष्यग्रन्थानां बोधो भवति ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		

Part B- Contents of the Course

Instructions for Paper-Setter

1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।

Unit	Topics	Contact Hours
I	प्राचीन-वैदिकाध्ययनविवरणम् : परिचयमात्रम् (संस्कृतमाध्यमेन) पारम्परिक भाष्यम्, पदपाठः, बृहदेवता, ऋक्सर्वानुक्रमणी। आलोचनात्मकः प्रश्न 1x14 = 14 अङ्काः	15
II	प्राचीन-वैदिकाध्ययनविवरणम् : परिचयमात्रम्-कल्पसूत्रम्, निरुक्तम्, स्कन्दमहेश्वर भाष्यम्, माधवः, सायणः । आलोचनात्मकः प्रश्नः 14 अङ्काः	15
III	आधुनिकवैदिकाध्ययनविवरणम् : पाश्चात्यविद्वांसः Wilson, Roth, Whitney, M.Muller, Oldenberg, Grassman, Hillebrant, Luders, Weber, caland. आलोचनात्मकः प्रश्न 1x14= 14 अङ्काः	15
IV	आधुनिकवैदिकाध्ययनविवरणम् : भारतीयविद्वांसः स्वामी दयानन्दः, अरविन्दः, मधुसूदनः ओझा, दामोदरपादसातवलेकरः। आलोचनात्मकः प्रश्नः 1x14= 14 अङ्काः	15

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks	End Term Examination: 70 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: - वेदभाष्यकारों की वेदार्थ-पद्धतियाँ, डा० रामनाथ वेदालंकार, विश्वेश्वरानन्द वैदिक शोध-संस्थान, होशियारपुर । - वैदिक व्याख्यानमाला, सम्पा० डॉ० कृष्णलाल, ईस्टर्न बुक लिंकर्स, दिल्ली, 1982 - वैदिक व्याख्या-विवेचन, डॉ० रामगोपाल, नेशनल पब्लिशिंग हाउस, दिल्ली - वैदिक साहित्य एवं संस्कृति का समीक्षात्मक इतिहास, डॉ० ओमप्रकाश पाण्डेय, न्यू एज पब्लिकेशन्स, 4835/24, अंसारी रोड, दरियागंज, नई दिल्ली, 2008 - वेद-व्याख्या की दिशाएँ, प्रो० ब्रजबिहारी चौबे, कात्यायन वैदिक साहित्य प्रकाशन, होशियारपुर, 2006 - वेदप्रामाण्य-मीमांसा एवं ऋषि दयानन्द, प्रो० श्रीनिवास शास्त्री, कुरुक्षेत्र विश्वविद्यालय, कुरुक्षेत्र।	

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-411, व्याकरणप्रक्रिया (3)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-7		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 411.1 – वैयाकरणसिद्धान्तकौमुद्याः हलन्तपुल्लिङ्गप्रकरणादारभ्य हलन्तनपुंसकलिङ्गप्रकरणं यावत् सोदाहरणं सूत्रोल्लेखपूर्वकं रूपसिद्धिप्रक्रियां छात्राः अवगमिष्यन्ति। CLO : 411.2 घटकेऽस्मिन् वैयाकरणसिद्धान्तकौमुद्याः पूर्वार्धस्य बहुव्रीहिसमासप्रकरणं द्वन्द्वसमासप्रकरणं एतयोः सूत्रव्याख्यापूर्वकं रूपसिद्धिप्रक्रिया प्रदर्श्यते । CLO : 411.3 – वैयाकरणसिद्धान्तकौमुद्याः तद्धितेष्वपत्याधिकारप्रकरणे “पितृष्वसुश्छण्” इति सूत्रादारभ्य “दैवयज्ञि०” इति सूत्रं यावत् छण्-ढञ्-यत्-ख-ढक्-अञ्- खञ्-छ-ठक्-ण-फिञ्-ण्य-इञ्-ष्यङ् इत्येते प्रत्ययाः छात्रान् पाठ्यन्ते । CLO : 411.4 – अस्मिन् खण्डे छात्राः वैयाकरणसिद्धान्तकौमुद्यानुसारं तद्धितेषु मत्वर्थीयप्रकरणान्तर्गतं मतुप्-लज्-इलच्-श-न-ण-विनि-इनि-अण्-उरच्-र-म-ईरन्-ईरच्- वलच्-इनि-ठन्-ठञ्-युस्-इत्यादीन् प्रत्ययान् ज्ञास्यन्ति।		
Credits – 4	Theory	Practical	Total
	4	--	4

Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			
Instructions for Paper-Setter			
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।			
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।			
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।			
Unit	Topics	Contact Hours	
I	सुबन्तप्रकरणम् (वैयाकरणसिद्धांतकौमुदी-पूर्वार्धम्) (बालमनोरमा-तत्त्वबोधिनी सहिता) 14 अङ्काः हलन्तपुंल्लिङ्गप्रकरणाद् आरभ्य हलन्तनपुंसकलिङ्गप्रकरणं यावत्। (क) सूत्रव्याख्या 2x3= 6 अङ्काः (ख) रूपसिद्धिः 2x4= 8 अङ्काः	15	
II	समास प्रकरणम् (वैयाकरणसिद्धांतकौमुदी-पूर्वार्धम्) 14 अङ्काः (बालमनोरमातत्त्वबोधिनीसहिता) बहुव्रीहिसमासप्रकरणम्, द्वन्द्वसमासप्रकरणम् । (क) सूत्रव्याख्या 2x3= 6 अङ्काः (ख) रूपसिद्धिः 2x4= 8 अङ्काः	15	
III	तद्धितप्रकरणम् (वैयाकरणसिद्धांतकौमुदी-पूर्वार्धम्) (बालमनोरमातत्त्वबोधिनीसहिता) अपत्याधिकारप्रकरणे 'पितृष्वसुशृण्व्' (सूत्रसंख्या 1138) इति सूत्राद् आरभ्य 'देवयज्ञि०'(सूत्रसंख्या 1201) इति सूत्रं यावत् । 14 अङ्काः (क) सूत्रव्याख्या 2x3= 6 अङ्काः (ख) रूपसिद्धिः 2x4= 8 अङ्काः	15	
IV	तद्धितप्रकरणम् (वैयाकरणसिद्धांतकौमुदी-पूर्वार्धम्) 14 अङ्काः	15	

(बालमनोरमातत्त्वबोधिनीसहिता) संस्कृतमाध्यमेन मत्वर्थीयप्रकरणम् ।		
(क) सूत्रव्याख्या	2x3= 6 अङ्काः	
(ख) रूपसिद्धिः	2x4= 8 अङ्काः	
Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः 1. वैयाकरणसिद्धान्तकौमुदी (पूर्वार्द्धम्) (बालमनोरमा-तत्त्वबोधिनी-सहिता), भट्टोजिदीक्षित, मोतीलाल बनारसीदास, दिल्ली । 2. वैयाकरणसिद्धान्तकौमुदी (भाग 1-2), व्याख्या. गोपालदत्त पाण्डेय, चौखम्बा सुरभारती, वाराणसी। 3. वैयाकरणसिद्धान्तकौमुदी (समासप्रकरणम्) व्याख्या. आचार्य जगदीश शास्त्री तथा मधुबाला शर्मा, मोतीलाल बनारसीदास, दिल्ली । 4. Siddhantakaumudi (Vol. I), Eng. Tr. S. C. Vasu, Motilal Banarsidass, Delhi.		

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-412, अद्वैतशैवागमः काश्मीरशैवदर्शनम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-7		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 412.1 – अभिनवगुप्तप्रणीतः परमार्थसारग्रन्थः अद्वैतशैवदर्शनस्य तत्त्वमीमांसायाः सृष्टिप्रक्रियायाः च परिचयं ददाति। CLO : 412.2 – परमार्थसार-ग्रन्थस्य कारिकाणां सप्रसंगव्याख्या सूक्ष्माध्ययनार्थं प्रदीयते । CLO : 412.3 – परमार्थसारपङ्क्तिव्याख्या वस्तुनिष्ठलेखन-कौशलं वर्धयति । CLO : 412.4 – अद्वैतशैवागमं दर्शनम् अधिकृत्य टिप्पणीलेखनद्वारा वस्तुनिष्ठं ज्ञानम् अभिवर्धते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थपञ्चम-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	अभिनवगुप्तः, परमार्थसारः (1-35 कारिकाः) 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 8 अङ्काः (ख) टिप्पणी 6 अङ्काः	15
II	अभिनवगुप्तः, परमार्थसारः (1-35 कारिकाः) 14 अङ्काः सप्रसंगमूलकारिकाव्याख्या 2x7= 14 अङ्काः	15
III	अभिनवगुप्तः, परमार्थसारः (36-70 कारिकाः) 14 अङ्काः सप्रसंगपङ्क्तिव्याख्या/कारिका व्याख्या 2x7= 14 अङ्काः	15
IV	अभिनवगुप्तः, परमार्थसारः (36-70 कारिकाः) 14 अङ्काः विशदटिप्पण्यात्मकः प्रश्नः 2x7= 14 अङ्काः	15
Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. काश्मीर शैवदर्शन, बलजिन्नाथ पण्डित ।
2. परमार्थसार, डॉ० कमला द्विवेदी, मोतीलाल बनारसीदास
3. Kashmirshaivism, The Secret Supreme, Swami Lakshmanjoo, Ishwar Ashram Trust
Srinagar
4. परमार्थसार, अभिनवगुप्त (योगराजकृत विवृति सहित) काश्मीर ग्रन्थावलि: श्रीनगर
5. परमार्थसार, सूर्यनारायण शुक्ल, अच्युतग्रन्थमाला कार्यालय बनारस ।

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-413, चम्पूकाव्यं काव्यादर्शश्च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-7		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 413.1 – घटकेऽस्मिन् चम्पूकाव्यस्य परिचयपूर्वकं व्युत्पत्तिपरां ग्रन्थसम्बद्धां श्लोकव्याख्यां छात्राः समधिगच्छन्ति। CLO : 413.2 – अत्र चम्पूकाव्ये गद्यांशानां व्याख्यां विद्यार्थिनः अर्थद्वयेन सम्यगवच्छन्ति । CLO : 413.3 – अत्र नलचम्पूकाव्यस्य प्रथमोच्छ्वासस्य समालोचनात्मकत्वेन विद्यार्थिनः विज्ञातारः भवन्ति । CLO : 413.4 – घटकेऽस्मिन् छात्राः दण्डिनः काव्यादर्शे समागतैः काव्य-गद्यकथा-आख्यायिकालक्षणैः सम्यक्परिचिताः जायन्ते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks: Internal Assessment Marks: End Term Exam Marks:	100 30 70	Time: 3 Hrs.	

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	नलचम्पूः, प्रथमः उच्छ्वासः । 14 अङ्काः काव्यसौष्टवनिर्देशपूर्वकं सप्रसंगं श्लोकव्याख्या 2x7=14	15
II	नलचम्पूः, प्रथमः उच्छ्वासः। 14 अङ्काः काव्यसौष्टवनिर्देशपूर्वकं सप्रसंगं गद्यव्याख्या 2x7=14	15
III	नलचम्पूः, प्रथमः उच्छ्वासः 14 अङ्काः एकः आलोचनात्मकः प्रश्नः	15
IV	काव्यादर्शः, प्रथमः परिच्छेदः (काव्यगुणान् व्यक्त्वा) 14 अङ्काः संस्कृतमाध्यमेन कारिका व्याख्या 2x7=14	15
Suggested Evaluation Methods		
Internal Assessment: 30 Marks ➤ Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

अनुशंसितग्रन्थाः

1. नलचम्पू, सम्पा. रामनाथ वेदालंकार, साहित्य भण्डार, सुभाष बाजार, मेरठ ।
2. नलचम्पू, चण्डपाल-कृत संस्कृतव्याख्या एवं हिन्दी रूपान्तरकार, डॉ. कैलासपति त्रिपाठी, चौखम्बा संस्कृत सीरीज ऑफिस, वाराणसी ।
3. नलचम्पू, सम्पा. परमेश्वरदीन पाण्डेय, वाराणसी ।
4. काव्यादर्श, सम्पा. धर्मेन्द्रनाथ गुप्त, दिल्ली ।
5. काव्यादर्श, सम्पा. श्रीकान्त पाण्डेय, साहित्य भण्डार, सुभाष बाजार, मेरठ ।
6. काव्यादर्श, शिवनारायण शास्त्री द्वारा रचित प्रसादिनी हिन्दी व्याख्यासहित, परिमल प्रकाशन, दिल्ली

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-414, वैदिकव्याकरणम्		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-8		
Level of the course (As per Annexure-I)	500-5		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 414.1 –अस्मिन् घटके वैदिकप्रक्रियायाः माध्यमेन संहितासु प्रयुक्तशब्दानां सिद्धेर्ज्ञानं प्राप्यते । CLO : 414.2 – एतस्मिन् घटके छात्राः धातूनां विभिन्नरूपैः सार्धं तेषां विविधार्थानां तुमर्थकादि-प्रत्यानाञ्च ज्ञानं प्राप्स्यन्ति । CLO : 414.3 – वेदानामवगमार्थं वेदाङ्गानामावश्यकता भवति, तेषु वेदाङ्गेषु शिक्षाग्रन्थानां स्वकीयवैशिष्ट्यं वर्तते । पाणिनीय शिक्षायाः माध्यमेन वयं स्वराणामुच्चारणस्थानादीनां सूक्ष्मज्ञानं प्रास्यामः ।। CLO : 414.4 – अस्मिन् घटके स्वामीदयानन्दविरचितसौवरस्य माध्यमेन वैदिक-स्वरउदात्त-अनुदात्त-स्वरित-प्रचय-कम्पादीनां ज्ञानं प्राप्यते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		

Part B- Contents of the Course		
Instructions for Paper-Setter		
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	वैदिक व्याकरणस्य अध्ययनम् (संस्कृतमाध्यमेन) भट्टोजिदीक्षितः, सिद्धान्तकौमुदी-वैदिकीप्रक्रिया, अध्यायः 1-3 संस्कृतमाध्यमेन सोदाहरणं सूत्र व्याख्या- 4x3.5=14 अङ्काः	15
II	भट्टोजिदीक्षितः, सिद्धान्तकौमुदी-वैदिकीप्रक्रिया अध्यायः 4-6 सोदाहरणं सूत्रव्याख्या - 4x3.5= 14 अङ्काः	15
III	शिक्षाग्रन्थस्य अध्ययनम्-पाणिनीयशिक्षा 14 अङ्काः (i) श्लोकद्वयस्य व्याख्या 2x4=8 अङ्काः (ii) आलोचनात्मकः प्रश्नः 1x6=6 अङ्काः	15
IV	वैदिक-स्वर-परिचयः (सौवरः' इत्यनुसारेण) - उदात्तः, अनुदात्तः, स्वरितः, प्रचयः, कम्पः, आमन्त्रितस्वरः, आख्यातस्वरः, प्रत्ययस्वरः, स्वरप्रकृतयः । निबन्धात्मकौ प्रश्नौ 2x7= 14 अङ्काः	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - वैयाकरणसिद्धान्तकौमुदी (वैदिकी प्रक्रिया), (हिन्दी व्याख्या सहित) सम्पा. उमाशंकर शर्मा ऋषि, चौखम्बा विद्याभवन, वाराणसी । - वैयाकरणसिद्धान्तकौमुदी (वैदिकी प्रक्रिया), हिन्दी व्याख्या., दामोदर महतो । - पाणिनपीयशिक्षा, 'आभा' हिन्दी टीका, प्रो. श्रीनारायणमिश्रद्व चौखम्बा साहित्य, वाराणसी । - पाणिनीयशिक्षा 'प्रदीप' हिन्दी टीका ('प्रह्लाद' हिन्दी व्याख्या सहित), सम्पा. गोस्वामी प्रह्लादगिरि वेदान्तकेशरी, चौखम्बा, वाराणसी । - सौवरः, स्वामी दयानन्द, वैदिक यन्त्रालय, अजमेर । - वैदिकस्वरमीमांसा,, पं. युधिष्ठिर मीमांसक, रामलाल कपूर ट्रस्ट, रेवली, सोनीपत - वैदिकस्वर-अवधारणा, डा. पारसनाथ त्रिपाठी, संदीप प्रकाश, बस्ती, 1978 । - स्वरप्रक्रियाप्रकाश, डॉ. वामदेव मिश्र, गीता संस्कृत प्रकाशन, राजमन्दिर, वाराणसी, 1975		

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-415, व्याकरणप्रक्रिया (4)		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-8		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 415.1 – वैयाकरणसिद्धान्तकौमुद्याः उत्तरार्धे तिङन्ते परिगणितानां प्रमुखधातूनां सूत्रवार्तिकोल्लेखपूर्वकं रूपसिद्धिप्रक्रिया अध्याप्यते यथा-दिवादिप्रकरणे-जनी, णश, स्वादिप्रकरणे-आप्लृ, तुदादिप्रकरणे-क्षिप्, इषु, विद्लृ, रुधादिप्रकरणे-भिदिर्, जि इन्धी, तनादिप्रकरणे-षणु, मनु, क्रयादिप्रकरणे-लूञ्, ग्रह, चुरादिप्रकरणे-पीड, ज्ञप इत्यादीनाम् । CLO : 415.2 अस्मिन् घटके वैयाकरणसिद्धान्तकौमुद्यानुसारं यङ्प्रकरणं, आत्मनेपदप्रकरणं, परस्मैपदप्रकरणं सोदाहरणं सूत्रोल्लेखपूर्वकं छात्राः अवगमिष्यन्ति । CLO : 415.3 – वैयाकरणसिद्धान्तकौमुद्याः उत्तरार्धे कृदन्तकृत्यप्रकरणे तव्य-तव्यत्-यत्-क्यप्-ण्यत्-अनीयर्-केलिमर् इत्येतैः प्रत्ययैः छात्राः परिचिताः भवन्ति । CLO : 415.4 – अस्मिन् घटके वैयाकरणसिद्धान्तकौमुद्यानुसारं पूर्वकृदन्त-प्रकरणे रूपसिद्धिपूर्वकं कृतप्रत्ययाः छात्रान् सम्यक् बोध्यन्ते ।		
Credits – 4	Theory	Practical	Total
	4	--	4

Contact Hours	60	--	60
Max. Marks:	100	Time: 3 Hrs.	
Internal Assessment Marks:	30		
End Term Exam Marks:	70		
Part B- Contents of the Course			
Instructions for Paper-Setter			
1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति ।			
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति ।			
3. द्वितीयतृतीयचतुर्थप्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।			
Unit	Topics	Contact Hours	
I	वैयाकरणसिद्धान्तकौमुदी, (उत्तरार्धम्) तिङन्तप्रकरणम् 14 अङ्काः दिवादि०-जनी, णश । स्वादि० आप्लृ, तुदादि०-क्षिप्, इषु, विद्लृ। रुधादि०-भिदिर्, जिङ्न्धी । तनादि०-षणु, मनु । क्रयादि०-लूञ्, ग्रह। चुरादि०-पीड, ज्ञप । (क) सूत्रव्याख्या 2x3=6 अङ्काः (ख) रूपसिद्धिः 2x4=8 अङ्काः	15	
II	वैयाकरणसिद्धान्तकौमुदी, (उत्तरार्धम्) 14 अङ्काः यङ्प्रकरणम्, आत्मनेपदप्रकरणम्, परस्मैपदप्रकरणम् (क) सूत्रव्याख्या 2x3=6 अङ्काः (ख) रूपसिद्धिः 2x4=8 अङ्काः	15	
III	वैयाकरणसिद्धान्तकौमुदी, (उत्तरार्धम्) 14 अङ्काः कृदन्ते कृत्यप्रकरणम् (क) संस्कृतमाध्यमेन सूत्रव्याख्या 2x3=6 अङ्काः (ख) संस्कृतमाध्यमेन रूपसिद्धिः 2x4=8 अङ्काः	15	
IV	वैयाकरणसिद्धान्तकौमुदी, (उत्तरार्धम्) 14 अङ्काः पूर्वकृदन्तप्रकरणम्	15	

	(क) सूत्रव्याख्या (ख) रूपसिद्धिः	2x3=6 अङ्काः 2x4=8 अङ्काः	
Suggested Evaluation Methods			
Internal Assessment: 30 Marks > Theory • Class Participation: 5 Marks • Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 • Mid-Term Exam: 15 Marks			End Term Examination: 70 Marks
Part C-Learning Resources			
Recommended Books/e-resources/LMS: अनुशंसितग्रन्थाः 1. वैयाकरणसिद्धान्तकौमुदी (बालमनोरमा-तत्त्वबोधिनी-सहिता) (उत्तरार्द्धम्), भट्टोजिदीक्षित, मोतीलाल बनारसीदास, दिल्ली । 2. आख्यातिकः - स्वामी दयानन्द, वैदिक यन्त्रालय, अजमेर । 3. Siddhantakaumudi (Vol. 2), Eng. Tr. S. C. Vasu, Motilal Banarsidass, Delhi.			

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-416, दार्शनिकसिद्धान्ताः आधुनिकविज्ञानञ्च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-8		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 416.1 –सर्वेषां प्राचीनभारतीयदर्शनानां प्रमुखसिद्धान्ताः तुलनात्मकाध्ययनार्थं समायोजिताः । CLO : 416.2 – भारतीयदार्शनिकसंप्रदायानां प्रमुखसिद्धान्तानां ज्ञानं प्राप्यते । CLO : 416.3 – भारतीयदर्शनस्य केषांचित् विषयाणाम् आधुनिकविज्ञानेन सह संबन्धः साधर्म्यं वा परीक्ष्यते । CLO : 416.4 – सृष्टि-पर्यावरण-शरीर-यज्ञादिविज्ञानानां भारतीयदर्शनालोके अध्ययनं क्रियते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks: Internal Assessment Marks: End Term Exam Marks:	100 30 70	Time: 3 Hrs.	

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थपञ्चम-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	दार्शनिकसम्प्रदायानां प्रमुखसिद्धान्ताः-लोकायतं, जैनं, बौद्धं, सांख्यं, योगश्च । 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 10 अङ्काः (ख) टिप्पणी 4 अङ्काः	15
II	दार्शनिकसम्प्रदायानां प्रमुखसिद्धान्ताः-वैशेषिकं, न्यायः, पूर्वमीमांसा, अद्वैतवेदान्तः अद्वैतशैवागमश्च । 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 8 अङ्काः (ख) टिप्पणी 6 अङ्काः	15
III	भारतीयदर्शनेषु आधुनिकविज्ञानतत्त्वानि पर्यावरणविज्ञानम्, औषधविज्ञानम्, शरीरविज्ञानम्, त्रिगुणत्रिदोषसिद्धान्तः सृष्टिविज्ञानम्, मनोविज्ञानम् । 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 8 अङ्काः (ख) टिप्पणी 6 अङ्काः	15
IV	भारतीयदर्शनेषु आधुनिकविज्ञानतत्त्वानि - परमाणुवादः, शब्दोत्पत्तिविज्ञानम्, भौतिकविज्ञानम्, सापेक्षतासिद्धान्तः, यज्ञविज्ञानम्, दिक्कालाकाशविचारः । 14 अङ्काः (क) निबन्धात्मकः प्रश्नः 8 अङ्काः (ख) टिप्पणी 6 अङ्काः	15

Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. भारतीय दर्शन का तात्त्विक सर्वेक्षण, डॉ. चन्द्रधर शर्मा, मोतीलाल बनारसीदास, दिल्ली । 2. History of Indian Philosophy, S. N. Dasgupta 3. History of Indian Philosophy, S. Radhakirshnan, Vol. I, II 4. Essentials of Indian Philosophy, M. Hiriana. 5. तत्त्व-मीमांसा की रूपरेखा, अनिरुद्ध झा, दिल्ली । 6. भारतीय दर्शन की मुख्य समस्याएँ, महेश भारतीय, गाजियाबाद । 7. वेद और उसकी वैज्ञानिकता, प्रियव्रत वेदवाचस्पति, गुरुकुल काँगड़ी, विश्वविद्यालय, हरिद्वार । 8. यज्ञ-विज्ञान रामप्रकाश । 9. वेद-विज्ञान-वीचिका, दयानन्द भार्गव, नाग प्रकाशन, दिल्ली । 10. भारतीय दर्शन (तत्त्व और ज्ञानमीमांसा के मौलिक सम्प्रतयय), जयदेव वेदालंकार, मोतीलाल बनारसीदास, दिल्ली । 11. An Introduction of Indian Philosophy, D. M. Dutta and S. C. Chatterjee. 12. Theory of Causation in Indian Philosophy, M. C. Bharatiya, Ghaziabad. 13. Pride of India, Sanskrit Bharati, New Delhi 14. Chemistry of Agnihotra, Swami Satya Prakash 15. Positive Sciences of the Ancient Hindus, B. N. Seal 16. Natural Science of the Ancient Hindus, Surendra Nath Dasgupta, ICPR Publication. 17. Vedic Meteorology, Ravi Prakash Arya		

18. Agnihotra, Vedic Samshodhana Mandala, Pune.
19. Srijnanamrtam, Ed. Vijaya Rani, Primal Prakashan, Delhi.
20. Vijnanasarathi, Ed. Vijaya Rani, Parimal Pub. Delhi
21. Maya in Physics, N. C. Panda.
22. Buddhism and Science, Buddhadasa, P. Kirtisinghe Motilal Banarsidass, Delhi.
23. Buddhism & Ecology, Ed. Martine Batchelor and Kerry Brown, Motilal Banarsidass, Delhi
24. Hinduism & Ecology, Ranchor Prime.
25. Sanskrit & Science, S. S. Janki, K.S.R. Institute, Chennai

Syllabus of Post Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-417, आधुनिककाव्यं गीतिकाव्यं च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	DEC-8		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 417.1 – घटकेऽस्मिन् छात्राः नाटके व्युत्पत्तिपरां व्याख्यां समधिगच्छन्ति । CLO : 417.2 – अत्र नाटके समागतानां सूक्तीनां सोद्धारणां व्याख्यां जानन्ति । CLO : 417.3 – अस्मिन् घटके छात्राः नाटकसम्बद्धान् आलोचनात्मकान् प्रश्नान् सम्यगभिजानन्ति । CLO : 417.4 – अस्मिन् घटके छात्राः मेघदूताभिधस्य खण्डकाव्यस्य संस्कृत-व्याख्यया उदबुद्धाः जायन्ते ।		
Credits – 4	Theory	Practical	Total
	4	--	4
Contact Hours	60	--	60
Max. Marks: Internal Assessment Marks: End Term Exam Marks:	100 30 70	Time: 3 Hrs.	

Part B- Contents of the Course		
Instructions for Paper-Setter 1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 70 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः चतुर्दशाङ्कानां भविष्यति । 2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 4 प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः 3½ अङ्कानां भविष्यति । 3. द्वितीयतृतीयचतुर्थप्रश्न-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।		
Unit	Topics	Contact Hours
I	कर्णाभिजात्यम्, नाटकम् । सप्रसंगं श्लोकव्याख्या । 14 अङ्काः 2x7=14	15
II	कर्णाभिजात्यम्, नाटकम् । सप्रसंगं सूक्तिव्याख्या । 14 अङ्काः 2x7=14	15
III	कर्णाभिजात्यम्, नाटकम् । एकः आलोचनात्मकः प्रश्नः 14 अङ्काः	15
IV	मेघदूतम्, उत्तरमेघः, 1-27 श्लोकाः संस्कृतमाध्यमेन श्लोकव्याख्या 14 अङ्काः 2x7=14	15
Suggested Evaluation Methods		
Internal Assessment: 30 Marks > Theory - Class Participation: 5 Marks - Seminar/presentation/assignment/quiz/class test etc.: 5+5=10 - Mid-Term Exam: 15 Marks		End Term Examination: 70 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

अनुशंसितग्रन्थाः

1. कर्णाभिजात्यम् नाटक, बलभद्रप्रसाद गोस्वामी, वाग्देवता प्रकाशन, बरेली ।
2. मेघदूत, कालिदास, सञ्जीवनी, चरित्रवर्धिनी, भावबोधिनी तथा विद्योतिनी टीकासहित, चौखम्बा संस्कृत संस्थान, वाराणसी ।
3. मेघदूत, सम्पा० एम० आर० काले, मोतीलाल बनारसीदास, दिल्ली ।
4. मेघदूत, संजीवनी टीकासहित, निर्णयसागर प्रैस, मुम्बई ।

Syllabus of Under Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	Sanskrit		
Semester	IV		
Name of the Course	M.A.		
Course Code	M24-SKT-418, यज्ञप्रक्रियायाः वैज्ञानिकाधारः वर्णोच्चारणं च		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	EEC		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	CLO : 418.1 – एतद्घटकद्वारा छात्राः यज्ञशब्दस्य अर्थम् अपि च यज्ञे प्रयुक्तपदार्थानां ज्ञानं करिष्यन्ति । CLO : 418.2 – यज्ञस्य सामग्री, तस्याः वैज्ञानिकः पक्षः, तद्भाषाः इत्यादीनां ज्ञानं घटकेनानेन भविष्यति । CLO : 418.3 – वर्णाणामुच्चारणं तस्य विधिः प्रयत्नाश्च एतेन घटकेन ज्ञास्यन्ते । CLO : 418.4 – अस्मिन् घटके छात्राः प्रमुखवैदिकमन्त्राणां उच्चारणविधिं ज्ञास्यन्ति ।		
Credits – 4	Theory	Practical	Total
	2	--	2
Contact Hours	30	--	30
Max. Marks: Internal Assessment Marks: End Term Exam Marks:	50 15 35	Time: 3 Hrs.	

Part B- Contents of the Course**Instructions for Paper-Setter**

1. प्रश्नपत्रे पञ्चप्रश्नाः भविष्यन्ति । प्रश्नपत्राय 35 अङ्काः निर्धारिताः सन्ति प्रत्येकं प्रश्नः 7अङ्कानां भविष्यति ।
2. प्रथमः प्रश्नः अनिवार्यः वर्तते । प्रश्नोऽयं पाठ्यक्रमस्य चतुर्घटकेषु आधारितः भविष्यति । अस्मिन् 7 लघूत्तरीयाः प्रश्नाः विकल्परहिताः प्रदास्यन्ते । प्रत्येकं प्रश्नः एकस्य अङ्कस्य भविष्यति ।
3. द्वितीयतृतीयचतुर्थप्रश्नम-प्रश्नानां निर्माणं यथाक्रमं चतुर्घटकेषु आधारितः भविष्यति। प्रत्येकस्मात् घटकात् द्वौ वैकल्पिकप्रश्नौ प्रदास्येते ।

Unit	Topics	Contact Hours
I	यज्ञशब्दस्य व्युत्पत्तिः, परिभाषा, यज्ञस्य लाभाः यज्ञकुण्डम्, यज्ञशाला, यज्ञपात्रम्। 7अङ्काः	8
II	यज्ञसामग्री, तद्वैज्ञानिकपक्षः, गुणाः पर्यावरणे तदप्रभावः। 7अङ्काः	7
III	वर्णानां उच्चारणस्थानानि, प्रयत्नाः च 7अङ्काः	7
IV	वैदिकमन्त्रोच्चारणविधिः 7अङ्काः 1. गायत्रीमन्त्रः 2. महामृत्युञ्जयमन्त्रः 3. शान्तिपाठः 4. सरस्वतीवन्दना	8

Suggested Evaluation Methods	
Internal Assessment: 30 Marks > Theory - Class Participation: 4 Marks - Seminar/presentation/assignment/quiz/class test etc.: 4marks - Mid-Term Exam: 7 Marks	End Term Examination: 35 Marks
Part C-Learning Resources	
Recommended Books/e-resources/LMS: - यज्ञ विमर्श, एक वैज्ञानिक अध्ययन, डॉ. राम प्रकाश, सत्यार्थप्रकाशन्यास, कुरुक्षेत्र - वर्णोच्चारण शिक्षा, श्रीमद्दयानन्द व्याख्या सहित, वैदिक यन्त्रालय अजमेर	

Syllabus of Post-Graduate Course

Session: 2025-26			
Part A – Introduction			
Subject	M.A. Sanskrit		
Semester	IV		
Name of the Course	Dissertation		
Course Code	M24-SKT-419		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	Dissertation		
Level of the course (As per Annexure-I)	500-599		
Pre-requisite for the course (if any)	NA		
Course Learning Outcomes(CLO):	CLO :1 – अनेन पाठ्यक्रमेण विद्यार्थिनः संस्कृतविषये शोधस्य विविधाः विधाः ज्ञास्यन्ति । CLO : 2 – संस्कृतभाषाकौशल-सहितं विषयस्य मौलिकं ज्ञानं प्राप्स्यन्ति । CLO : 3 – संस्कृतस्य पारम्परिकविषयेषु शोधेन भारतीयज्ञानपरम्परायाः अभिवर्धनं गूढज्ञानम् च भविष्यति । CLO : 4 – आधुनिकसन्दर्भे प्राचीनज्ञानस्य उपयोगितां स्थापयितुं समर्थाः भविष्यन्ति ।		
Credits – 12	Theory	Practical	Total
	12	--	12
Contact Hours	0	--	0
Max. Marks: 300 Internal Assessment Marks: End Term Exam Marks: 300		Time:	
Part B- Contents of the Course			
Instructions for Paper-Setter			

- Synopsis presentation & approval of Subject- August.
- Presentation & Seminar – January.
- Final Submission – 31st March.
- The evaluation of Dissertation and Viva-voce will be conducted by External & Internal Examiner.

	Topics	Contact Hours
	शोधप्रबन्ध : (Dissertation) विषयसम्बन्धिशिक्षकस्य निर्देशने छात्रेण एकः महत्त्वपूर्णः उपादेयः शोधविषयः चयनीयः, परीक्षायाश्च पूर्वं चयनितविषयस्य एकः शोधप्रबन्धः अवश्यं प्रस्तोतव्योऽस्ति । तत्र महत्त्वपूर्णाः निर्दिष्टाः शोधविषयाः सन्ति- वेदः, व्याकरणम्, दर्शनम्, साहित्यम्, धर्मशास्त्रम्, तन्त्रागमः, ज्योतिष, आयुर्वेदः, पाण्डुलिपि-प्रकाशनम्, अन्ये च संस्कृतनिबद्धाः प्रासङ्गिका समसामयिकाः विषयाः ।	
	Suggested Evaluation Methods	
	Viva-Voce	End Term Examination : 300

KURUKSHETRA UNIVERSITY KURUKSHETRA



Modified Scheme of Examinations and Syllabus

5th & 6th Semester

for Under-Graduate

Programme

Bachelor of Fashion Designing Interdisciplinary SCHEME-D

**Under Multiple Entry-Exit, Internship
and CBCS-LOCF in accordance to NEP-
2020**

w.e.f. 2025-26

Department of Home Science

SEMESTER-5

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A5 4 credit	B23-FDS-501	Traditional Costumes	3	3	20	50	70	3 hrs.
		Traditional Costumes Lab	1	2	10	20	30	4 hrs.
CC-B5 4 credit	B23-FDS-502	Men’s Clothing	3	3	20	50	70	3 hrs.
		Men’s Clothing Lab	1	2	10	20	30	4 hrs.
CC-C5 4 credit	B23-FDS-503	Fabric Ornamentation	3	3	20	50	70	3 hrs.
		Fabric Ornamentation Lab	1	2	10	20	30	4 hrs.
CC-M5 (V) 4credit (2+2)		From available VOC-5 pool list of 4 credits as per NEP						
Skill enhancement course	INTERNSHIP #4 credits							

#4 credits of internship, earned by a student during summer internship after 2nd semester or 4th semester, will be taken into account in 5th semester of the students who pursue three year UG Programme without taking exit option

SEMESTER-6

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A6 4 credit	B23-FDS-601	Marketing & Merchandising	3	3	20	50	70	3 hrs.
		Marketing & Merchandising Lab	1	2	10	20	30	4 hrs.
CC-B6 4 credit	B23-FDS-602	Crochet & Macrame Making	3	3	20	50	70	3 hrs.
		Crochet & Macrame Making Lab	1	2	10	20	30	4 hrs.
CC-C6 4 credit	B23-FDS-603	Dyeing & Printing	3	3	20	50	70	3 hrs.
		Dyeing & Printing Lab	1	2	10	20	30	4 hrs.
CC-M7(V) 4credit (2+2)		From available CC-M7(V) pool list of 4 credits as per NEP						

Semester-5

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Fashion Designing		
Semester	5		
Name of the Course	Traditional Costumes		
Course Code	B23-FDS-501		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	12 th Pass		
Course Learning Outcomes(CLO):	After completing the course, the learner will be able to: 1: Discuss and gain knowledge of traditional costumes scope and significance in present day status. 2: Know overview of fashion history and origin of Indian ancient civilization ages to present. 3: Describe in detail, clothing from a specific culture and ages. 4: Know about comparisons of clothing in different periods in Indian history. 5*: Interpret the historic context of textiles and costumes to a specific intended audience through poster presentations, scrap files, window displays and power point presentations.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5

Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50(TH) 20(P) =70		Time:3hrs(T) 4hrs(P)
Part B-Contents of the Course		
<u>Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.</u>		
<u>Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.</u>		
Unit	Topics	Contact Hours
I	Definition and Scope of Traditional Costumes. Significance of Traditional costumes and their social, religious and ceremonial role. Impact of Globalization on Traditional costumes.	12
II	Origin and History of Clothing, Dress in Neolithic Age, Stone Age, Bronze Age, Vedic Age. Changing Scenario of Indian costumes, Costumes and Fashion in Mohenjo-Daro period. Dress during Mauryan and Sunga period	12
III	Independence Movement and its influence in ushering in khadi .Dress during Kushan period .Dresses during Satvahna period and Gupta Period .Dress during Mughal period.	9
IV	Differentiate between Clothing, Costume and Fashion. Influence of Industrial Revolution on Textile Industry. Influence of world wars on fashion and changes in Traditional Costumes. Present Day status of Traditional costumes.	12
V*	Prepare a project file for at least three different Ages to depict their historic costumes along with various head dresses, footwear and other accessories. Students to prepare power point presentation and poster presentation on any one related topic of theory. Students should also make window display on any one of the above.	30
Suggested Evaluation Methods		

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Fashion Designing		
Semester	5		
Name of the Course	Men’s Clothing		
Course Code	B23-FDS-502		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	12 th Pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To familiarize with the growth of men’s wear 2. To understand different categories of men’s wear 3. To understand design details and special features for men 4. To acquire construction and finishing techniques for men’s wear 5. * Design men wear by understanding the design details and special features for men and also can give a finishing outlook to the garments.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50(TH) 20(P) =70		Time:3hrs(T) 4hrs(P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.</u>			

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	Detailed study of garment details like Collars, Sleeves, Fasteners Pockets Plackets and Trimmings used in men's clothing Factors to be considered while selecting clothing for males of different age groups	12
II	Sewing machines specifically used in men's clothing types Different categories of men's clothing their uses and features including activities, workout, office wear, party wear, wedding dresses etc.	12
III	Men's Fashion and Erasure of gender. -How men's clothing and fashion choices challenge or reinforce traditional gender roles. Influence of Men in shaping Fashion trends including street wear, tailored wear and casuals. Rise of Ethical and Sustainable clothing choices of men including materials, production processes and consumer behaviour.	12
IV	Athletic wear for men playing different games and work outs like- Gym wear Yoga Walking/jogging Swimming Cycling Biking Other few sport games and recreational activities	9
V*	Drafting, Pattern making and construction of following garments: Bu-shirt Trousers Men's Shirt Kurta and Pajama Shorts/Nickers	30
Suggested Evaluation Methods		

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Fashion Designing		
Semester	5		
Name of the Course	Fabric Ornamentation		
Course Code	B23-FDS-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	12 th Pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1: Know about fabric ornamentation styles and their importance. 2: Learn different historical perspectives of fabric ornamentation. 3: Study and compare Indian, Japanese and African traditions in ornamentation. 4: Learn the psychology of ornamentation. 5*: Learn and make use of latest ornamentation techniques in new styles and create designer articles of daily use and export.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50(TH) 20(P) =70		Time:3hrs(T) 4hrs(P)	
Part B-Contents of the Course			

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	Introduction; Define the term Fabric Ornamentation. Importance of Fabric Ornamentation and its use in fabric Industry. Historical overview and cultural significance of ornamentation .Role of Ornamentation in fashion and design	12
II	Historical Perspectives; --Evolution of Ornamentation, Development of Fabric Embellishment techniques from ancient times to present highlighting cultural and technological influences. Regional Traditions in Ornamentation; Distinct ornamentation styles from various cultures;-Indian embroideries, Japanese textiles, African beadwork, their symbolism and craftsmanship.	12
III	Various ornamentation techniques and their history, origin, stitches used, threads used, tools used and steps in processing the following • Gold & Silver embroidery • Mirror work • Sequin work • Patch work • Appliqué work • Quilting Techniques Application of trims laces and buttons in enhancing surface ornamentation.	9
IV	Impact of Technology on fabric ornamentation; Role of new printing machinery and digital tools in shaping ornamentation techniques and aesthetics. Psychology of fabric ornamentation; How ornamentation affects human perception and emotional responses, considering aspects of color, texture and, pattern. Future of fabric	12

Semester-6

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Fashion Designing		
Semester	6		
Name of the Course	Marketing and Merchandising		
Course Code	B23-FDS-601		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	12 th Pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1: gain knowledge about marketing& merchandising. 2: know about various market types. 3: gain knowledge regarding merchandiser and its roles in market. 4: learn about role of market facilitators 5*: learn about layout, design and illustration for dissimilar kinds of store display, window thematic displays and variety of brands in the market.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5

Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50(TH) 20(P) =70		Time:3hrs(T) 4hrs(P)
Part B-Contents of the Course		
<u>Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.</u>		
<u>Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.</u>		
Unit	Topics	Contact Hours
I	Marketing terminology: marketing, market niche, target customers, customer, vendor, supplier, franchise, market research, sales, mood board. Fashion market, introduction to marketing environment (macro & micro). Sales promotion techniques. Factors affecting consumers purchasing habits ,consumer buying process and consumer tasks.	12
II	Market and types of markets, Understanding target markets, consumer preferences and trends in textile and apparel industry. Marketing Mix-Analysing Role of 4p's product (fabric characteristics), price, place (distribution channels and promotion (advertising marketing campaigns) .	12
III	Merchandising-Introduction, role of merchandiser, types of merchandising. Terms pertaining to merchandising, sourcing and components of merchandising activities—Functions of merchandiser. Primary, Secondary, Retailing and auxiliary services; desired characteristics and locales of employment.	12
IV	Role and responsibilities of PP-(Preproduction) merchandiser, PD (product development) merchandiser in an export house. Marketing Facilitators; Advertising agencies, Transportation Firms Warehousing Firms, Economic and social aspects of Marketing	9
V*	Survey on famous brands available in market for men, women & children. (Make a portfolio) Development of Promotional Material-Brand, Logo, Visiting	30

	Card, Print advertisement and Shopping Bag. Window display for a specific store and boutique. Thematic window display.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: - • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: -		End Term Examination: 50 20
Part C-Learning Resources Recommended Books/e-resources/LMS: • Eascy M., "Fashion Marketing" Blackwell Science, 1994. • Kotler Philip, "Marketing Management "prentice Hall, New Delhi, 2000. • J. Jarnow and K.G. dickerson, "Inside the Fashion Business", Prentice Hall, 1997. • Elaine Stone, Jean A Samples, "Fashion Merchandising", Mc Graw Hill book, 1985. • Colbornbe Robert, "Visual Merchandising; The Business of Merchandise Presentation", Thomson Delinar Learning, USA.		

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Fashion Designing		
Semester	6		
Name of the Course	Crochet & Macrame Making		
Course Code	B23-FDS-602		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	12 th Pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Know about background of crocheting. 2. Know about various crocheting and macramé techniques. 3. Learn relation of mental health and crocheting. 4. Learn to make sustainable crochet and macramé in modern style. 5. *Acquire knowledge of making samples and articles using crochet and macrame making techniques.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50(TH) 20(P) =70		Time:3hrs(T) 4hrs(P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.</u>			

Libby Moore

4. Crochet Patterns: Complete Step-by-Step illustrated guide; Alexia Cassie
5. Macrame for Beginners and Beyond; Amy Mullins & Marnia Ryan Raison

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Fashion Designing		
Semester	6		
Name of the Course	Dyeing & Printing		
Course Code	B23-FDS-603		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	12 th Pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Gain knowledge of dyeing and its various techniques. 2. Learn management of dyeing waste at industrial level. 3. Learn present day scenario of printing in apparel industry. 4. Learn modern printing methods used in industries. 5. *apply and design motifs for modern printing methods used.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50(TH) 20(P) =70		Time:3hrs(T) 4hrs(P)	
Part B-Contents of the Course			

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	Definition of Dyeing and its introduction. Origin and History of Dyeing and various dyeing methods. Principles and Characteristics of Dyeing. Process and techniques used in following; Fibre Dyeing, Yarn Dyeing, Fabric Dyeing, Garment Dyeing their Advantages and Disadvantages.	9
II	Understanding Union Dyeing and Cross Dyeing Methods and their application in achieving desired colour effects. Management of Dye waste at cottage and industrial levels and practically in laboratories.	12
III	Printing-Meaning and significance, Present Day scenario of Printing in modern apparel industry. Government policies in Dyeing and Printing Industry Rules and Regulations to be followed by the owners.	12
IV	Modern Printing Methods used in different industries. Digital printing 3D Printing Flexographic Printing Laser printing AI powered 3D printing	12
V*	Students will prepare a file (sheet work) including various designs and patterns used in Digital printing 3Dprinting Flexographic printing Laser printing Each sheet should have original picture of the design selected for the same.	30

	Prepare a collage book including modern dyeing and printing pictures exploring their effects on various articles and garments available in the market. Student will submit a project on any latest dyeing or printing technique (mentioned above or any new currently used method) based on an industrial survey or visit. (Optional)s	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: - • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: -		End Term Examination: 50 20
Part C-Learning Resources Recommended Books/e-resources/LMS: 1. R. S. Prayag, Technology Textile Printing – Noyes Data Corporation. 2. V.A. Shenai (1977), Technology of Printing – Technology of Textile Processing, Vol. IV, Sevak Publication. 3. M.L. Gulrajani and Deepti Gupta (1990), Natural dyes and their Application to Textiles”, ed. I.T.I. Delhi Publications. 4. John and Margarot Cannow (1994), Dye Plants and Dyeing, The Herbert Press (UK).		

KURUKSHETRA UNIVERSITY KURUKSHETRA



Modified Scheme of Examinations and Syllabus

5th & 6th Semester

for

**Under-Graduate Programme
Bachelor of Fashion and Apparel Design (FAD)**

Interdisciplinary SCHEME-D

**Under Multiple Entry-Exit,
Internship and CBCS-LOCF in
accordance to NEP-2020
w.e.f. 2025-26**

Department of Home Science

SEMESTER-5

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A5 4 credit	B23-FAD-501	History of Indian Clothing & Art	3	3	20	50	70	3 hrs.
		History of Indian Clothing & Lab	1	2	10	20	30	3 hrs.
CC-B5 4 credit	B23-FAD-502	Fabric Fundamental Techniques	3	3	20	50	70	3 hrs.
		Fabric Fundamental Techniques Lab	1	2	10	20	30	3 hrs.
CC-C5 4 credit	B23-FAD-503	Men’s Clothing	3	3	20	50	70	3 hrs.
		Men’s Clothing Lab	1	2	10	20	30	3 hrs.
CC-M5 (V) 4credit (2+2)		From available VOC-5 pool list of 4 credits as per NEP						
Skill enhancement course	INTERNSHIP #4 credits							

#4 credits of internship, earned by a student during summer internship after 2nd semester or 4th semester, will be taken into account in 5th semester of the students who pursue three year UG Programme without taking exit option

SEMESTER-6

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-A6 4 credit	B23-FAD-601	Fashion Forecasting & Merchandising	3	3	20	50	70	3 hrs.
		Fashion Forecasting & Merchandising Lab	1	2	10	20	30	4 hrs.
CC-B6 4 credit	B23-FAD-602	World Costumes	3	3	20	50	70	3 hrs.
		World Costumes Lab	1	2	10	20	30	3 hrs.
CC-C7 4 credit	B23-FAD-603	Dyeing & Printing	3	3	20	50	70	3 hrs.
		Dyeing & Printing Lab	1	2	10	20	30	3 hrs.
CC-M6 4 credit	B23-FAD-604	Accessory design	3	3	20	50	70	3 hrs.
		Accessory design Lab	1	2	10	20	30	3 hrs.
CC-M7(V) 4credit (2+2)		From the available CC-M7(V) pool list of 4 credits as per NEP						

Semester 5

Session: 2025-26	
Part A - Introduction	
Subject	Bachelor of Fashion and Apparel Design
Semester	V
Name of the Course	History of Indian Clothing & Art
Course Code	B23-FAD-501
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	12 th pass
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Students will understand the evolution & characteristics of prehistoric civilisations 2. Students will understand about art and designs of the ancient civilisation of western world and their nature, and importance and need in the present time line. 3. Students acquired a clear knowledge about the various types of Indian textile and its historical backgrounds. 4. Students will gain the knowledge about the

	western clothing's and costumes along with the famous designers and their fashion career history, so they could able to get inspired. 5*.To impart students' knowledge about sketching and designing on sheet of Indian historic period and exhibited by various styles.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5 Hrs
Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50 (TH) 20 (P) =70		Time:3hrs (T) 3hrs (P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.</u>			
<u>Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.</u>			
Unit	Topics		Contact Hours
I	• Evolution of Dress, Functions of clothing • Beginning of Prehistoric civilization • Egypt • Mesopotamia		12
II	• Indus valley civilization • Vedic age • Middle ages • Mauryan's influence		9
III	• Satahanavanas period costumes and arts • Kushan's costumes • Gupta period costumes and designs • Muslim Period costumes and arts		12
IV	• Infiltration of western influence on costumes and arts. • Traditional costumes of different states of India		12

V*	- Costumes Stylization & Illustrations of all period's costumes on croquis and create any one costumes of any period by any method of garment making and follow design process. - Projected of any art sculpture of ancient civilization by DIY and exhibited.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 05 - Seminar/presentation/assignment/quiz/class test etc.: 05 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: - - Seminar/Demonstration/Viva-voce/Lab records etc.: 10 - Mid-Term Exam: -		End Term Examination: 50 20
Part C-Learning Resources Recommended Books/e-resources/LMS: - Flynn, D. 1971. Costumes of India, New Delhi, Oxford and IBH Publishing Company - Roshen Alkazi. Ancient Indian Costume - Ancient Indian Costumes Vol. I & II, Roshen Alkazi, National Book Trust, New Delhi, India, 2010 - A History of Western Art – 5th Edition, Laura Adams, Mc-Graw Hill, New Delhi, 2010. - Indian Art &Aesthetics: Endeavour & Entrepreneurial by Kamal Giri &Nandan Tiwari		

*Applicable for courses having practical component.

Semester 5

Session: Session: 2025-26	
Part A - Introduction	
Subject	Bachelor of Fashion and Apparel Design
Semester	V
Name of the Course	Fabric Fundamental Techniques
Course Code	B23-FAD-502
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	12 th pass
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Identify various knitting elements and machines to produce different types of knitted fabrics structures. 2. Review about the different industrial weft knit stitches. 3. Understand the various warp knitting structures and their uses. 4. Understand the different applications non-wovens, various raw materials required such as natural and man-made.
	5*.To impart students' knowledge about knitting and non-woven through create knits and exhibited by various styles.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5 Hrs
Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50 (TH) 20 (P) =70		Time:3hrs(T) 3hrs(P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.</u>			
<u>Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.</u>			
Unit	Topics	Contact Hours	
I	• Introduction to Knitting: Comparison of non-woven, woven and knitted fabrics, Comparison of warp and weft knitting. • Fundamental terms of knitting technology, elements and of knitting machines.	12	
II	• Introduction to weft knit structure:- Basic weft knit stitches: single jersey, rib, purl, interlock. Loop and needle diagram of basic structures. • Scope and need of weft knitting, requirement of hosiery yarn, common defects in weft knitting.	9	
III	• Introduction to warp knitting:- elements, Basic warp knit stitches: under-lap, overlap, closed-lap, open-lap. • Loop formation in tricot and raschel knitting machines. • Basic lapping movements in warp knitting.	12	
IV	• Introduction to Nonwovens:- Definitions of nonwovens, comparison of nonwoven and knitted fabric. • Tailor made classification of nonwoven and other classifications. • Fiber as raw material for nonwoven fabrics, end uses of nonwovens.	12	
V*	• Making basic knitted samples. • Making of knitted article using any one type of warp and weft knit stitches. • Development of fabric glossary. • Visit to Textile industry and knit wear industry in India	30	

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: - • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: -	End Term Examination: 50 20
Part C-Learning Resources Recommended Books/e-resources/LMS: • Marks A.T.C & Robinson. Principles of weaving. • Watson. Textile Color & Design. • Banerjee, N.N. Weaving. • Corbmen. Fibre to Fabric. Hollen, N. and Saddler, J. 1968. Textiles. New York, Macmilan Company.	

*Applicable for courses having practical component.

Semester 5

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Fashion and Apparel Design		
Semester	V		
Name of the Course	Men's Clothing		
Course Code	B23-FAD-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	12 th pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understanding of Practical application of menswear products for a global customer. 2. Impart knowledge about male physique and menswear. 3 Understanding and implementation of new technologies related to menswear design development, paper patterns 4. Understanding the style features in men's wear and implementation. 5. Impart knowledge about constructional detail		
	through men's garment making.		
Credits	Theory	Practical	Total

	3	1	4
Contact Hours	3	2	5 Hrs
Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50 (TH) 20 (P) =70		Time:3hrs (T) 3hrs (P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.</u>			
<u>Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.</u>			
Unit	Topics	Contact Hours	
I	- History of Men’s Wear - Practical Application and Analysis - Market Analysis - Material Science - Tailoring Techniques	12	
II	- Classification of Men’s Wear - Formal - Casual - Ethnic - Functional - Contemporary Styles - Understanding Men’s Body Types and Proportions	9	
III	- Role of Technology and Innovation in Modern Men’s Fashion - Study of Trims,Fasteners and Accessories used in Men’s Garments	12	
IV	- Colour Psychology and Colour Coordination in Men’s Fashion - Print and Surface Design Trends	12	

V*	• Making Paper Patterns of following garments:- 1. Shirt with and without yoke 2. Trousers 3. Hoods 4. Jackets 5. Shorts 6. Kurtas	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: - • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: -		End Term Examination: 50 20
Part C-Learning Resources Recommended Books/e-resources/LMS: • Bowers Lewis and Kettunen. Clothing Construction and Wardrobe Planning. • Carr and Lather. The Technology of Clothing Manufacture. • S. Baines and J.Hutton. Singer Sewing Book. • Gioello and Brake. Figure Types and Size Ranges. • Aldrich Winifred. Metric Pattern Cutting. Om Book Services. 1997. • Armstrong H.J. Pattern Making for Fashion Design. Longman. 2003. • Bray Natalia. More Dress Pattern Designing. Blackwell Science. 1999. • Cooklin Grey. Pattern Cutting for Women's Outer wear. Blackwell Science. 2001.		

*Applicable for courses having practical component.

Semester 6**Session: 2025-26****Part A – Introduction**

Subject	Bachelor of Fashion and Apparel Design
Semester	6
Name of the Course	Fashion Forecasting & Merchandising
Course Code	B23-FAD-601
CourseType: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6
Level of the course (As per Annexure-I	300-399
Pre-requisite for the course (if any)	12 th pass

Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. The student will understand, fashion phenomena with fashion theories and frameworks. 2. Develop a holistic understanding of fashion, trends, and forecasting in a global Setting and effectively communicate the understanding of fashion trends in both visual and written form. 3. Knowledge in merchandising activities for Sourcing of Right Merchandise in Right time , with Right Price negotiation for Right client located at Right Place /Market. 4. Students can do apply the knowledge in fashion marketing for promotional activities in National & Foreign Product Promotion fairs. 5*. At the end of the course students able to apply to real life business market or professional practices for each of the forecasting disciplines		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10 (P)=30 End Term Exam Marks:50 (T) +20 (P) =70		Time:3hrs (T) 3hrs (P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter :The examiner will set nine questions in all, selecting two questions from each unit and one compulsory question as well</u> <u>Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well</u>			
Unit	Topics		Contact Hours

I	• Introduction and Research process in forecasting: Object of Fashion, Components and structure of fashion Industry, forecasting and its precision. Roll of a forecaster, selling strategy and fashion time table, types of resources, primary, secondary and tertiary. • Design Boards:-Research, inspiration, theme, mood, silhouette, colour, client profile, swatch, design preparation and spec creation/Specification/technical boards.	12
II	• Forecasting and Technology information: Forecasting the fashion with reference to Color, style, season, different patterns, different fabric swatches, accessories on different themes • The new technology, New uses of products, Value & life style, Fashion of involvement, forecasting services, agencies	12
III	• Merchandising: Terms pertaining to merchandising, sourcing, and components of merchandising activities – functions of merchandiser. Primary, secondary, retailing and auxiliary services, career possibilities: desired characteristics, locales of employment, and potential growth components of each. • Role and responsibilities of PP (pre-production) merchandiser, PD (product development) merchandiser in an export house, buying house and design house individually.	12
IV	Visual Merchandising: Importance of Visual Display. Fashion communication – Visual Merchandising – advantages – 3D visual merchandising system – optimizing techniques in retail space.	9

Semester 6

Session: 2025-26	
Part A – Introduction	
Subject	Bachelor of Fashion and Apparel Design
Semester	6
Name of the Course	World Costumes
Course Code	B23-FAD-602
CourseType: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	CC-B6
Level of the course (As per Annexure-I	300-399
Pre-requisite for the course (if any)	12 th pass
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Students will understand the evolution & characteristics of prehistoric civilizations. 2. Students will understood about art and designs of the ancient civilization of western world and their nature, and importance and need in the present time line. 3. Students acquired a clear knowledge about the various types of western textile and its historical backgrounds.

	4. At the end of the course students will gain the knowledge about the western clothing's and costumes along with the famous designers and their fashion career history, so they could able to get inspired. 5*. To impart students' knowledge about sketching and designing on sheet of Indian historic period and exhibited by various styles.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10 (P)=30 End Term Exam Marks:50 (T) +20 (P) =70		Time:3hrs (T) 3hrs (P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter :The examiner will set nine questions in all, selecting two questions from each unit and one compulsory question as well</u> <u>Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well</u>			
Unit	Topics		Contact Hours
I	• To understand the characteristics of the costumes of various parts of the world like: Egypt, Crete & Greece, Rome. • To study the changes happened in clothing style of: 1. Ancient Egypt. 2. Germanic (Pre-history & early times) 3. Ancient Greece 4. Ancient Rome. 5. Byzantine – middle age. 6. Romanesque. 7. Gothic.		12

II	- Costumes of Middle Ages:- - Byzantine – middle age. - Romanesque. - Gothic. - Modern age:- - Renaissance - Renaissance fashion - Spanish fashion. - Netherlands fashion.	12
III	- Recent Times:- - Neoclassicism - English fashion. Director & Empire. Biedermeier. - Romanticism - Neo – Rococo. The Victorian Era. - Art Nouveau - Belle Époque. Reform - Art Nouveau.	12
IV	- Present Day :- 20th century & 21st century costumes- - The Twenties. - The Thirties. - The Forties. - The Fifties. - The sixties. - The seventies. - The eighties. - The nineties.	9
V*	Design process: - Theme presentation by design process of any era fashion. - Create the costumes of Era's by garmenting techniques. - Exhibiting idea creation of costumes and projected design process.	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quizz/class test etc.: 05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: - • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: -	End Term Examination: 50 20
PartC-Learning Resources	
Recommended Books/e-resources/LMS:	
Reference Books:	
1. Phyllis Tortora Keith Eu Bank. Survey of Historic costumes. 2. Laver James, Thames and Hudson. Costume and Fashion-A Concise History, 2002. 3. Payinne. History of Costume. 4. Cassin Scott Jack. The Illustrated Encyclopedia of Costume and Fashion from 1066 to Present. Brockhampton Press, 1997. 5. Cuming Valerie and Ribeiro Aileen. The Visual History of Costume, Batsford, 2002. 6. Walter Hutchinson. Costumes of World (Vol. II).	

Semester 6

Session: 2025-26	
Part A – Introduction	
Subject	Bachelor of Fashion and Apparel Design
Semester	6
Name of the Course	Dyeing & Printing
Course Code	B23-FAD-603
CourseType: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C7
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	12 th pass
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Students will understand the concept of colour, dyes, pigments and finishes and processes. 2. Understand the process of dyeing of various fibers and different dyes. 3. Students acquired a clear knowledge about the various types of dye and pigment classes and their supporting fibers class. 5. Understand the mechanism of various printing techniques with different printing paste and methods. 5*. To enable the students to develop samples and articles
	from natural and synthetic dyes & printing methods.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10 (P)=30 End Term Exam Marks:50 (T) +20 (P) =70		Time:3hrs (T) 3hrs (P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter :The examiner will set nine questions in all, selecting two questions from each unit and one compulsory question as well</u> <u>Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well</u>			
Unit	Topics	Contact Hours	
I	Introduction to Fabric finishes:- • Process of removing impurities from natural fiber based fabrics; Singeing Desizing, Scouring, Bleaching, silk degumming, wool carbonizing and milling • Finishes – Introduction, objectives and classification of finishes on the basis of their method of application, stability and function.	12	
II	• Aesthetic finishes: - Delustering, beetling, napping, flocking, burn out design, acid design, plisse design, shearing and cropping Felting, Softening, stiffening, decatizing. Embossing . • Functional finishes:- Waterproof and water repellent finishes, shrinkage control, durable press, soil resistant, self-cleaning, flameproof and flame retardant finish.	12	
III	• Dyeing:- Introduction, classification and selection of dyes. • Types of dyes; direct, acid, reactive, basic, vat, azoic, sulphur, disperse and mordant dyes, • Methods of dyeing- fibre, yarns and fabrics • Identifying dyeing defects. • Colorfastness: fastness to washing, light, perspiration and crocking.	12	

IV	• Introduction to printing- difference between dyeing and printing. • Styles of printing: - Direct, Discharge and Resist printings. • Applications of Printing:-Block, eco-printing, Roller, Duplex, Stencil, Screen printing (Flat screen, Rotary screen printing), Transfer (Dry heat and Wet heat transfer), Blotch, Jet spray (Polychromatic dyeing, Microjet), Electrostatic, Photo, Warp, Batik and Tie – Dyeing	9
V*	Design process: • Dyeing of yarn and fabrics samples with different dyes (natural and synthetic). • Creating designs on fabrics through various dyeing process.:-Tie and dye, Batik • Preparation of printing samples:-Stencil, block, screen and hand painting on:- cotton, silk ,wool, cotton-wool, cotton-silk, cotton-polyester with different dye classes. • Making one article each of:- Block, Stencil, Screen, Tie and Dye and Batik.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: - • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: -		End Term Examination: 50 20
PartC-Learning Resources		
Recommended Books/e-resources/LMS: Reference Books: • Bernard P. Corbman. Fibre to Fabric. • Clarke. W. 1974. An Introduction to Textile Printing. London, Newness Butter Worth. • Anderson, F. 1974. Tie-dyeing and Batik. London, Octopus Editorial Production by Berkeley Publishers Ltd. • Smith, J.L. Textile Proccessing: Printing, Finishing, Dyeing. • H.Panda. Modern Technology of Textile: Dyes & Pigments.		

*Applicable for courses having practical component.

Semester 6

Session-2025-26			
Part A – Introduction			
Subject	Bachelor of Fashion and Apparel Design		
Semester	6		
Name of the Course	Accessory design		
Course Code	B23-FAD-604		
CourseType: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	12 th pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: • To impart knowledge of traditional and contemporary accessories • To help students understand design methodology, materials, production process, and market dynamics		
	of accessory design.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5 Hrs
Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50 (TH) 20 (P) =70		Time:3hrs (T) 3hrs (P)	
Part B-Contents of the Course			

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	• Basics of the Design Process • Introduction to Accessory Design 1. Overview of Fashion Accessories (bags, belts, footwear, jewelry, etc.) 2. Product Categories and Market Segments 3. Materials and Manufacturing Processes • History of Accessories Design and Trends. 1. Evolution of Accessories throughout History. 2. Current Trends.	12
II	• Materials and Techniques 1. Leather, Metal, Fabric, Wood, Plastic, Sustainable Materials 2. Craft Techniques (embroidery, weaving, knitting, beading, etc.) 3. Surface Development and Ornamentation. 4. Material Exploration and Innovation.	12
III	Specialized Accessory Categories 1. Footwear Design 2. Bag and Luggage Design	12

	3. Jewelry and Fashion Accessories 4. Eyewear and Headgear 5. Sustainable Accessories	
IV	- Product Development - Ideation and Concept Development - Prototyping and Mock-Ups - Technical Drawings and Specification Sheets - Design Thinking Process	9
V*	- Workshop Practice and Industry Exposure - Studio Work / Hands-on Projects - Guest Lectures by Designers - Industry Visits - Internship / Industrial Training Computer-Aided Design (CAD) for Accessories Design(Adobe Photoshop and Illustrator)	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 05 - Seminar/presentation/assignment/quiz/class test etc.: 05 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: - - Seminar/Demonstration/Viva-voce/Lab records etc.: 10 - Mid-Term Exam: -		End Term Examination: 50 20
PartC-Learning Resources		
Recommended Books/e-resources/LMS: Reference Books: - Claire Billcocks, "Century of Bags", Chartwell Books, New Jersey, 1997. - Jamila BrijBhusan, "Master Piece of Indian Jewellery", Taraporevala, Bombay, 1979. - Jinks McGrath, "Basic Jewellery Making Techniques", Krause Publications, 2003. - John Peacock, "Fashion Accessories - Men", Thames and Hudson, London, 1996. - John Peacock, "The Complete 20th Century Source Book", Thames and Hudson, London, 2000. - Malolow Blahnik, Co Collin Mac Dolw, "Shoes - Fashion and Fantasies", Thames and Hudson, 1989 - Teresa Searless, "Fabric Jewellery: 25 Designs to Make Using Silk, Ribbon Buttons and Beads", St.Martin's Press, 1st edition, 2008.		

*Applicable for courses having a practical component.

KURUKSHETRA UNIVERSITY
KURUKSHETRA



Modified Scheme of Examinations and Syllabus

5th & 6th Semester

for

Under-Graduate Programme

**Bachelor of Fashion and Textile Design
Interdisciplinary Scheme–D**

**Under Multiple Entry-Exit,
Internship and CBCS-LOCF in
Accordance to NEP-2020**

w.e.f 2025-26

Department of Home Science

SEMESTER-5

Course	Paper(s)	Nomenclature of Paper	Credit	Hours/ Week	Internal marks	External Mark	Total Marks	Exam Duration
CC-A54- Credits	B23-FTD-501	Textile Processing Printing And Dyeing	3	3	20	50	70	3 Hours
		Textile Processing Printing And Dyeing Lab	1	2	10	20	30	4 Hours
CC-B5 4- Credits	B23-FTD-502	Surface Ornamentation	3	3	20	50	70	3 Hours
		Surface Ornamentation Lab	1	2	10	20	30	4 Hours
CC-C5 4- Credits	B23-FTD-503	History of Indian Clothing	3	3	20	50	70	3 Hours
		History of Indian Clothing Lab	1	2	10	20	30	4 Hours
CC-M54 Credit (2+2)		From available VOC-4 pool list of 4 credits as per NEP						
Skill enhancement course		INTERNSHIP #4 credits						

#4 credits of internship, earned by a student during summer internship after 2nd semester or 4th semester, will be taken into account in 5th semester of the students who pursue three year UG Programme without taking exit option

SEMESTER-6

Course	Paper(s)	Nomenclature of Paper	Credit	Hours/Week	Internal marks	External Mark	Total Marks	Exam Duration
CC-A6 4- Credits	B23-FTD-601	Textile testing and quality construction	3	3	20	50	70	3 Hours
		Textile testing and quality construction lab	1	2	10	20	30	4 Hours
CC-B6 4- Credits	B23-FTD-602	Advanced Apparel Construction	3	3	20	50	70	3 Hours
		Advanced Apparel Construction lab	1	2	10	20	30	4 Hours
CC-C6 4- Credits	B23-FTD-603	Social and Psychological Aspects of Clothing	3	3	20	50	70	3 Hours
		Social and Psychological Aspects of Clothing lab	1	2	10	20	30	4 Hours
CC-M6 4 Credit (2+2)		From available VOC-4 pool list of 4 credits as per NEP						

Session :2025-26			
Subject	Bachelor of Fashion & Textile Design		
semester	V		
Name of the Course	Textile Processing, Printing and Dyeing		
Course Code	B23-FTD-501		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the Course	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Students will be able to explain the basic concepts of textile processing, preparatory processes, and routine finishes applied to fabrics. 2. Students will be able to classify dyes and pigments, describe their properties, and analyze different dyeing methods and stages. 3. Students will be able to identify various printing methods, evaluate printing and dyeing defects, and suggest remedies. 4. Students will be able to apply dyes on textiles, assess fastness properties, and evaluate eco-friendly practices in dyeing. 5* Students will be able to demonstrate practical skills in block, batik, and screen printing, and develop creative textile samples.		
Credits	Theory	Practical	total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100		Time: 3 hrs.(T) 4 hrs (P)	
Internal Assessment Marks: 20(T) +10(P) =30			
End Term Exam Marks:50(T) +20(P) =70			

Part B-Contents of the Course		
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.		
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.		
UNITS	TOPICS	CONTACT HOURS
1	• Introduction of Textile Processing • Fabric Finishing: - • Preparatory Processes (Singeing, Desiring, Scouring, Bleaching, Heat-setting) • Routine Finishes (Beetling, Calendaring, Anti-shrink, Permanent Setting) • Special Purposes Finish (Flame Retardant, Water-repellent, Durable-press, Moth-proofing, Soil-repellent, Anti-static).	11
2	• Layout in Design • Colorant- Dyes and Pigments, Classification of Dyes and Pigments • Define Dyeing, Stages of Dyeing, Methods of Dyeing, Classification of Dyeing.	10
3	• Define Printing, Methods of Printing, and Types of Printing. • Identifying Printing and Dyeing Defects • Colour Fastness to Washing, Lighting, Rubbing and Perspiration	12
4	• Application of Dyes on various Fibers/Fabrics and their fastness properties (Washing, Light, Perspiration and Rubbing) • Dimensional Stability of Fabric. • Recent Developments in Dyeing and Printing- Toxicity of Dyes, Banned Dyes, Eco-friendly Dyes	12
5*	1. Developing design for block, stencil, screen printing & hand printing → overall design → border design → spot design (T-shirt work) 2. Making a sample with stencil, screen, hand on fabric 3. Making a sample of tie & dye by different technique. 4. Make any 2 articles of block, hand, screen, stencil & tie & dye.	30

PART A – INTRODUCTION			
Session:2025-26			
Subject	Bachelor of Fashion & Textile Design		
semester	V		
Name of the Course	Surface Ornamentation		
Course Code	B23-FTD-502		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the Course	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Students will be able to explain the definition, types, and applications of trimmings and decorations, and analyze their role in figure irregularities and wardrobe planning. - Students will be able to describe basic embroidery concepts, differentiate between hand and machine embroidery, and identify tools, needles, threads, and machine attachments used. 3 Students will be able to define and apply different surface ornamentation methods such as appliqué, smocking, laces, bead work, sequins work, and mirror work using appropriate tools and materials. 4. Students will be able to identify and create decorative elements such as bows, tassels, handbags, cut work, ribbon work, and needle techniques. 5. * Students will be able to explain quilting and patchwork techniques, use tools effectively, and develop creative fabric samples and articles.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100		Time: 3 hrs.(T)	
Internal Assessment Marks: 20(T) +10(P) =30 End Term Exam		4 hrs (P)	
Marks:50(T) +20(P) =70			

Part B-Contents of the Course

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

UNITS	TOPICS	CONTACT HOURS
1	• Trimmings & Decorations – Definition and types. • Figure irregularities, • wardrobe planning	11
2	• Introduction to surface ornamentation and embroidery; general rules for hand and machine embroidery • special attachments to sewing machines for embroidery – tools and equipment's – needles – threads	11
3	• Define following surface ornamentation techniques with their types, tools and materials requirements : • Appliqué	12
	• Smocking , • Laces, • Bead Work, • Sequins Work, • Mirror Work,	
4	• Define- Belts , Bows, , Tassels, Handbags and its types • Define – Cut work, needle, ribbon work	11
5*	• Quilting -Patch work- Introduction, tool • Technique and type of embroidery, cut work , couching , glass work , bows • Special technique – smoking ribbon work beads and sequence work • Make sample of hand embroidery stiches • (at least 10) • Developing one article based on technique of surface Ornamentation	30

Suggested Evaluation methods	
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practical • Class Participation: 00	End Term Examination: 50 20
• Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	
Part C-Learning Resources Recommended Books/e-resources/LMS: • Rajit Mookerjee -5000 Designs and Motifs from India, 1996. • Bina Abbing- Fashion Sketch Book, Fair child publications, New York. • G.J. Sumathi- Elements of Fashion & Apparel Design, New Age International, 2002. • Judith Rasband- Wardrobe Strategies for Women, Delmar Publishers, London. • Jeannette A Jarnow, Morianr Guerreiro & Beatrice Judelle- Inside the Fashion Business 4th edition, Mac Millan Company, New York. • M Nichols- Encyclopedia of Embroidery Stitches Including Crewel by Dover Publications – 1974. • Susheela Dantyagi- Fundamentals of Textiles and their Care,5th edition, Published by Orient Longman Ltd., New Delhi, • Therese De Dillmont – 3rd Edition-Computerized Encyclopedia of Needle Work. Val Holmes -Decorative Painting Techniques Book, 2003. □ Traditional Indian Motifs for Weaving and Printing.	

PART A – INTRODUCTION			
Session-2025-26			
Subject	Bachelor of Fashion & Textile Design		
semester	V		
Name of the Course	History of Indian Clothing		
Course Code	B23-FTD-503		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the Course	300-399		
Pre-requisite for the course (If any)	Senior Secondary (10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Students will be able to explain the origin of clothing, trace the evolution of dress, and analyze the social and functional significance of clothing. Students will be able to identify and describe the traditional costumes of different regions of India (North, South, East, West) and recognize their cultural importance. 3. Students will be able to discuss the clothing styles of different historical periods such as Muslim, Gupta, Vedic, and Western periods. 4. Students will be able to examine costumes from the Kushan period, Indus Valley civilization, and Satavahana period, highlighting their unique features. 5*. Students will be able to create 12-head figures with proper sketching of costumes from historical periods (Muslim, Western, Gupta) and regional costumes (North, South, East, West India).		
Credits	Theory	Practical	Total
	3	1	4
Contact hours	3	2	5
Max. Marks: 100		Time: 3 hrs.(T)	
Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		4 hrs (P)	

Part B-Contents of the Course

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

UNITS	TOPICS	CONTACT HOURS
1	• Origin of clothing • Evolution of dress • Function of clothing	11
2	• Traditional costume of different regions of India – North , South, East, West	11
3	Ancient Indian clothing • Muslim Period • Gupta Period • Vedic Period • Western Period	12
4	• Kushan Period • Indus Valley Civilization • Satavahanas Period	11
5*	• Make 12-head Figure with proper sketching of ○ Muslim period ○ Western period ○ Gupta period • Make 12-head Figure with proper sketching of ○ North region ○ Southern region	30
	○ Eastern region ○ Western region	

PART A – INTRODUCTION	
Session:2025-26	
Subject	Bachelor of Fashion & Textile Design
semester	VI
Name of the Course	Textile testing and quality construction
Course Code	B23-FTD-601
Course Type: (CC/MCC/MDC/CCM/ DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6
Level of the Course	300-399
Pre-requisite for the course (if any)	Senior Secondary (10+2)
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Students will be able to explain the objectives of fibre testing, perform mechanical tests (tensile strength, elongation, elasticity, length, fineness, maturity), and evaluate fibre properties including thermal behavior and air permeability. 2. Students will be able to conduct yarn tests to measure count, breaking strength, twist, crimp, and evaluate resistance and performance characteristics. 3. Students will be able to analyze fabrics for thread count, weight, thickness, stiffness, crease recovery, dimensional stability, and evaluate their end-use performance. 4. Students will be able to assess apparel fabrics for properties such as abrasion resistance, tearing strength, bursting strength, drape, and resilience. 5. *Students will be able to practically perform fibre, yarn, and fabric tests, record observations, interpret results, and prepare professional test reports.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100		Time: 3 hrs.(T)	
Internal Assessment Marks: 20(T) +10(P) =30		4 hrs (P)	
End Term Exam Marks:50(T) +20(P) =70			

Part B-Contents of the Course		
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory. Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.		
UNITS	TOPICS	CONTACT HOURS
1	- Fiber Testing – Definition and Objectives - Method of Testing, Staple Tensile strength, fineness, Evenness , staple length, mean length, tearing, bursting - Thermal properties of textile fibres - Porosity & Air & water permeability of fabric	10
2	Yarn Test - Count - Breaking Strength - Twist - Crimp - Pilling - Resistance	12

3	Fabric Analysis • Thread count • Weight • Thickness • Abrasion • Stiffness • Crease recovery • Dimensional changes in laundering	12
4	Color Fastness • Laundering • Crocking • Pressing (Dry & Wet) • Perspiration – Acid and Alkaline	12
5*	Yarn Test – a) Count b) Twist c) Crimp 2) Fabric Analysis – a) Thread Count b) Weight c) Thickness d) Abrasion 3) Color Fastness to – a) Laundering b) Crocking c) Pressing Dry & Wet d) Perspiration – Acid & Alkaline	30
Suggested Evaluation methods		
Internal Assessment: ➤ Theory		End Term Examination: 50

• Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	20
Part C-Learning Resources	
REFERENCES: 1. Booth, J.E.: Principles of Textile Testing – Newness Butter Worth, London. 2. Billie, J. Collier and Heler H. Epps – Textile Testing and Analysis – Prentice Hall, New Jersey. 3. John, H. Skinkle – Textile Testing – Brooklyn, New York. 4. Grover and Hareby – Hand book of Textile Testing and Quality Control, Wiles. 5. ISI Specifications, BIS specifications. 6. ASTM Standards.	

PART A – INTRODUCTION	
Session:2025-26	
Subject	Bachelor of Fashion & Textile Design
semester	VI
Name of the Course	Advanced Apparel Construction
Course Code	B23-FTD-602
Course Type: (CC/MCC/MDC/CCM/ DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6
Level of the Course	300-399
Pre-requisite for the course (if any)	Senior Secondary (10+2)
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Students will be able to identify factors affecting good fit, analyze common fitting problems in upper and lower garments, suggest remedies, and design clothing solutions for people with special needs. 2. Students will be able to describe the history of the apparel industry, explain the mass production process, and evaluate costing methods in garment manufacturing. 3. Students will be able to assess the quality of apparel through testing and inspection, and apply standards in cutting, sewing, finishing, and packaging. 4. Students will be able to prepare fabrics for garment construction by identifying fabric grain, performing pre-treatment processes (straightening, shrinking, pressing), and applying pinning, marking, and cutting techniques. 5. * Students will be able to construct garment components such as pockets and plackets, and demonstrate drafting and construction skills for designer garments.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100		Time: 3 hrs.(T) 4 hrs (P)	
Internal Assessment Marks: 20(T) +10(P) =30			
End Term Exam Marks:50(T) +20(P) =70			
Part B-Contents of the Course			
<u>Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.</u>			
<u>Instructions for the Candidate: The candidates will attempt five questions in all selecting one question from each unit and the compulsory question as well.</u>			
UNITS	TOPICS		CONTACT HOURS
1	Fitting – Factors affecting good fit a) Common problems and remedies for fitting defects (Upper & Lower garments) 2) Clothing for people with Special Needs – old age, Physically Challenged		12
2	History of Apparel Industry 2) Mass Production Process 3) Costing		11
3	Evaluating the quality of apparel a) Testing & Inspection 2) Quality specifications & standards in cutting, sewing, supplies, finishing & packaging		11

4	Preparation of fabric a) Fabric grain b) Preparation of fabric before cutting – straightening, shrinking, pressing c) Pinning, marking, cutting	11
5*	Make a sample of pockets - Slashed pockets – welt, bound, flaps - Inseam pockets – closed & open 2) Plackets - Fly front placket - Zipper inseam placket Designing, drafting & construction of designer gown, designer suit	30
Suggested Evaluation methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: 50 20

Part C-Learning Resources

REFERENCES:

- | |
|---|
| <ol style="list-style-type: none">1. Stamper, Sharp & Donnell: Evaluating Apparel, Quality – Fairchild Publications, New York.2. Natalie Bray – Dress Fitting, Published by Blackwell Science Ltd.3. Margolis – Design Your Own Dress Pattern, Published by Double Day and Co. Inc., New York.4. Strickland, Gertrude – A Tailoring Manual, New York, Macmillan Company.5. Pepin Harriet – Modern Pattern Design, New York. |
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PART A- INTRODUCTION	
Sesssion: 2025-26	
Subject	Bachelor of Fashion & Textile Designing
Semester	VI
Name of the Course	Social and Psychological Aspects of Clothing
Course Code	B23-FTD-603
Course Type: (CC/MCC/MDC/CCM/ DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6
Level of the Course	300-399
Pre-requisite for the course (if any)	Senior Secondary (10+2)
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Students will be able to explain the functions and psychological importance of clothing, analyze the relationship between clothing and personality, and evaluate factors influencing clothing choices such as tradition, modernity, modesty, and fashion. 2 Students will be able to discuss the influence of culture, religion, and social status on clothing behaviour , and evaluate how clothing reflects customs, traditions, and social identity. 3.Students will be able to examine the relationship between clothing and family income, social class, and economic status, and analyze how socioeconomic factors affect clothing consumption. 4. Students will be able to interpret clothing as a means of self-expression, analyze clothing in relation to self-concept and self-image, and evaluate

	clothing choices as reflections of individuality. 5. * Students will be able to assess the impact of modern trends on clothing practices, evaluate technological influences on clothing (fibres, finishes, fashion forecasting), and discuss issues of sustainability in modern clothing.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 20(T) +10(P) =30 End Term Exam Marks:50(T) +20(P) =70		Time: 3 hrs.(T) 4 hrs (P)	

Part B-Contents of the Course
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

UNIT	TOPIC	CONTACT HOURS
1	• Clothing and first impression. • Introduction of clothing and Psychological(meaning and importance of clothing, Relationship between clothing and personality. How clothing affects behaviour and attitude. Reasons why people wear clothes (Protection, Modesty, Decoration, status , identity). • Modern philosophy of clothes.	11
2	• Social aspects of clothing [influence of culture and tradition on clothing][clothing and social status/class][groups behaviour and dress(school uniform, uniform at jobs)] • Clothing and communication. • Clothing and physical health, clothing and mental health.	12
3	• Clothing and social changes. [impact of fashion trend on change. Role of media and celebrities in clothing pattern] • Clothing and subcultures (punk, goth, hip-hop, etc.) • Clothing and profession (corporate vs. creative industry)	11
4	• Clothing and self confidence – How clothes affects the way we feel about ourself. • Clothing and occupation. • Cloth and colour , Psychological impact of colours.	11

5*	• Mood board based on colour psychology ➤ collect fabrics swatches magazine cutouts , or coloured papers. • Culture clothing collage ➤ Make a collage showing traditional clothing from different Indian states or countries. • “ Then and now” – Fashion evaluation scrapbook. ➤ Collect pictures from 90s/ early 2000s and today’s fashion. ➤ Paste in scrapbook with a small write up on social / psychological changes in fashion.	30

Suggested Evaluation methods	
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: 50 20
Part C-Learning Resources	
REFERENCES: 1. Avis, M. Dry (1961): The Psychology of Jung, Methuen & Co., London. 2. Horn, Marilyu J. (1968): The Second Skin, Houghton Mifflin Co., USA. 3. Flugel, J.C. (1950): The Psychoanalytical Study of the Family, The Hogarth Press & The Institute of Psycho Analysis, London. 4. Richard Wollhein (1985): Freud, Fontana Press, London. 5. Vincent Brome (1978): Jung, Granada Publishing, London, Toronto, Sydney, New York.	

KURUKSHETRA UNIVERSITY

KURUKSHETRA



Modified Scheme of Examinations and Syllabus

5th & 6th Semester

for

Under-Graduate Programme

Bachelor of Vocation in Interior Designing

Interdisciplinary Scheme - D

**Under Multiple Entry-Exit, Internship and CBCS-
LOCF in accordance to NEP-2020**

w.e.f. 2025-26

Department of Home Science

KURUKSHETRA UNIVERSITY, KURUKSHETRA

Scheme of Examinations for Under-Graduate Programme
Under multiple Entry-Exit, Internship & CBCS-LOCF-CCF in accordance to NEP 2020 w.e.f. 2025-26

Bachelor of Vocation in Interior Designing

SEMESTER 5								
Course	Paper(s)	Nomenclature of Paper (s)	Credits	Hours/ Week	Internal Marks	External Marks	Total Marks	Exam Duration
CC-A5 @4 Credits	B23-VID-501	Landscape in Interiors	3	3	20	50	70	3 Hrs
		Landscape in Interiors-Practical	1	2	10	20	30	4 Hrs
CC-B5 @ 4 Credits	B23-VID-502	Working Drawings and Interior Design Studio-I	3	3	20	50	70	3 Hrs
		Working Drawings and Interior Design Studio-I-Practical	1	2	10	20	30	4 Hrs
CC-C5 @ 4 Credits	B23-VID-503	Services in Interiors	3	3	20	50	70	3 Hrs
		Services in Interiors - Practical	1	2	10	20	30	4 Hrs
CC-M5 (V) @4 Credits	From Available CC-M5(V) pool list of four credits as per NEP							
Skill Enhancement Course	Internship # 4 Credits							
# Four credits of internship, earned by a student during summer internship after 2nd semester or 4th semester, will be taken into account in 5th semester of the students who pursue 3 year UG Programme without taking exit option.								

KURUKSHETRA UNIVERSITY, KURUKSHETRA

**Modified Scheme of Examinations for Under-Graduate Programme
Under multiple Entry-Exit, Internship & CBCS-LOCF-CCF in accordance to NEP 2020 w.e.f. 2025-26**

Bachelor of Vocation in Interior Designing

SEMESTER-6								
Course	Paper(s)	Nomenclature of Paper (s)	Credits	Hours/ Week	Internal Marks	External Marks	Total Marks	Exam Duration
CC-A6 @4 Credits	B23-VID-601	Project Management & Estimation	3	3	20	50	70	3 Hrs
		Project Management & Estimation- Practical	1	2	10	20	30	4 Hrs
CC-B6 @ 4 Credits	B23-VID-602	Working Drawings and Interior Design Studio -II	3	3	20	50	70	3 Hrs
		Working Drawings and Interior Design Studio-II-Practical	1	2	10	20	30	4 Hrs
CC-C6 @ 4 Credits	B23-VID-603	Graphics & Signage	3	3	20	50	70	3 Hrs
		Graphics & Signage- Practical	1	2	10	20	30	4 Hrs
CC-M6 @4 Credits	B23-VID-604	Journalism & Communication	3	3	20	50	70	3 Hours
		Journalism & Communication- Practical	1	2	10	20	30	4 Hours
CC-M7(V) @4 Credits	From Available CC-M7(V) pool list of four credits as per NEP							

<u>Session: 2025-26</u>			
<u>Part A - Introduction</u>			
<u>Subject</u>	<u>Bachelor of Vocation in Interior Designing</u>		
<u>Semester</u>	<u>V</u>		
<u>Name of the Course</u>	<u>Landscape in Interiors</u>		
<u>Course Code</u>	<u>B23-VID-501</u>		
<u>Course Type:</u> <u>(CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)</u>	<u>CC-A5</u>		
<u>Level of the course (As per Annexure-I)</u>	<u>300-399</u>		
<u>Pre-requisite for the course (if any)</u>	<u>Senior Secondary (10+2)</u>		
<u>Course Learning Outcomes(CLOs):</u>	<u>After completing this course, the learner will be able:</u> <u>1. To understand the importance & types of interior landscape.</u> <u>2. To gain knowledge about different types of indoor plants.</u> <u>3. To know about designing with plants & flowers.</u> <u>4. To acquire knowledge about landscape planters & indoor plant maintenance.</u> <u>5*. To gain practical knowledge about plants for interiors & landscaping designs.</u>		
<u>Credits</u>	<u>Theory</u>	<u>Practical</u>	<u>Total</u>
	<u>3</u>	<u>1</u>	<u>4</u>
<u>Contact Hours</u>	<u>3</u>	<u>2</u>	<u>5</u>
<u>Max. Marks:100</u> <u>Internal Assessment Marks:20(T)+10(P)=30</u> <u>End Term Exam Marks:50(T)+20(P)=70</u>		<u>Time:3 hrs (T)</u> <u>4 hrs(P)</u>	

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting at least one question from each unit as well as compulsory questions.

<u>Unit</u>	<u>Topics</u>	<u>Contact Hours</u>
<u>I</u>	• <u>Meaning & importance of interior landscape, limitations of interior landscape, types of interior landscape designs.</u> • <u>Steps involved in interior landscape design.</u> • <u>Elements of interior landscape.</u>	<u>12</u>
<u>II</u>	• <u>Types of Indoor Plants: Plant characteristics- biology, soil, moisture, light nutrients, atmospheric conditions, growing medium, pests & diseases. Indoor plants in Indian context.</u> • <u>Indoor potted plants for color, indoor potted plants for health, Indoor potted plants for texture.</u>	<u>11</u>
<u>III</u>	• <u>Design with Plants & Flowers –The physical attributes in relation to design.</u> • <u>Design concepts related to use of sculpture, lightings, fountains, garden furniture, architectural features and grouping them into meaningful compositions for visual and functional effects.</u> • <u>Interior landscape in bedrooms, bathrooms, living rooms, kitchens, indoor gardens, courtyards- residential and commercial forms.</u>	<u>11</u>
<u>IV</u>	• <u>Landscape planters for interior plants.</u> • <u>Points to be kept in mind in interior landscaping</u> • <u>Indoor plant maintenance.</u>	<u>11</u>

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Interior Designing		
Semester	V		
Name of the Course	Working Drawings and Interior Design Studio-I		
Course Code	B23-VID-502		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To understand meaning & components of working drawings. 2. To know the methods of preparing working drawings. 3. To learn the adaptive re-use of institutional spaces. 4. To learn the analysis of design issues. 5* To acquire practical knowledge about preparation of plans.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3 hrs (T) 4 hrs (P)	
Part B- Contents of the Course			

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting at least one question from each unit as well as compulsory questions.

<u>Unit</u>	<u>Topics</u>	<u>Contact Hours</u>
<u>I</u>	• <u>Meaning & importance & components of working drawings.</u> • <u>Types of working drawings & types of drawings used in interior design drafting plans.</u> • <u>Difference between shop & working drawings.</u>	<u>12</u>
<u>II</u>	• <u>Essential elements of creating effective working drawings.</u> • <u>Working drawing drafting tools.</u> • <u>Methods of working drawings.</u> • <u>Scales of drawings, methods of giving dimensions and standards on plans, sections, elevations, details etc.</u>	<u>11</u>
<u>III</u>	• <u>Transformation and adaptive re-use of institutional spaces in urban/ semi-urban/ rural contexts.</u> • <u>Planning audio visual communication, color and light interaction, sound control system, products and furniture forms for recreational spaces.</u>	<u>11</u>
<u>IV</u>	• <u>Analysis of the design issues.</u> • <u>Integration of interior architectural elements to other interior elements.</u> • <u>Interpretation of institutional activities and their spatial correlation.</u>	<u>11</u>

V*	• <u>Prepare at least two working drawing sets, one for a small residence and one for a large building.</u> • <u>Visit Institutional spaces & recreation centers with an aim to explore and understand transformation and adaptive re-use.</u> • <u>Make a report.</u>	<u>30</u>
<u>Suggested Evaluation Methods</u>		
<u>Internal Assessment:</u> ➤ <u>Theory</u> • <u>Class Participation: 05</u> • <u>Seminar/presentation/assignment/quiz/class test etc.:05</u> • <u>Mid-Term Exam: 10</u> ➤ <u>Practicum</u> • <u>Class Participation: 00</u> • <u>Seminar/Demonstration/Viva-voce/Lab records etc.:10</u> • <u>Mid-Term Exam: NA</u>		<u>End Term Examination:</u> <u>50</u> <u>20</u>
<u>Part C-Learning Resources</u>		
<u>Recommended Books/e-resources/LMS:</u> • <u>Francis.D, Ching & Corky B-</u> Interior Design Illustrated, 2nd edition, Wiley publishers, 2004. • <u>Fredd S-</u> Working Drawing Manual, McGraw-Hill Professional; 1st edition, 1998. • <u>Joseph D C, Julius Panero & Martin Z-</u> Time Saver Standards for Interior Design & Space Planning, 2nd edition, Mc-Graw Hill Professional, 2001. • <u>Julius Panero & Martin Zelnick-</u> Human Dimension & Interior Space: A source Book of Design Reference Standards, Watson – Gupill, 1979. • <u>Karlen Mark-</u> Space planning Basics, Van Nostrand Reinhold, New York, 1992. • <u>Maureen Mitton,</u> Interior Design Visual Presentation: A Guide to Graphics, Models, and Presentation Techniques. John Wiley and Sons, 2003 • <u>Kilmer-</u> Workind Drawings and Details for Interiors, John Wiley and Sons. • <u>Leibing WR-</u>Architectural Working Drawings, 4th edition, John wiley and sons, New York, 1999. • <u>Mark.WL-</u> Drawing and Designing with Confidence: A Step-By-Step Guide, Wiley and Sons, 1993. • <u>Maryrose M & Kelsey K-</u> Interior Graphic Standards, Wiley and Sons, 2004. • <u>Neufert E-</u> Architect's Data, Granada pub. Ltd. London, 2000.		

- **Oliver H & Bruce L** - Universal Design: Solutions for Barrier-free, Birkhäuser Basel; 1st edition, 2008

*Applicable for courses having practical component.

<u>Session: 2025-26</u>			
<u>Part A - Introduction</u>			
<u>Subject</u>	<u>Bachelor of Vocation in Interior Designing</u>		
<u>Semester</u>	<u>V</u>		
<u>Name of the Course</u>	<u>Services in Interiors</u>		
<u>Course Code</u>	<u>B23-VID-503</u>		
<u>Course Type:</u> <u>(CC/MCC/MDC/CC-</u> <u>M/DSEC/VOC/DSE/PC/AEC/VAC)</u>	<u>CC-C5</u>		
<u>Level of the course (As per Annexure-I)</u>	<u>300-399</u>		
<u>Pre-requisite for the course (if any)</u>	<u>Senior Secondary (10+2)</u>		
<u>Course Learning Outcomes(CLOs):</u>	<u>After completing this course, the learner will be able:</u> 1. <u>To understand types of services provided in interiors.</u> 2. <u>To know building wiring system & Indian electricity rules.</u> 3. <u>To gain knowledge about AC & fire safety.</u> 4. <u>To understand vertical transportation system & intelligent buildings.</u> 5* <u>To gain practical knowledge about types of fittings, faucets, valves for water supply & sanitation & intelligent buildings .</u>		
<u>Credits</u>	<u>Theory</u>	<u>Practical</u>	<u>Total</u>
	<u>3</u>	<u>1</u>	<u>4</u>
<u>Contact Hours</u>	<u>3</u>	<u>2</u>	<u>5</u>
<u>Max. Marks:100</u> <u>Internal Assessment Marks:20(T)+10(P)=30</u>		<u>Time:3hrs (T)</u> <u>4hrs(P)</u>	

<u>End Term Exam Marks:50(T)+20(P)=70</u>		
<u>Part B- Contents of the Course</u>		
<u>Instructions for Paper- Setter:</u>The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the Candidate:</u> The candidates will attempt five questions in all, selecting at least one question from each unit as well as compulsory questions.		
<u>Unit</u>	<u>Topics</u>	<u>Contact Hours</u>
I	• <u>Definition, importance, elements & types of interior services.</u> • <u>Water Supply- Domestic water systems, pipes and their sizes and jointing, types of fittings, faucets and valves.</u> • <u>Sanitations and disposal of waste materials from buildings - Principles of sanitation, connection to outdoor drainage system, types of pipes available in the market, water carriage systems, standard sanitary fittings; traps, pipes and their jointing; flushing systems.</u>	<u>12</u>
II	• <u>Refuse- Different forms of refuse garbage.</u> • <u>Building Wiring System- service wires, metering distribution boards, circuits, miniature circuit breaker (MCB) cutouts, conductors, wiring methods, switch boards, electrical devices in the buildings, light and power circuits, Indian electricity rules.</u>	<u>11</u>
III	• <u>Air Conditioning, functions of air conditioning, principles of AC, types of Ac systems.</u> • <u>Fire – Causes and spread of fire, design considerations for fire safety, devices for firefighting, fire regulations as per national building code (NBC).</u>	<u>11</u>
IV	• <u>Services for multi storied buildings, vertical transportation systems.</u> • <u>Security and Safety Systems- Designing a security system – burglar alarm, CCTV, central alarm systems, intrusion sensors and space sensors; other services – cable TV, private automatic branch exchange (PABX).</u> • <u>Intelligent buildings, building automation and energy management – criteria for choosing the right building automation system (BAS), open system architecture.</u>	<u>11</u>

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Interior Designing		
Semester	VI		
Name of the Course	Project Management & Estimation		
Course Code	B23-VID-601		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To understand project management & its life cycle. 2. To know project management strategies. 3. To gain knowledge about techniques of monitoring of development works. 4. To learn SI Measurement System. 5*. To get practical knowledge about preparation of various items of work in the interior works, preparation of schedule & bill of quantities.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	

Part B- Contents of the Course		
<u>Instructions for Paper- Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the Candidate:</u> The candidates will attempt five questions in all, selecting at least one question from each unit as well as compulsory questions.		
Unit	Topics	Contact Hours
I	• Introduction to Project Management – Definition, importance, reasons for shortfall in its performance, scientific management, life cycle of project. • Planning and controlling- Human aspects, development of project network, critical path, project organization, contracting, procurement and recruitment, budget and fund flow statement, stabilization and finishing.	12
II	• Organization of Project- Matrix organization, task forces, project teams, monitor and control of project. • Project management strategies- Tools and techniques for project management. Integrated reporting system, flow diagrams, bar charts, milestone charts.	11
III	• Techniques of Monitoring of Development Works – Standard oriented costs control, turnkey system, vertical production method, inventory cost control techniques and unified status, index techniques. • Measurements- Types, modes, methods of taking out quantities, preparation of schedule or bill of quantities. • Rate Analysis - Preparation of various items of work in the interior works.	11
IV	• SI Measurement System- SI nomenclature methods, dimensional and modular coordination, modules and modes of measurements practiced by various agencies. • Specification- Types, specification contents, standards developed by trade and industry, government agencies. • Interior Items Estimation- Manual and through spreadsheet programmes. Specification writing proforma, order writing, scheduling etc	11

V*	Make a report on preparation of various items of work in the interior works, preparation of schedule & bill of quantities.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 05 - Seminar/presentation/assignment/quiz/class test etc.:05 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: 00 - Seminar/Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: Barbori Balboni- Interior Cost Data, R.S. Means company, 2001. Carol E Farren- Planning and Managing Interior projects, Robert Snow Means Company, 2000. Carol Simpson- Estimating for Interior Designers, Watson Guptill, Rev. Sub edition, 2001. Harold Kerzner- Project Management : A systems approach to planning, scheduling and controlling, 2006 .		

*Applicable for courses having practical component.

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Interior Designing		
Semester	VI		
Name of the Course	Working Drawings and Interior Design Studio -II		
Course Code	B23-VID-602		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To prepare plans. 2. To understand details of all services in interiors. 3. To understand specification writings. 4. To gain knowledge about designing with all details.. _____ 5*. To give practical knowledge of making interior designs of different types of buildings.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting at least one question from each unit as well as compulsory questions.

Unit	Topics	Contact Hours
I	- Preparation of Plans – Architectural plans, furniture layout, floor plans with clearances, different level of floor plans, detailed floor plans of each room. - Elevations and Sections – Detailed sectional elevations of all the walls in the interior with all the required dimensions and specifications.	12
II	Details of all Services – Layouts for flooring, ceiling, electrical, plumbing, lighting, fire fighting etc., toilet details, kitchen details, staircase details, furniture details, interior finishing details, material, color and texture details, fixture and fixing and joinery details.	11
III	Specifications Writing- Writing detailed clause by clause specifications for materials pre and post execution, manufacturer's details and specifications etc.	11
IV	Designing with interior construction detailing, way finding/signage and graphic identification, decorative accessories, building codes, rendering (Hand and computer generated), custom designed furniture and cabinetry, selection of sustainable/green materials.	11

V*	• Make two major interior designs of any of the following with all details: ✓ Retail design/ healthcare design/ office systems. ✓ Urban Interiors – Shopping malls/streets/town squares/ fair grounds. ✓ Interior Ports – Air Ports/ bus stops/ railway stations/boats/ports. ✓ Exhibition Displays –State level/ national level. ✓ Mobile Units – Buses/ cars/ railway coaches etc.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Macey. W. Frank- Specification in detail, 5th edition, Technical press ltd, London, 1955. • Shah, M.G.; and others- Building Drawing : An integrated approach to build environment, 3rd ed, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 1996. • Karlen Mark- Space Planning Basics, Van Nostrand Reinhold, New York, 1992. • Mark.W. Lin- Drawing and Designing with Confidence: A Step-by-Step Guide, Wiley and Sons, 1993. • Maureen Mitton- Interior Design Visual Presentation: A Guide to Graphics, Models, and Presentation Techniques. John Wiley and Sons, 2003. • Maryrose McGowan & Kelsey Kruse- Interior Graphic Standards, Wiley and sons, 2004. • Mary Jo Peterson, Universal Kitchen and Bathroom Planning: Design That Adapts to People, McGraw-Hill Professional Publishing, 1998. • Neufert Ernest- Architect's Data, Granada pub. Ltd. London, 2000. • Robert Rengel- Shaping Interior Space, Fairchild Books & Visuals, 2002		

*Applicable for courses having practical component.

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Interior Designing		
Semester	VI		
Name of the Course	Graphics & Signage		
Course Code	B23-VID-603		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To understand meaning & importance of graphics & signage. 2. To gain knowledge about graphic system. 3. To understand hardware system. 4. To get knowledge about signage design & planning. 5* To gain practical knowledge about graphics & signage used in commercial buildings & roads.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100		Time:3hrs (T)	
Internal Assessment Marks:20(T)+10(P)=30		4hrs (P)	

End Term Exam Marks:50(T)+20(P)=70		
Part B- Contents of the Course		
<u>Instructions for Paper- Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the Candidate:</u> The candidates will attempt five questions in all, selecting at least one question from each unit as well as compulsory questions.		
Unit	Topics	Contact Hours
I	- Meaning & importance of graphics & signage. - Types of graphics & signage. - Information Content System – Kinds of sign information, hierarchy of content, developing the sign information content, navigation – message hierarchy and proximity, pictorial information content, signage master plans.	12
II	Graphic System - Typography overview, choosing a typeface, typographic treatment, typographic considerations in signage for non-sighted and low-sighted people, symbols and arrows, other graphic elements, color, layout, overview of signage graphic process.	11
III	The Hardware System – Shape, connotations of form, sign mounting considerations, sign size considerations, sign lighting overview, sign materials overview, basic sign materials, electronic message displays, stock sign hardware systems, sign materials and codes, overview of coatings and finishes applied to signs.	11
IV	- Signage Design – Eyelevel, light, fonts, typographical systems and type area, pictograms, arrows, color – contrast, language, systems, tones, coding, privacy and protection, Room identification. - Signage Planning – Contract, obtaining information, preliminary design, design, construction, work plan and prototypes, tenders, specifications, on-site management, completion.	11
V*	Conduct survey of different types of graphics & signage used in commercial buildings & roads and make a report.	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory ● Class Participation: 05 ● Seminar/presentation/assignment/quiz/class test etc.:05 ● Mid-Term Exam: 10 ➤ Practicum ● Class Participation: 00 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10 ● Mid-Term Exam: NA	End Term Examination : 50 20
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Andreas Uebele- Signage Systems and Information Graphics , Thames and Hudson, 2007 ● Craig Berger- Wayfinding: Designing and Implementing Graphic Navigational Systems, Rotovision, 2009. ● Chris Calori- Signage and Wayfinding Design: A Complete Guide to Creating Environmental Graphic Design Systems, Wiley and sons, 2007. ● David Gibson- The Wayfinding Handbook: Information Design for Public Places, Princeton Architectural Press; 1st edition, 2009. ● Joseph DeChiara, Julius Panero, and Martin Zelnik -Time-Saver Standards for Interior Design and Space Planning, 2nd edition, Mc-Graw Hill Professional,2001. ● Rayan Abdullah and Roger Hubner- Pictograms, Icons and Signs, Thames and Hudson, illustrated edition, 2006.	

*Applicable for courses having practical component.

Session: 2025-26**Part A - Introduction**

Subject	Bachelor of Vocation in Interior Designing
Semester	VI
Name of the Course	Journalism & Communication
Course Code	B23-VID-604
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	Senior Secondary (10+2)
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To understand principles & types of journalism 2. To gain knowledge about types of media & photo journalism 3. To get insight into features & patterns of communication. 4. To understand factors affecting process of communication.

	5*. To get practical knowledge about conversation & public speaking.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks: 20(T) +10(P) =30End Term Exam Marks:50(T) +20(P) =70		Time:3 hrs.(T) 4 hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> The examiner will set nine questions in all, selecting twoquestions from each unit and one compulsory objective type question. <u>Instructions for the Candidate:</u> The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.			
Unit	Topics		Contact Hours
I	• Definition & scope • Principles, functions, journalism . • Nature & features of • Types of journalism. • Role & skills of journalist.		12

	• Work of journalism.	
II	• Types of Media: Print, broadcast and new media (Digital and Social Media). • Editing: Principles of editing; headlines , page making . • Photo journalism, Interviewing: Research, planning, framing. • Journalism in today's world & technological evolution in journalism	11
III	• Meaning & importance of communication, • Features of effective communication • Patterns of communication • Barriers of communication, • Essentials of communication.	11
IV	• 7 C's of communication. • Factors affecting process of communication. • Forms of Communication- Intrapersonal communication, interpersonal communication, group communication (public, crowd, small group), mass communication, non-verbal communication, body language.	11

V*	• Rewriting and Summarizing a given piece of news with headlines and suitable introduction; Creating a sample page on computer with hard and soft news. • Writing story, writing article, assignment • Preparing a presentation on types and categories of news. • Writing an application, business letter, memo and personal resume • Conducting Interviews. • Listening exercise – listening to news on Radio & TV • Conversation & Public Speaking	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum		End Term Examination: 50
• Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Aggarwal V - Handbook of Journalism and Mass Communication , 2013. • Detrani JR - Mass Communication, 2021 . , • Nayyer D- Modern Mass Communication: Concepts and Processes Hardcover, 2017 .		

- **Roy B** - Beginners' Guide To Journalism & Mass Communication, 2013 .

*Applicable for courses having practical component.

**KURUKSHETRA
UNIVERSITY KURUKSHETRA**



**Syllabus
(5th & 6th Semester)
for
Under-Graduate
Programme
Bachelor of Vocation in
Fashion Technology
Interdisciplinary Scheme-D
Under Multiple Entry-Exit
Internship and CBCS-LOCF in
accordance to NEP-2020
w.e.f. 2025-26
Department of Home Science**

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Fashion Technology		
Semester	V		
Name of the Course	Fashion Forecasting		
Course Code	B23-VFT-501		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand basic concepts of Fashion and Trend Forecasting 2. Understand the Research Process in Forecasting 3. Know about the Fashion forecasting agencies 4. Understand the Selection theme based forecasting _____ 5*. Gain practical knowledge about Fashion, Characteristics of Innovation, Fashion Movement, Dimensions of the Color Story, Fashion in Fiber and Fabric, The Fashion Geography, Fashion Brands etc.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs (P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	Introduction to Fashion and Trend Forecasting • Meaning of Fashion & Forecast • Role of forecaster • Precision of the forecast • Fashion industry components • Structure of the fashion industry	10
II	Research Process in Forecasting • Primary Sources, Secondary Sources, Tertiary Sources, Tracking Sales, Competition, Demographics • Value and Lifestyle, Publication, Forecasting Services, Plethora Influences, Observation posts • New Technology, Fashion of involvement, New uses of Products, Old neighborhoods, Related Industries	11
III	Fashion forecasting agencies • Forecasting Agencies & their functions • Seasons collection • Interpreting the forecast into the theme • Color Forecasting, Direction of Fashion change	12
IV	Selection theme based forecasting • Consumer Research, Steps in Developing a Forecast, Research theme • Explain keywords, Work on Indian market (casual, formal, party, leisure) • Inspiration board, Mood board, Sales Forecasting • Seasonal trend analysis color, silhouettes and detailing, material and textures, print and graphics, accessories in trend	12
V*	• Introduction to Fashion; Fashion Trends; Fashion Forecasting; Forecasting in Apparel Planning and Scheduling. • Dimensions of the Color Story; Color in Marketing; Consumers and the Psychology of Color; the Language of Color; Color Names; Forecasting with Color Cycles; Color Research; Sources for Color Ideas and Palettes. • Fashion in Fiber and Fabric; Sources of Innovation in Textile Development; Fabric Fairs and Trade Shows; Fabric Libraries. • The Fashion Geography; Collections on the Runway; Different Designers with the Same Design Concept. • Fashion Brands; Retail Formats: Emergence of Catalogs, TV Shopping and Online Shopping.	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: 50 20
Part C-Learning Resources	
• Recommended Books/e-resources/LMS: • Brannon Evelyn L., “Fashion Forecasting”, Fairchild Books, New York, 3rd Edition, 2010 • Perna Rita, “Fashion Forecasting”, Fairchild Books, New York, 1992 • McKelvey Kathryn and Munslow Janine, “Fashion Forecasting”, Wiley-Blackwell, 2008 • Raymond Martin, “The Trend Forecasters Handbook”, Laurence King, UK, 2010 • Nirupama, Pundir, Fashion Technology-Today and Tomorrow, Mittal publications, New Delhi, 2007. • Fashion buying, Helen Goworek, Wiley-Blackwell. • Fashion art for the Fashion Industry, Rita Gersten, Fairchild Books. • Fashion Forecasting: a Mystery or a Method? Rita Perna, Images Publishing Group. • The Fashion Design Manual, Pamela Stecker, Macmillan Education.	

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Fashion Technology		
Semester	V		
Name of the Course	Line Development		
Course Code	B23-VFT-502		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand Introduction to line development and Process of line development 2. Understand mood board, theme board, story board and its functions 3. Know about Fashion forecasting, types, purpose and its steps 4. Understand the Tech pack and its importance _____ 5*. Gain practical knowledge about Developing complimenting accessories to the design collection, fashion styling to create look book by fashion photo shoot and updating of e-portfolio		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs (P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.			

Unit	Topics	Contact Hours
I	• Introduction to line development and Process of line development • Market Research and its methods • Definition & Brief introduction: Research, Inspiration, Theme, Client Study, - Design brief, Development of theme and range, Market Survey, Fabric & Trim Development and Sourcing, Swatch, Fashion Illustration, Flat sketches, Spec sheet & Cost sheet	10
II	• Definition and function of mood board, theme board, story board • Exhibition and its types • Mind Mapping and its steps	11
III	• Fashion forecasting, types, purpose and its steps • Role of fashion forecaster in fashion designing • Styling Reading and its types	12
IV	• Definition and importance of Teck pack • Definition of Prototype, Difference between Prototype and sample • Fashion show and its types	12
V*	• Development of design collection Sportswear / Eveningwear / Ethnic / Fusion/Avant Garde- focusing on women's wear & kid's wear. • Development of theme and range, Market Survey, Fabric and trim Development and Sourcing, Swatch, trim board, Fashion Illustration, Flat sketches, tech pack, Spec sheet and Cost sheet • Developing patterns for the final five selected design, muslin test fit and final garment construction. • Developing complimenting accessories to the design collection, fashion styling to create look book by fashion photo shoot and updating of e-portfolio	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Claire Shaeffer, Sewing for the apparel industry, 2013, 2nd edition, Pearson, UK
- Betsy Hosegood, The Complete Book of Sewing, 2011, reprint, Dorling Kindersley Limited, London
- Reader's Digest, "The new complete guide to sewing: step-by-step techniques for making clothes and home accessories", Reader's Digest, 2010

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Fashion Technology		
Semester	V		
Name of the Course	Traditional Costumes		
Course Code	B23-VFT-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the basic Study of Indian Costumes during different periods like Indus Valley etc 2. Understand the Indian Costumes during different periods like Gupta period. 3. Know the costume of different periods like Babylonia etc. 4. To understand the costume of different periods like Benzantine etc. 5*. Gain practical knowledge about Designing and construction of fashion show garment.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs (P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.			

Unit	Topics	Contact Hours
I	Study of Indian Costumes during following periods - Indus Valley Period - Vedic Period - Kushan Period	10
II	Study of Indian Costumes during following periods - Gupta Period - Mughal Period - Mauryan & Sunga Period	11
III	Study of World Costumes during following periods - Babylonia - Greek - Egyptian	12
IV	Study of World Costumes during following periods - Byzantine - Roman - Crete	12
V*	Construction of the following garments:- - Corset dress, halters, wraps, off shoulder dress (any two) - Evening gown - One piece dress (Three different elements combination) Designing and construction of any one fashion show garment from the following:- - Ethnic wear - Western wear Project Report Presentation of Costumes of different periods Visit to Museum	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 05 - Seminar/presentation/assignment/quiz/class test etc.:05 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: 00 - Seminar/Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Kumar Ritu, "Constumes and Textiles of Royal India", Christies Book Ltd., London, 1999.
2. Deborah Nadoolman, "Dressed- A Century of Hollywood Costumes" The Pepin Press, "Renaissance"
3. Gurey G.S., "Indian Costumes", The popular Book Depot
4. Bina Abbing, "Costumes"
5. Mehta R.J., "Master pieces of Indian Textiles" Taraporevala Sons & Co. Pvt. Ltd., Mumbai, 1960.

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Fashion Technology		
Semester	VI		
Name of the Course	Boutique Management		
Course Code	B23-VFT-601		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand basic Introduction to Boutique management, fashion Retailing and its types. 2. Understand the Business options and plans for boutique, costing and funding agencies. 3. Know about Boutique management – types of Boutique, planning, layout and storing 4. Understand Inventory control – definition, types, importance, remedies. 5*. Gain practical knowledge about Construction of Dresses		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs (P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	• Introduction to Boutique management and terminologies. • Fashion Retailing – History, Scope, Importance. • Techniques and types of retailing (Domestic & International) • Boutique market place and its role.	10
II	• Business options and plans for boutique, costing and funding agencies. • Boutique display, Exterior of Boutique, Illumination, Masking and Proscenia, Mannequins and 3D Dressing. • Props & promotions on floor. • Visual merchandising and color pallets.	11
III	• Boutique interior planning – Boutique interiors and display locations • Fixture & dressings, purchase display systems for boutique interior planning • Boutique management – types of Boutique, planning, layout and storing	12
IV	• Inventory control – definition, types, importance, remedies. • Buying for boutique, Pricing merchandise and hiring. • Effective Sales techniques, Boutique operations, Brand Building, Competitive strategies and survey, market research, trade shows, Exhibitions, Fashion shows, Trade organizations.	12
V*	Construct at least 5 garments in the Boutique using following steps: • Designing • Sourcing • Marking • Cutting • Stitching • Finishing • Cost sheet	30

Suggested Evaluation Methods

Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: 50 20

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- LAURA I BLISS, Guide Visual Merchandising and Display III Edition, 1995 Fairchild Publications.
- Fashion marketing and merchandizing Manmeet sodhia 81-272-1184-2
- Gastelino. M. Fashion Kaleidoscope, Rupa & Co. 1994.
- Gibson. G. Vedomani, Retail Management, jaico Publishing house, Bangalore
- Elaine Stone, The Dynamics of Fashion, Fairchild Publication
- Brenda Sternquist international Retailing, Fairchild Publication, New York
- Martin. M. Pegler, Store Window No.14, No 12, Visual reference Publishers, Newyork.
- Jonny Tuckers,"Retail Desire" Rotovision SA UK.
- Natalie Bray. Dress Fitting - Basic Principles and Practice, BSP Professional Book Publishers, 2nd Edition, 1991.
- Armstrong Helen Joseph. Pattern Making for Fashion Design, 3rd edition, Prentice Hall, 1999.
- Gavin Waddell. How Fashion Works. Blackwell Publishing, 2005.
- Cooklin G. Garment Technology for Fashion Designers. Blackwell Publishing, 1977.
- Encyclopedia of Sewing.
- Thomas Anna Jacob. The Art of Sewing, USB Publishers, New Delhi, 1994.
- Verma G. Cutting & Tailoring Theory, Asian Publishers, New Delhi, 1999.

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Fashion Technology		
Semester	VI		
Name of the Course	Fashion Merchandising & Retailing		
Course Code	B23-VFT-602		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand basic Introduction to merchandising 2. Understand working with vendor 3. Know about the Merchandise planning 4. Understand Retailing and retailing operations 5*. Gain practical knowledge about fashion markets and its segments to understand the production line and merchandising process		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.			
Unit	Topics		Contact Hours
I	Introduction to merchandising		10

	• Evolution of merchandising in apparel industry • Merchandising- definition and terms • Role and responsibilities of fashion buyer and merchandiser • Market center industry trend	
II	Working with vendor • Different types of buyers • Communication with buyers • Awareness of current market trends • Working with vendor & understanding vendoring concept • Organizing buying/selling activity	11
III	Merchandise planning • Importance of merchandise planning and sourcing • Importance of seasons in merchandising with respect of fabric sampling, packaging, tech pack and product development • Selection of merchandise assortment • Analyzing merchandising environment in terms of market trends, economic condition, technological advancements, competition & revolutions	12
IV	Retailing • Retail Organizational structure store; Buying, Selling, Line and • Customer identification, Customer, Planning and role of Buyer • Retail store chains –National (Ebony, Fabindia, Ritu Wears, Shoppers Stop) and International (Tommy Hilfiger, Espirit) • Store Operations, Store merchandise, Stores management, Fashion supply changes –store retailing, non store retailing	12
V*	• Study of fashion markets and its segments to understand the production line and merchandising process. • Understanding working sketches • Spec sheet • Preparation of a Prototype • Sourcing of raw materials • Sampling Garment analysis • Costing – construction of garments • Communication with clients • Inventory management	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory ● Class Participation: 05 ● Seminar/presentation/assignment/quiz/class test etc.:05 ● Mid-Term Exam: 10 ➤ Practicum ● Class Participation: 00 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10 ● Mid-Term Exam: NA	End Term Examination: 50 20

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Chatley, Pooja., Fashion Marketing and Merchandising, Kalyani Publishers.
- Gowerk, Helen., Fashion Buying, Blackwell Science Ltd, London.
- Burns, Leslie. Davis & Bryant., Nancy. O., The Business of Fashion, Fairchild Publication, New York 2005.
- Nosenav, Jeremy. A., Apparel Merchandising: The line starts here, Fair Child, New York.
- Grren wood, Fashion marketing communication, John wiley and sons Pvt Ltd, 2013.
- Gowerk, Helen., Fashion Buying, Blackwell Science Ltd, London.
- Levy, Michael, Retailing Management, Tata Mc Graw Hill, 2008
- Krishnakumar, M., Apparel Merchandising: An integrated approach, Abhishek publication, Chandigarh, 2010.
- Easey, Mike., Fashion Marketing, Blackwell Science Ltd, London 1995.
- Stephens, Gini, Frings, Fashion from Concept to Consumers, 6th ed. Prentice Hall, New Jersey, 1999.
- Jackson, Tim & Shaw, David, Fashion buying and merchandising management, Palgrave Macmillan publisher, London, 2008.
- Donnellan, John, Merchandise buying & management, Fairchild publication, New York, 1999.

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Fashion Technology		
Semester	VI		
Name of the Course	Portfolio Development		
Course Code	B23-VFT-603		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand basic concepts of Portfolio and of Portfolio and Types Varied Number of Portfolio. 2. Understand the Personal Philosophy and Philosophy of your education. 3. Acknowledge about client and Portfolio for job prospective 4. Understand the Portfolio Uniqueness and creativity in making a portfolio and a portfolio case. 5*. Gain practical knowledge about portfolio development and presentation.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs (P)	
Part B- Contents of the Course			
Instructions for Paper- Setter : The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.			
Unit	Topics		Contact Hours

I	- Portfolio: Purpose and Scope of a Portfolio - Types of Portfolio; Varied Number of Portfolios - Process flow in fashion portfolio development	10
II	- Definition of Resume, Process of resume making - Design philosophy: Clarification of attitude towards fashion - Contents of Resume; Cover/ Title page of a portfolio; Brief information and descriptions of work; Thumbnails; Snapshots of self	11
III	- Purpose of Portfolio: Portfolio for client and Portfolio for a prospective job interview (Best looking portfolio at the interview) - Portfolio tips and tools. - Growing role of computer-aided design in the fashion industry.	12
IV	- Portfolio methodology: Sorting out the best work; placing work in logical order; Conscious choices on layout; scrapbook, magazine, small postcard samples. - Exercise imagination: Uniqueness and creativity in making a portfolio and a portfolio case; Designing a Personal Book; Separate portfolios for Illustrations, Designs etc.	12
V*	The portfolio must include. - Page of contents - Bio-data/ Resume - Each separate project should include inspiration sheet/story board and color chart with appropriate swatches. - Design collection concept - Give a name/theme to each project - Flat working drawings, detailed magnification and specification sheets, Line planning, fabric consumption. - Internship project is absolutely mandatory. It is very important to show designs applicability for the craft. - Any other creative graphic work, photography done, should be included. Make a CD:- A digital version of portfolio, PDF file.	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory ● Class Participation: 05 ● Seminar/presentation/assignment/quiz/class test etc.:05 ● Mid-Term Exam: 10 ➤ Practicum ● Class Participation: 00 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10 ● Mid-Term Exam: NA	End Term Examination: 50 20

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Julia. “Highlight your skills with a Fashion Portfolio”. September 18, 2013. Accessed 12 August 2017 <https://www.craftsy.com/blog/2013/09/creating-a-fashion-portfolio/>
- Griffith College. “Fashion Portfolio Examples and tips for Design Courses at College”. November 25, 2014. Accessed 12 August 2017 <https://www.griffith.ie/blog/portfolio-tips-fashion-and-design-courses-college>
- Griffith College “Portfolio Brief”. Accessed 12 August 2017
- https://www.griffith.ie/sites/default/files/storage/uploads/GCD_Portfolio_Brief_2016.pdf
- De Montfort University. “Contour Fashion application portfolio advice – Your portfolio”. Accessed 12 August 2017 <http://www.dmu.ac.uk/study/courses/undergraduate-courses/contour-fashion-ba-degree/contour-fashion-ba-degree-application-portfolio-advice.aspx>
- Sarkar, S. “The Design process in fashion product development”. Accessed 12 August 2017 <http://www.fibre2fashion.com/industry-article/5723/the-design-process-in-fashion-product-development?page=2>
- Wikihow. “How to prepare a Fashion Design Portfolio”. Accessed 12 August 2017 <http://www.wikihow.com/Prepare-a-Fashion-Design-Portfolio>
- Tran, L. “Fashion Sketchbook with fashion design drawings & fabric samples; fashion designer’s process”. Fashion International Journal. Accessed 13 August 2017 <https://in.pinterest.com/pin/469500329875415402/>
- Huxtable, A. “Fashion Design Explore – Research A”. February 3, 2011. Accessed 13 August 2017

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Fashion Technology		
Semester	VI		
Name of the Course	Media and Communication		
Course Code	B23-VFT-604		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand basic concept of One way and two way communication 2. Understand the Written communication 3. Know about Visual communication 4. Understand Communication in practice 5*. Gain practical knowledge about preparation of oral presentation and business letters		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs (P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.			

Unit	Topics	Contact Hours
I	One way and two way communication • Essential of good Communication, • Methods of Communication, Types of Communication, • Barriers of Communication Fashion and the communication process • Theories of fashion adoption need for promotion of fashion • Need for the communication process and communication through different media.	10
II	Written communication • Fashion writing • Creative writing • Business letters • Reporting features • Editing and printing techniques • Image management and advertising • Public relation, press laws and media ethics	11
III	Visual communication • Visual merchandising and display • Fashion photographs • Fashion shows • Multimedia.	12
IV	Communication in practice • Scripting shows • Conducting interview and reporting events • Fashion critics • Planning Public Relations campaigns • Formulating case studies • Designing catalogues ad brochure • Layout for stands in exhibition • Visualization of decor ambience, introduction to preparing short films and audio visuals, choreography of fashion event.	12
V*	Oral presentation: • Preparing a speech, delivery techniques, using the visual aids, overcoming errors in public speaking, group discussion. Interviews: • Types, stages, skills for interviewer and interviewee, interview follow-up	30

	letters and letters of acceptance and refusal. Visual communication: Planning, Recording and reporting of: • Visual merchandising and display • fashion photographs • fashion shows and multimedia Communication in practice: • Scripting shows, conducting interviews of designer's, reporting events for fashion shows, fashion critics, Introduction to preparing short films and audio visuals • Textile craft • Designers work • Event related to the field Designing & Developing messages/ advertisement for Fashion • E-mails • SMS • Local News Paper • Local T.V. • Billboards & Hoardings • Blogs or Web-Pages • Visit to media agency	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

- Rao M. Feature Writing PHI Learning Private Ltd. New Delhi, 2009.
- Theaker A, The Public Relations Handbook, Routledge & Kegan Paul 2001.
- Meera, R., Feature Writing PHI Learning Private Ltd. New Delhi, 2009
- Theaker A, The Public Relations Handbook, Routledge & Kegan Paul 2001
- Sharam, Diwakar., Mass communication theory and practice in the 21st century, deep and deep publications, 2004.
- Matharu, Gurmit, What is Fashion Design?, Rotovision SA, Switzerland, 2010.

**KURUKSHETRA
UNIVERSITY KURUKSHETRA**



**Syllabus (5th & 6th Semester)
For
Under-Graduate
Programme**

**Bachelor of Vocation in Food
Science and Quality Control
Interdisciplinary Scheme-D
Under Multiple Entry-Exit,
Internship and CBCS-LOCF
in accordance to NEP-2020**

w.e.f. 2025-26

Department of Home Science

Session: 2025-26			
Part A – Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	V		
Name of the Course	Advances in Food Processing & Preservation		
Course Code	B23-FTQ-501		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the basics of extrusion and hydrostatic pressure technology 2. Gain knowledge about methods of processing and applications in food industry 3. Know various new technologies as methods of preservation 4. Understand effect of processing methods and their effect on food properties. 5*. Gain practical knowledge about methods of preservation, processing and food quality		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs (P)	

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	1. Extrusion Technology: Introduction to extruders, principles, extrusion process, advantages of extrusion, extrusion equipment, single screw extruders and twin screw extruders. Breakfast cereals by extrusion technology. 2. Hydrostatic Pressure Technology: General principles, effect of hydrostatic pressure on microorganisms-possible mode of action, application of hydrostatic pressure technology in food industry.	12
II	1. Hurdle Technology: Principles and basic aspects of hurdle technology, different hurdles, hurdle effect, application of hurdle technology in food products. 2. Osmotic Dehydration: Mechanism of osmotic dehydration, application of osmotic dehydration.	10
III	1. Membrane Separation: Principle, different types of Membrane processing, Application in Food industry. 2. Pulsed Electric Fields Processing: PEF treatment systems, main processing parameters. Mechanisms of action: mechanisms of microbial inactivation.	11
IV	1. Ultrasound Processing: Fundamentals of ultrasound, ultrasound as a food preservation and processing aid, effects of ultrasound on food properties. 2. Alternate Thermal Processing: Microwave heating, Radio-frequency processing: Dielectric heating, Radio-frequency heating; Ohmic heating, Freeze drying, Freeze concentration, UV radiation.	12

V*	- Filtration of juices for preservation - Microbial load estimation in preserved food - Microwave treatment of food	30
	- To study the effect of processing on the keeping quality of food - Estimation of shelf life using various preservation techniques - New product development using food processing techniques and its proximate analysis	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory - Class Participation: 05 - Seminar/presentation/assignment/quiz/class test etc.:05 - Mid-Term Exam: 10 ➤ Practicum - Class Participation: 00 - Seminar/Demonstration/Viva-voce/Lab records etc.:10 - Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - Gloud, G. W. (1995). New Methods of Food Preservation, Springer Publication - Holdsworth, S. D. (1993). Aseptic Processing and Packaging of Food Products, Elsevier, London. - Church, P. N. (1993). Principles and Applications of Modified Atmosphere Packaging of Food, Blackie Academic & Professional, U.K. - Leistner L & Gould G.W. (2002). Hurdle Technologies: Combination Treatments for Food Stability, Safety and Quality. Springer Publications - Gustavo V. Barbosa-Cánovas, María S. Tapia, M. Pilar Cano (2005). Novel Food Processing Technologies, CRC press - Tewari, G, Juneja, V.K. (2007). Advances in thermal and non-thermal preservation, Wiley Blackwell Press		

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	V		
Name of the Course	Principles of Food Engineering		
Course Code	B23-FTQ-502		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Gain knowledge about concept of evaporators and energy balance. 2. Understand the role of thermal processing in food engineering 3. Know about methods and their principles of processing and engineering in food industry 4. Understand about the food processing plants 5*. Gain practical knowledge about use of various equipment for measuring specific heat, viscosity, dehydration etc.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs (P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	1. Material & Energy Balance:- Properties of wet, dry saturated & superheated steam, use of steam tables & Mollier diagram 2. Evaporation:- Boiling point elevation. Basic principles of evaporators. Construction and operation. Different types of evaporators used in food industry.	12
II	Thermal Processing:- Microbial inactivation, concept of F, Z & D value, evaluation of thermal process time for batch sterilization by graphical & formula method, Calculation of process time, continuous flow system, factors affecting rate of heat penetration, effect of Can size on sterility requirement	11
III	Drying and Dehydration:- Rate of drying, constant, & falling rate periods, Engineering aspects of different types of driers used in food processing including tray drier, drum drier, fluidized bed drier, spray and freeze drier etc.	10
IV	1. Freezing:- Depression of Freezing point, Planks equation and other modified equations for prediction of freezing time, freezing time calculation for a product having uniform temperature (negligible internal resistance). 2. Liquid Transport System- Pipelines and pumps for food processing plants-positive displacement pumps, air-lift pumps, propeller pumps, centrifugal pumps and jet pumps.	12
V*	• Determination of cooking properties of parboiled and raw rice. • Determine the viscosity of the given sample using capillary viscometer. • To analyze the milk components using Milk Analyzer • Experiment on properties of food through microwave oven heating. • To perform dehydration of given food sample and to evaluate its moisture content on wet and dry basis. • To determine Brix of any food sample using Digital refractometer	30

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	V		
Name of the Course	Microbial Technology and Therapeutic Foods		
Course Code	B23-FTQ-503		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Know about microbial technology and their use 2. Understand the health benefits of foods with adequate safety 3. Gain knowledge about fermented foods and their therapeutic use 4. Know about therapeutic foods and their usage 5*. Gain practical knowledge about production of therapeutic recipes using microbial technology		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question			

from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	1. Introduction: Definition, Development of functional food, Isolation, Storage, Processing and stability of phytochemicals/bioactive compounds. 2. Prebiotics and Probiotics: Usefulness of probiotics and prebiotics in gastro intestinal health and other benefits, beneficial microbes; types of prebiotics and their effects on gut microbes, resistant starch, fructo-oligosaccharides as probiotic food components.	12
II	Natural pigments (chlorophyll, chlorophyllin, carotenoids), Anthocyanin, Glucosinolates, Isoflavonoids, Phytoestrogens, Antioxidants, Phytosterols.	10
III	1. Fermentation technology: Fermentation Definition, Type-Aerobic and Anaerobic Fermentation. 2. Fermented Food Products: Microbial starter culture, Uses in dairy, meat, fruits, and vegetables products. Production of Pickle and Olives, Alcoholic beverages and Acetone, Butanol, Glutamic acid, Lactic acid, Citric acid, Baker's yeast and L-Aspartic acid.	12
IV	1. Production of vitamins: Thiamin B-1, Riboflavin (B-2), vitamin B-12. Microbial polysaccharides: Fermentative production of Xanthan gums, Dextran, Pullulan. 2. Health benefits of nutraceuticals.	11
V*	• Production of probiotic foods e.g. juice, milk, etc. • Production of wine e.g. cider, red wine, etc. • Production of ethanol from whey • Production of fermented juice • Production of lactic acid • Production of sauerkraut • Development of a therapeutic product	30
Suggested Evaluation Methods		

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	VI		
Name of the Course	Food Industry Waste and By Product Management		
Course Code	B23-FTQ-601		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VA C)	CC-A6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the concept of food waste and its characterization 2. Know about the various methods of effective waste utilization 3. Gain knowledge about waste utilization of meat, poultry and fish 4. know about various treatments given to food industry waste 5*. Gain practical knowledge about various useful products from food industry waste		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.			

Unit	Topics	Contact Hours
I	1. Introduction: Definition, Origin, Type of waste and magnitude of waste, Importance of Waste Management, Food waste as source of biogenic raw material and energetic utilization. 2. Waste Characterization: Temperature, pH, Oxygen Demand (BOD, COD, TOD), Fat, Oil and Grease content, Metal content, Forms of phosphorus and sulphur in waste waters.	11
II	1. Utilization of waste: Processes for waste utilization from fruit and vegetable industries like (apple, orange, mango, potato etc.), Distillation for production of alcohol - oil extraction from waste - citric acid production from fruit waste, Extraction of active ingredients from fruit waste. 2. By-Products Utilization of Wheat and Pulse Mill: By products of wheat milling- germs and bran, By products of pulses milling - husk, germs and broken.	10
III	1. Fish, Meat and Poultry Waste Utilization: Fish Industry by products, Waste utilization- Meat and Poultry Waste recycling. 2. Environmental Protection Act and Specification for Effluent of different food industries. Waste Utilization Environment Management Systems (ISO 14000) and its Application in Food Industry.	12
IV	1. Effluent Treatment: Pre-treatment of waste: Sedimentation, Coagulation, Flocculation and Flotation. 2. Secondary treatments: Biological oxidation-trickling filters, Oxidation ditches, Activated sludge process, Rotating biological contractors, Lagoons. 3. Tertiary treatment: Advanced waste water treatment process-sand, coal and activated carbon filters, phosphorus, sulphur, nitrogen and heavy metals removal. Assessment, treatments and disposal of soil waste; Concept of Vermicomposting and Bio-gas generation.	12

V*	• Identification of useful products from food and agricultural waste • Characterization of industrial effluents for pH, TS, TDS, TSS parameters. • Food waste as a compost agent • To determine acidity & alkalinity of waste water • Determination of TPC in water samples from different sources. • Product development using food waste	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Robert R. Zall (2004), Managing Food Industry Waste: Common sense methods for Food Processors, Blackwell Publishing. 2. Ioannis S. and Arvanitoyannis (2008). Waste Management in Food Industry, Academic Press 3. Vasso Oreopoulou and Winfried Russ (2007). Utilization of byproducts and treatments of waste in Food Industry, Springer publication. 4. Lawrence K. Wang (2006). Waste Treatments in Food Industry, Taylor and Francis.		

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	VI		
Name of the Course	Nutrition and Health		
Course Code	B23-FTQ-602		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Know about the new concepts of nutrition 2. Understand the healthy aspects of macronutrients 3. Gain knowledge about nutritional assessment 4. Now about the role of drugs in health 5*. Gain practical knowledge about planning and cooking of healthy recipes and performing nutritional assessment		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question			

from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	1. Food and nutrients: Definition, Functions of food, Levels of Nutritional status 2. Assessment of nutritional status : Objectives and importance, Methods of assessment a. Direct – Clinical signs, Anthropometric Measurements, Biochemical Tests b. Indirect – Diet surveys, Vital statistics	11
II	1. Energy balance: Food energy measure, Basal Metabolic Rate (B.M.R.), Factors affecting B.M.R., RDA 2. Malnutrition: Type of Malnutrition, Nutrition Infection and Immunity, Nutrition Education	10
III	1. Carbohydrates: Dietary Importance, Special Functions of Carbohydrates in Body Tissues, Relationship Between Dietary Fiber and Various Health Problems, Glycemic Index 2. Fats: Functions of EFA, Role of ω-3, ω-6 Fatty Acids in Health and Disease, Trans Fatty Acids and Prostaglandin. Essential Fatty Acids, Cholesterol, LDL, HDL, VLDL.	12
IV	1. Proteins: Nature and Essentiality of Amino Acids and Proteins, Functions of Protein, Concept of Protein Balance, Biological Value, Therapeutic Applications of Specific Amino Acids. 2. Nutrient Drug Interaction.	12
V*	• Role of various National and International agencies in field of human nutrition • Planning of low cost nutritious recipes for infants, preschoolers • Planning and preparation of diet for various health conditions. • Nutritional labeling of food products • Planning and preparation of snacks for PEM • Dietary assessment – FFQ and 24 hour diet recall	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory ● Class Participation: 05 ● Seminar/presentation/assignment/quiz/class test etc.:05 ● Mid-Term Exam: 10 ➤ Practicum ● Class Participation: 00 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10 ● Mid-Term Exam: NA	End Term Examination: 50 20
Part C-Learning Resources	
Recommended Books/e-resources/LMS: 1. Insel, P., Turner R.E. & Ross, D. (2006). Discovering Nutrition, IInd Edition. ADA, Jones and Bartlett Publishers Inc., USA. 2. MudambiSumati R. & Rajagopal, M.V. (1995). Fundamentals of Food & Nutrition. New Age International (P) Limited, Publishers. 3. ICMR (1995). Nutrient Requirement & RDA, ICMR, New Delhi. 4. Gibney, M.J., Elia, M., Ljungqvist, O. & Dowsett, J. (2005). Clinical Nutrition. The Nutrition society textbook series, Blackwell publishing company. 5. Srilakshmi B. (2011). Dietetics. New Age International Publishers 6. Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh & Co.	

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	VI		
Name of the Course	Food Logistics and Supply Chain Management		
Course Code	B23-FTQ-603		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain the concept of food supply chain 2. Understand about food sourcing and procurement 3. Know about latest trends in food supply chain 4. Understand the challenges faced in food supply chain 5*. Gain practical knowledge about packaging, labeling and food safety		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.			
Unit	Topics		Contact Hours

I	Introduction and Overview: Food Supply Chains & Food Logistics, Evolution of Food Supply Chain, Relationship Between Food & Economy, Factors in Food Supply Chain(FSC)–Producers, Processors, Retailers & Distributors, Consumers; Types of Food Supply Chains.	10
II	1. Food Logistics: Movement of Food, Packaging in Logistics, Temperature Controlled Supply Chains. 2. Food Sourcing and Procurements: Sourcing- Low-cost sourcing, Outsourcing, In-sourcing, Singlesourcing, Multiplesourcing, Partnerships, Procurement(Purchase)- Supplier Segmentation, Sustainable Procurement	12
III	1. Risk Management: Risks of Logistics and Supply chain Management in Food Industry. 2. Technology Trends in Food Supply Chain: Traceability and Use of Technology- Traceability, Bar-coding, e-Procurement, Food Regulations & Safety- Minimum Quality Standards.	11
IV	1. Sustainability & Future Challenges: Attributes to consider when designing food supply chain-Perishability, Seasonality in Production. 2. Sustainability Challenges in Food Supply Chain: Developing Sustainability within Food Supply Chains- Production, Processing, Logistics & Retail Logistics Infrastructure Food Cluster & Enterprise Zone, Food Parks & Hubs.	12
V*	• Infrastructure development for the food sector • Applications of Packaging in logistics • Market survey on Packaging material and labeling details • Food Safety - Minimum Quality Standards, Regulations & Standards • Innovations within food supply chains	30
Suggested Evaluation Methods		

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Food Science and Quality Control		
Semester	VI		
Name of the Course	Entrepreneurship Development and Management		
Course Code	B23-FTQ-604		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary(10+2)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Gain knowledge about concept of a successful entrepreneur 2. Explain about the challenges in entrepreneurial process 3. Know about the Financial Institutions and Small scale Industries 4. Understand about the latest trends and legal aspects of small scale business 5*. Gain practical knowledge about TQM and economic analysis and profitability analysis of food plant		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.			
Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.			

Unit	Topics	Contact Hours
I	1. Entrepreneurship: Definition of Entrepreneur, Internal and External Factors, Classification of entrepreneurs; Characteristic of successful entrepreneurs; Entrepreneurial motivation and Barriers. 2. Concept of Entrepreneurship: Concept & Theory of Entrepreneurship, Development of entrepreneurship	10
II	1. Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative Performance 2. Project Planning: Evaluation, Monitoring and Control segmentation. 3. Institutional support for New Food Ventures: Supporting Organizations; Incentives and facilities; Financial Institutions and Small scale Industries, Govt. Policies for SSIs.	11
III	1. Managerial aspects of small Business: Definition, Principles and Functions of Management, Marketing techniques, Personnel and Inventory Management. 2. Trends in Entrepreneurship: Rural, Social and women entrepreneurship; Family businesses; Entrepreneurship Education and Research: Need, Obstacles, Opportunities and Developments.	12
IV	1. Production management: Plant Location and Layout, Production Planning and Control, Marketing Challenges and Approaches for New Products and Services. 2. Agricultural food processing industry : Problems and Opportunities, Standard related to food industry 3. Legal Aspects of small Business: Elementary Knowledge income tax, sales tax, excise rules, factory act and payment of wages act.	12
V*	• Overview of present status of food industries in India • Overview of management databases • Market Survey, Consumer survey to identify new products	30

	• Layout for different types of food industries. • Data collection of materials and processes. • To study the essential elements of TQM.	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA	End Term Examination: 50 20	
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Holt(1990)Entrepreneurship, New Venture Creation,Prentice-Hall 2. DollingerMJ(1999) Entrepreneurship,Prentice-Hall 3. SinghB.P., Management Concepts &Practices, DhanpatRai&sons,NaiSarak,Delhi. 4. Naidu NVR and KrishnaRaoT(2009).ManagementandEntreneurship,I.K.InternationalPvt.Ltd. 5. DwivediR.S. Management–An Integrated Approach, National Publishing Co.,Delhi.		

**KURUKSHETRA UNIVERSITY
KURUKSHETRA**



**Syllabus
(5th & 6th Semester)
For
Under-Graduate Programme
Bachelor of Vocation in Textile and
Fashion Designing
Interdisciplinary Scheme-D
Under Multiple Entry-Exit,
Internship and CBCS-LOCF in
accordance to NEP-2020
w.e.f. 2025-26
Department of Home Science**

Session: 2025-26			
Part A - Introduction			
Subject	Bachelor of Vocation in Textile and Fashion Designing		
Semester	V		
Name of the Course	Fashion Forecasting		
Course Code	B23-TFD-501		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To understand fashion forecasting & its principles. 2. To learn research process in forecasting. 3. To acquire knowledge about organization of store. 4. To analyze trade area and site- selection. 5*. To acquire practical knowledge about selling strategies and retail environment after visiting retail stores.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30End Term Exam Marks:50 (T)+20(P)=70		Time: 3hrs (T) 4hrs (P)	

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.

Unit	Topics	Contact Hours
I	• Meaning of Fashion & Fashion Forecasting, Importance & Limitations of Fashion Forecasting, Elements Of Forecasting, • Principles of Forecasting, Types of Fashion Forecasts, Precision of The Forecast. • The Role of a Forecaster, The Structure of The Fashion Industry, The Fashion Timetable, Information Network, The Selling Strategy.	12
II	• Research Process in Forecasting- Primary sources, secondary sources, tertiary sources, tracking sales, competition, demographics , value & life style, publications of forecasting services, plethora influences, observation posts, new technology, processes of reporting, process of implementation, promotion, and making the fashion happen.	11
III	Forecasting the Fashion with Reference to- - Color - Style -Season -Different Patterns - Different Fabric Swatches - Accessories On Different Themes	11

IV	• The New Technology, New Uses of Products, Value & Life Style, Fashion of Involvement, Forecasting Services • Process of Reporting- Observation, publication, reporting. Process of Implementation, Promotion, and Making the Prediction Reality.	11
V*	• Study a Particular Style /Design (Classic) (National) and its Progression. • Identify Styles That Never Got Accepted & Reasons for Rejection. • Design Forecast Boards for Colour, Print, Texture and Style. Design a Range of Outfit Using Upcoming Forecast.	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory ● Class Participation: 05 ● Seminar/presentation/assignment/quiz/class test etc.:05 ● Mid-Term Exam: 10 ➤ Practicum ● Class Participation: 00 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10 ● Mid-Term Exam: NA	End Term Examination: 50 20
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Berman B -Retail Management. ● Bolen & William- Stamp Effective Retailing. ● Davidson S- Retail Management. ● Evelyn LB.- Fashion Forecasting. ● Gerald J & Pintel -Retailing Diamond. ● Rabolt NJConcepts and Cases in Retail Merchandise Management. ● Rita P.- Fashion Forecasting.	

*Applicable for courses having practical component.

Session: 2025-26			
Part A – Introduction			
Subject	Bachelor of Vocation in Textile and Fashion Designing		
Semester	V		
Name of the Course	Applications of Traditional Textiles		
Course Code	B23-TFD-502		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To provide an understanding of traditional textiles. 2. To provide knowledge about dyed, printed & painted textiles. 3. To know the woven and various embroidered textiles. 4. To acquire knowledge about modification of the properties of material to make it more contemporary in the recent decade		
	5*.To acquire practical understanding about traditional motifs used in traditional textiles and embroideries of different states of India.		
Credits	Theory	Practical	Total

	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question.			
<u>Instructions for the Candidate:</u> The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.			
Unit	Topics		Contact Hours
I	• Meaning & Significance of traditional textiles. • Classification of Traditional Textiles. • Influence on Traditional textiles of India.		12
II	• Dyed and Printed (Processes, Application & Design) – Bandhej and Leheria, Block Printing of Bagaru and Sangner, Dabu Printing, Kalamkari, Ajrakh, Ikat. • Painted (Processes, Application & Design)– Phad Painting, Pichhwai, Madhubani Painting, Mata Ni Pachedi, Warli.		11

● Mid-Term Exam: NA	
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Chelna D - Ikat Textiles of India , Chronicle Books, San Francisco, 1988. ● Ela D and Hundekar M- Ajrakh Impressions and Expressions, 2008. ● Kapur C, Ambasanyal & Amar V- Saris of India Wiley Eastern Limited, New Delhi, 1989 ● Rosemary C - Indian Ikat Textiles. Weatherhill Inc, 1998. ● Rosemary C- Indian Embroidery , 1999. ● Yashodhara R & Janssen BV - Silk Brocades.	

*Applicable for courses having practical component.

Session: 2025-26	
Part A - Introduction	
Subject	Bachelor of Vocation in Textile and Fashion Designing
Semester	V
Name of the Course	Sourcing & Export Management
Course Code	B23-TFD-503
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C5
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	Senior Secondary (10+2)
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able to: 1. Understand sourcing & its importance. 2. Know factors affecting sourcing. 3. Gain knowledge in export management & its importance. 4. To enable students to understand documentation formalities relating to export transactions.
	5*. Gain practical knowledge about specifications for garments on hangers, shipping marks & bar code labels.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks: 20(T) +10(P) =30 End Term Exam Marks:50(T) +20(P) =70		Time:3 hrs.(T) 4 hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the Candidate:</u> The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.			
Unit	Topics		Contact Hours
I	• Sourcing- Meaning, Importance & Types. • Functions of Sourcing Department in Garment Industry. • Process of Sourcing. • Types of Suppliers.		12
II	• Factors Affecting Sourcing. • Points to be kept in Mind While Sourcing. • Common Challenges in Sourcing. • Critical Innovative Development in Fabric Sourcing • National and International Markets & Suppliers Related to Fabrics, Trims and Accessories.		11

III	• Definition & Importance of Export Management. • Nature of Export Management, Features of Export Management, Process of Export Management. • Current Trade Policies and Guidelines with Specific Reference to Shipment. • Fundamentals of Trade Logistics as Applied in international Trade.	11
IV	• Negotiation Techniques in International Sales Contract. • Types of Garments and Apparels Which Manufacturers can Export. • Factors that Make India One of the Best Fabric Exporting Hubs Globally. • Future of Apparel Exports from India.	11
V*	• Conduct General Market Research in Various Categories of Garments, Made ups and Home Furnishings. Evaluate Suppliers for the Capability of Supplying Materials with Respect to Price, Quality, Quantity. • Prepare Specifications for Garments on Hangers (GOH). • Prepare Shipping Marks & Bar Code Labels. • Calculate Logistics Cost with Different Types of Shipment Modes.	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum		End Term Examination: 50
• Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		20

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- **Garg AK** - Export Procedures and Documentation.
- **Bedey L. Bedey** - Purchase & Materials Mgt.
- **Jain KS** - Export Import Procedures & Documentation.
- **Leenders**- Purchasing & Supply Mgt.
- **Meenakshi & Richa**- Logistics Management.
- **Peter B** -Procurement, Principles & management.
- **Khurna PK** - Export Management.
- **Robert BH et al**- Sourcing & Supply Chain Mgt.
- **Shagufta P**- Logistics Management.

*Applicable for courses having practical component

Session: 2025-26	
Part A - Introduction	
Subject	Bachelor of Vocation in Textile and Fashion Designing
Semester	VI
Name of the Course	Boutique Management
Course Code	B23-TFD-601
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	Senior Secondary (10+2)

Course Learning Outcome (CLOs):	After completing this course, the learner will be able to : 1. Know definition & importance of boutique management. 2. Analyze common challenges in boutique management. 3. Understand boutique business plan. 4. Know the focus areas of boutique management. 5*. Get practical knowledge about becoming a boutique manager.

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question.			
<u>Instructions for the Candidate:</u> The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.			
Unit	Topics	Contact Hours	
I	• Definition & Importance of Boutique Management. • Types of Boutiques, Steps in Boutique Management. • Factors o be Considered before Starting Boutique. • Key Aspects of Boutique Management.	12	

II	• Common Challenges in Boutique Management. • Essential Skills in Boutique Management. • How to Become a Successful Boutique Manager. • Duties and Responsibilities of the Boutique Manager .	11
III	• Boutique Business Plan- Market Survey, Goals, Budget Planning, Sourcing, Location, Visual Merchandising, Boutique Interiors And Display Locations Manpower, Publicity, • Budget Planning– Place, Infrastructure, Equipments And Machinery, Salary, Advertisement, Daily Operational And Maintenance. • Finance Loan Benefits From Government Policies And Banks.	11
IV	• Focus Areas- Design, Marketing & Merchandising, Manufacturing, Inspection and Follow Up in Boutique Management. • Customer Employees Care and Service Management- Customer Feedback Register, Employees Register and The Appraisal Records. • Boutiques Business Ethics. • Monitoring & Managing Boutique Performance for Profitability and Growth. • SMART (Specific, Measurable, Achievable, Realistic and Time-Bound) Business Objectives, Team Goals and Team Objectives In Line With Business Objectives, Monitoring Progress.	11
V*	Students can work in a team so as to prepare the unique products (at least 2 each) to be displayed in the boutique. They can work as follows: • Identifying new and promising materials, trends as well as sources/suppliers for procurement of such items. • Identify quality standards as applicable to the product, develop techpack for designs. • Develop photo sample of similar or identical designs to persuade customers for order booking. • Book order for the product and record details of order booking in suitable form. • Display the developed products in the boutique so as to attract the customers.	30

Suggested Evaluation Methods		
Internal Assessment: ➤ Theory ● Class Participation: 05 ● Seminar/presentation/assignment/quiz/class test etc.:05 ● Mid-Term Exam: 10 ➤ Practicum ● Class Participation: 00 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10 ● Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Briana S- Opening a Boutique Guide : How to Start your own Unique Clothing Boutique. • Brianna S How to Open a Boutique: The Simple Guide to Boutique Success, Create Independent Publishing Platform, Newyork, 2014. • Gastelino M- Fashion Kaleidoscope, Rupa & Co. • Kincade H & Fay YG -Merchandising of Fashion Products, Pearsons Publications, Newyork, 2012. • Leon CM - Small Business Management – An Entrepreneur’s Guide Book, 5th Edition, Mc Graw Hill Educational (India) Pvt. Ltd., New Delhi, 2013. • Manmeet S- Fashion marketing and merchandising, Kalyani Publishers , 1994. • Melissa C -Design and Launch an Online Boutique in a Week . • Sharma RK & Gupta SK -Business Management, Kalyani Publishers, New Delhi, 2009.		

*Applicable for courses having practical component.

Session: 2025-26	
Part A – Introduction	
Subject	Bachelor of Vocation in Textile and Fashion Designing
Semester	VI
Name of the Course	Fashion Merchandising & Retailing
Course Code	B23-TFD-602
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B6
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	Senior Secondary (10+2)
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To understand the concept of merchandising. 2. To develop capability to understand market trends. 3. To understand concept of fashion retail. 4. To gain an understanding of organization of retail store.

	5*To give practical understanding of tech pack, specification sheet, bill of material and retail stores.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30End Term Exam Marks:50(T)+20(P)=70		Time:3hrs (T) 4hrs(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> The examiner will set nine questions in all, selecting twoquestions from each unit and one compulsory objective type question.			
<u>Instructions for the Candidate:</u> The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.			
Unit	Topics		ContactHours
I	• Meaning & importance of fashion merchandising. • Steps & process of merchandising. • Principles of merchandising. • Types of merchandising. • 5R’s of merchandising.		12

II	• Role & skills required for merchandiser. • Identifying the market trends , forecast, vendor/suppliers for raw materials, fabrics and trims, negotiations with vendors. • Management of merchandising documents • Planning and monitoring of merchandising objectives	11
III	• Definition & importance of fashion retailing. • Principles of retailing. • Types of fashion retail stores. • Role & characteristics of fashion retailer. • Fashion marketing research analysis.	11
IV	• Retail evolution- Formats of store, classification of retail outlets • Environment of retail, organization of store, franchising and product labels, international trends in retailing. • Layout and site selection, location, analysis of trade area and site-selection, • Departmentalization, space allocation. • Promotion calendar, retail pricing strategies. • Signage policies.	11
V*	• Making of tech pack , specification sheet & bill of material • Calculating SAM, calculate cost, TNA development • Visit at least two retail fashion stores and observe the following things and write a report: ✓ The selling strategy. ✓ Environment of retail. ✓ Organization of store. ✓ Interior and design, departmentalization,. ✓ Franchising and product labels. ✓ Retail pricing strategies. ✓ Signage policies.	30

Session: 2025-26**Part A - Introduction**

Subject	Bachelor of Vocation in Textile and Fashion Designing
Semester	VI
Name of the Course	Portfolio Development
Course Code	B23-TFD-603
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C6
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	Senior Secondary (10+2)
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To understand concept of portfolio development. 2. To gain an understanding of process of portfolio development.

	3. To help students to get knowledge of methods for portfolio development. 4. To acquire knowledge about presentation of portfolio. 5*. To enable students to develop a comprehensive portfolio, showcasing their professional competencies and skills.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks: 20(T) +10(P) =30 End Term Exam Marks:50(T) +20(P) =70		Time:3 hrs.(T) 4 hrs.(P)	
Part B- Contents of the Course			
Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. Instructions for the Candidate: The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.			
Unit	Topics		Contact Hours
I	Meaning & importance of portfolio development . Meaning & importance of fashion portfolio development. Types of portfolios.		12

II	• Points for selecting content of portfolio development. • Steps in making portfolio. • Points to be kept in mind while making portfolio. • Process of portfolio development.	11
III	• Important requirements for developing an impressive portfolio. • Methods for portfolio development . • Layout of fashion portfolio.	11
IV	• Elements of completed portfolio. • Compilation of the portfolio. • Ways of Presentation of portfolio. • Methods of Reworking old work.	11
V*	• Conceptualize design collection consisting of at least four ensembles (Any 4 Stitched Garments) which must demonstrate the creativity and understanding of the student towards the target customer. These collections should be displayed effectively in the form of a show or exhibition. • Presentation of final design project in the form of a written report. Illustrate the sourcing, costing and flat sketches of the final garments. Swatches of embellishments and construction details should also be incorporated. • All design projects undertaken by the student must be included in a very brief and comprehensive presentation.	30
Suggested Evaluation Methods		

Internal Assessment: ➤ Theory ● Class Participation: 05 ● Seminar/presentation/assignment/quiz/class test etc.:05 ● Mid-Term Exam: 10 ➤ Practicum	End Term Examination: 50
● Class Participation: 00 ● Seminar/Demonstration/Viva-voce/Lab records etc.:10 ● Mid-Term Exam: NA	20
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ● Bina Abbing-. Fashion Illustration. ● Harold Carr-. Fashion Design & Product Development. ● Linda Tain-. Portfolio Presentation for Fashion Designers, 2nd Edition ● Marian L. Davis. - Visual Design & Dress.	

*Applicable for courses having practical component.

Session: 2025-26	
Part A - Introduction	
Subject	Bachelor of Vocation in Textile and Fashion Designing
Semester	VI
Name of the Course	Journalism & Communication
Course Code	B23-TFD-604
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6
Level of the course (As per Annexure-I)	300-399
Pre-requisite for the course (if any)	Senior Secondary (10+2)
Course Learning Outcomes(CLOs):	After completing this course, the learner will be able : 1. To understand principles & types of journalism. 2. To gain knowledge about types of media & photo journalism. 3. To get insight into features & patterns of communication. 4. To understand factors affecting process of communication.

	5*. To get practical knowledge about conversation & public speaking.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks: 20(T) +10(P) =30End Term Exam Marks:50(T) +20(P) =70		Time:3 hrs.(T) 4 hrs.(P)	
Part B- Contents of the Course			
<u>Instructions for Paper- Setter:</u> The examiner will set nine questions in all, selecting twoquestions from each unit and one compulsory objective type question. <u>Instructions for the Candidate:</u> The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.			
Unit	Topics		Contact Hours
I	• Definition & scope • Principles, functions, journalism . • Nature & features of • Types of journalism. • Role & skills of journalist. • Work of journalism.		12

II	• Types of Media: Print, broadcast and new media (Digital and Social Media). • Editing: Principles of editing; headlines , page making . • Photo journalism, Interviewing: Research, planning, framing. • Journalism in today's world & technological evolution in journalism	11
III	• Meaning & importance of communication, • Features of effective communication • Patterns of communication • Barriers of communication, • Essentials of communication.	11
IV	• 7 C's of communication. • Factors affecting process of communication. • Forms of Communication- Intrapersonal communication, interpersonal communication, group communication (public, crowd, small group), mass communication, non-verbal communication, body language.	11

V*	• Rewriting and Summarizing a given piece of news with headlines and suitable introduction; Creating a sample page on computer with hard and soft news. • Writing story, writing article, assignment • Preparing a presentation on types and categories of news. • Writing an application, business letter, memo and personal resume • Conducting Interviews. • Listening exercise – listening to news on Radio & TV • Conversation & Public Speaking	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam: 10 ➤ Practicum		End Term Examination: 50
• Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.:10 • Mid-Term Exam: NA		20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Aggarwal V - Handbook of Journalism and Mass Communication , 2013. • Detrani JR - Mass Communication, 2021 . , • Nayyer D- Modern Mass Communication: Concepts and Processes Hardcover, 2017 . • Roy B - Beginners' Guide To Journalism & Mass Communication, 2013 .		

*Applicable for courses having practical component.

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Syllabus
for
Under-Graduate Programme
Bachelor of Interior Design
Interdisciplinary Scheme–D
5th & 6th Sem.

Under Multiple Entry-Exit,
Internship and CBCS-LOCF in
Accordance to NEP-2020

w.e.f 2025-26

Department of Home Science

SEMESTER-5

Session:2025-26			
Name of the Course	Bachelor of Interior design		
Semester	V		
Subject	INTERIOR DESIGN-V		
Course Code	B23-IDS-501		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A4		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes (CLO):	1: Analyze and apply advanced design methodology in large-scale interior projects. 2: Design hospitality interiors integrating furniture layout, finishes, and lighting systems. 3: Plan healthcare interiors addressing ergonomics, hygiene, and psychological comfort. 4: Integrate building services (HVAC, acoustics, lighting, fire safety) within interior layouts. 5: Prepare professional working drawings, specifications, and material boards for selected projects.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max.Marks:100 InternalAssessmentMarks:20(T)+10(P)=30 End Term Exam Marks:50(T) +20(P) =70		Time:3 hrs.(T) 4 hrs.(P)	

Part B- Contents of the Course		
<u>Instructions for Paper-Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the candidate:</u> The candidate will have to attempt five questions in all, selecting at least one question from each unit as well as compulsory question.		
Unit	Topics	Contact Hours
I	Advanced design methodology- Concept development for large-scale interiors, integrating brand identity, user experience, and sustainability principles	10
II	Hospitality Interiors - Design of boutique hotel/restaurant/resort including furniture layout, finishes, lighting, acoustics, and thematic design	12
III	Healthcare Interiors -Design of clinic/wellness center with emphasis on ergonomics, hygiene, and psychological comfort	12
IV	Services Integration -Incorporating HVAC, artificial & natural lighting, acoustics, fire safety, and accessibility in interior layout	11
V*	Working drawings, specifications, and BOQ preparation for selected project spaces; material boards and 3D visualizations	30
Suggested Evaluation Methods		
Internal Assessment: > Theory ● ClassParticipation:05 ● Seminar/presentation/assignment/quiz/classtest etc.:05 ● Mid-TermExam:10 > Practical ● Seminar/Demonstration/Viva-voce/Labrecordsetc.:10 ● Mid-TermExam:NA		End Term Examination: 50 20

Part C- Learning Resources

Recommended Books/e-resources/LMS:

- “Interior Design Illustrated”, Francis D.K. Ching -Visual guide to space planning and design principles.
- “Hospitality Design for the Grumpy Traveler”, John C. Dunn - Practical insights into hospitality interiors.
- “Designing Commercial Interiors”, Christine M. Piotrowski & Elizabeth A. Rogers - Covers retail, hospitality, and office spaces.
- “Evidence-Based Design for Healthcare Facilities”, Cynthia S. McCullough -Specialized guide for healthcare interiors.
- “Lighting for Interior Design”, Malcolm Innes - Detailed study on artificial and natural lighting design
- “Materials for Interior Environments”, Corky Binggeli- Selection, application, and sustainability of materials.
- “Building Services Handbook” , Fred Hall & Roger Greeno - Integration of HVAC, fire safety, and other services in interiors.

Session: 2025-26			
Name of the Course	Bachelor of Interior design		
Semester	V		
Subject	MATERIALS & CONSTRUCTION DETAILS-V		
Course Code	B23-IDS-502		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC)	CC-B4		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes (CLO):	1: Analyze the properties and applications of advanced composite materials and select appropriate materials for interior projects. 2: Demonstrate knowledge of façade and glazing systems and integrate them effectively within interior and exterior spaces. 3: Apply modular systems in designing flexible and efficient interior layouts. 4: Design and detail interior lighting systems by integrating fixtures, conduits, and layouts into interior drawings. 5: Prepare detailed working drawings and execution documents, including specifications, BOQs, and quality checklists, for a selected commercial/interior projects (hospitality, auditorium, retail)		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 InternalAssessmentMarks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs(T) 4hrs(P)	
Part B- Contents of the Course			

Instructions for Paper-Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question.

Instructions for the candidate: The candidate will have to attempt five questions in all, selecting at least one question from each unit as well as compulsory question.

Unit	Topics	Contact Hours
I	Advanced Composite Materials -HPL, ACP, FRP, engineered stone, laminates, their properties, fabrication, and applications	11
II	Curtain Wall & Façade Systems - Glazing systems, cladding materials, structural glazing, ventilated façades	12
III	Modular Interior Systems -Modular furniture, demountable partitions, movable wall systems, modular kitchens for commercial/institutional use	12
IV	Lighting Integration in Interiors -Recessed, cove, pendant, track, integrated lighting systems, electrical conduits and detailing	10
V*	Case study, working drawings, Professional Execution Methods for commercial/interior projects (hospitality, auditorium, retail) with complete material and finishing schedules- Tender documentation, specifications writing, BOQs, quality checks, vendor coordination	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory ● Class Participation:05 ● Seminar/presentation/assignment/quiz/classtest etc.:05 ● Mid-TermExam:10 ➤ Practicum ● Class Participation: ● Seminar/Demonstration/Viva-voce/Labrecordsetc.:10 ● Mid-TermExam:NA		End Term Examination: 50 20

Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Francis D.K. Ching, Building Construction Illustrated - Comprehensive reference on materials and construction systems.
- W. R. J. Keall, Modern Building Materials, Structures and Techniques - Covers composite materials and façade systems.
- Michael Forsyth, Materials and Skills for Historic and Modern Buildings - Selection and detailing for a range of materials.
- Egan &Matz, Concepts in Architectural Acoustics - Acoustic principles and treatments for interiors.
- Gary R. Steffy, Architectural Lighting Design - Detailed study on integrating lighting into interiors.
- Corky Binggeli, Materials for Interior Environments -Materials selection with technical and aesthetic focus.
- American Institute of Architects, Architectural Graphic Standards - Industry-standard detailing and material references.

Session:2025-26			
Name of the Course	Bachelor of Interior design		
Semester	V		
Subject	BUILDING SERVICES - III (HVAC, Fire Safety & Security Systems)		
Course Code	B23-IDS-503		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC)	CC-C4		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes (CLO):	1: Explain the principles of HVAC systems and evaluate suitable systems for different interior spaces. 2: Design and integrate HVAC layouts, components, and ducting systems within interior projects. 3: Apply fire safety codes and design evacuation, detection, and suppression systems for interior environments. 4: Incorporate security and access control systems into interior layouts with effective placement strategies. 5: Prepare service layouts and working drawings integrating HVAC, fire safety, and security systems for selected projects.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5

Max. Marks:100 InternalAssessmentMarks:20(T)+10(P)=30 End Term Exam Marks:50(T) +20(P) =70	Time:3hrs.(T) 4 hrs.(P)

Part B-Contents of the Course		
<u>Instructions for Paper-Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the candidate:</u> The candidate will have to attempt five questions in all, selecting at least one question from each unit as well as compulsory question.		
Unit	Topics	Contact Hours
I	Introduction to HVAC Systems – Principles of heating, ventilation, and air conditioning; thermal comfort parameters; types of HVAC systems (centralized, split, VRV/VRF, ducted); selection criteria for interior spaces	11
II	Components & Layouts – Air handling units, chillers, condensers, ducts, diffusers, grilles; placement strategies for interiors; integration with false ceilings and partitions	11
III	Fire Safety Systems – Fire behavior, classification of fires, fire resistance ratings; fire detection systems (smoke, heat, flame detectors); suppression systems (sprinklers, hydrants, extinguishers); fire exits and evacuation planning for interiors	12
IV	Security & Access Control – CCTV, biometric systems, intrusion alarms, motion sensors, card access systems; placement strategies and wiring integration in interiors	11
V*	Lab/Practical Component – Preparation of service layouts for HVAC, fire safety, and security systems for a selected building; working drawings with specifications and legend symbols; case studies of existing systems in commercial or public buildings	30

Suggested Evaluation Methods	
Internal Assessment: > Theory ● ClassParticipation:05 ● Seminar /presentation/ Assignment/ quiz/ classtest etc.:05 ● Mid-TermExam:10 > Practicum ● Class Participation: ● Seminar/Demonstration /Viva-voce/ Lab records etc.:10 ● Mid-TermExam:NA	End Term Examination: 50 20
Part C- Learning Resources	
Recommended Books/e-resources/LMS: ● Moncef Krarti, Energy Audit of Building Systems: An Engineering Approach - HVAC design and energy efficiency. ● Samuel Sugarman, HVAC Fundamentals - Core principles and system types. ● NFPA (National Fire Protection Association), NFPA Fire Protection Handbook -Fire safety codes and design guidelines. ● Jane Buchanan & Michael R. J. Barrett, Fire Safety Management Handbook - Fire risk assessment and safety planning. ● Bill Phillips, Security Systems and Intruder Alarms - Practical guide to security systems in buildings. ● American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), ASHRAE Handbook -HVAC systems design. ● David G. Cotts et al., The Facility Management Handbook - Integration of building services into design and operations.	

SEMESTER 6

Session:2025-26			
Name of the Course	Bachelor of Interior design		
Semester	VI		
Subject	INTERIOR DESIGN - VI		
Course Code	B23-IDS-601		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A4		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes (CLO):	1: Design interiors for public spaces considering crowd flow, accessibility, and zoning. 2: Plan retail interiors integrating branding, display systems, and customer experience. 3: Apply sustainable and adaptive reuse strategies in redesigning existing buildings. 4: Execute a comprehensive capstone interior project integrating services and detailing. 5: Develop a professional portfolio documenting drawings, visuals, and specifications.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max.Marks:100 InternalAssessmentMarks:20(T)+10(P)=30 End Term Exam Marks:50(T) +20(P) =70		Time:3 hrs.(T) 4 hrs.(P)	

Part B- Contents of the Course		
<u>Instructions for Paper-Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the candidate:</u> The candidate will have to attempt five questions in all, selecting at least one question from each unit as well as compulsory question.		
Unit	Topics	Contact Hours
I	Urban Public Spaces - Interiors for large public facilities (airport lounges, museums, cultural centers) focusing on zoning, user flow, and accessibility	11
II	Retail Chains & Branding -Multi-outlet retail design, display systems, visual merchandising, and customer experience strategies	11
III	Sustainable & Adaptive Reuse - Redesigning heritage/industrial buildings into functional interior spaces	11
IV	Capstone Project - Comprehensive mixed-use interior design (minimum 2000 sqm) with all drawings, renderings, material boards, and cost estimates	12
V*	Professional Practice & Portfolio Development -Preparing industry-ready presentations, portfolios, and learning about contracts, tendering, and project management	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory ● ClassParticipation:05 ● Seminar/presentation/assignment/quiz/classtest etc.:05 ● Mid-TermExam:10 ➤ Practicum ● Class Participation: ● Seminar/Demonstration/Viva-voce/Labrecordsetc.:10 ● Mid-TermExam:NA		End Term Examination: 50 20

Part C- Learning Resources

- Jennifer Hudson Interior Architecture: From Brief to Build-Complete process from concept to completion.
- Otto Riewoldt, Retail Design- Strategies for branding, visual merchandising, and customer experience.
- Douglas Macdonald, Adaptive Reuse: Extending the Lives of Buildings- Revitalizing heritage and industrial spaces.
- Matthew Carmona, Public Spaces, Urban Spaces - Design approaches for public interiors and urban environments.
- Harold Linton, Portfolio Design -Creating a professional designer's portfolio.
- David Kent Ballast, Interior Detailing: Concept to Construction - Standards and methods for technical detailing.
- Christine M. Piotrowski, Professional Practice for Interior Designers- Industry standards, contracts, and career preparation.

Session: 2025-26			
Name of the Course	Bachelor of Interior design		
Semester	VI		
Subject	Interior Project Management		
Course Code	B23-IDS-602		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE/PC/AEC/VA C)	CC-B4		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes (CLO):	1: Explain the scope, stages, and stakeholder roles in interior project management. 2: Prepare project schedules using WBS, Gantt charts, and CPM for interior works. 3: Develop cost estimates, BOQs, and budgets applying rate analysis and value engineering. 4: Analyze contracts, tenders, and legal aspects related to interior project execution. 5: Prepare a complete project management plan including schedule, BOQ, contract documents, and quality control checklist for an interior project.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T)+20(P)=70		Time:3hrs(T) 4hrs(P)	

Part B- Contents of the Course		
<u>Instructions for Paper-Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the candidate:</u> The candidate will have to attempt five questions in all, selecting at least one question from each unit as well as compulsory question.		
Unit	Topics	Contact Hours
I	Introduction to Project Management in Interiors- Definition, scope, and stages of interior projects; roles of project manager and stakeholders; integration of design and execution	8
II	Project Planning & Scheduling- Work breakdown structures (WBS), Gantt charts, Critical Path Method (CPM), resource allocation, sequencing of trades in interiors	15
III	Cost Estimation & Budgeting- Types of estimates, rate analysis, quantity take-off, preparing Bills of Quantities (BOQ), value engineering	11
IV	Contracts, Tenders & Legal Aspects- Types of contracts, tender documentation, bidding process, vendor selection, contractual obligations, dispute resolution	11
V*	Quality Control & Site Management- Quality assurance protocols, safety regulations, coordination with contractors, site supervision, tracking progress, managing change ordersPreparation of a complete project management plan for an interior project including schedule, BOQ, contract documents, and quality control checklist	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory ● Class Participation:05 ● Seminar/presentation/assignment/quiz/classtest etc.:05 ● Mid-TermExam:10 ➤ Practicum ● Class Participation: ● Seminar/Demonstration/Viva-voce/Labrecordsetc.:10 ● Mid-TermExam:NA		End Term Examination: 50 20

Part C- Learning Resources

Recommended Books/e-resources/LMS:

- Jack Meredith & Samuel Mantel, Project Management: A Managerial Approach - Fundamentals of project management.
- K. K. Chitkara, Construction Project Management: Planning, Scheduling, and Controlling - Adaptable to interior projects.
- Christine M. Piotrowski, Professional Practice for Interior Designers -Contracts, documentation, and business aspects.
- David G. Cotts, Kathy Roper & Richard Payant, The Facility Management Handbook - Managing operations and execution in built environments.
- Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling - Advanced project management tools.
- Chris Hendrickson, Project Management for Construction - Resource planning, cost control, and coordination.
- Allan Ashworth, Contractual Procedures in the Construction Industry -Legal and procedural guidelines for tendering and contracts.

Session: 2025-26			
Name of the Course	Bachelor of Interior design		
Semester	VI		
Subject	Professional Practice		
Course Code	B23-IDS-603		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE /PC/AEC/VA C)	CC-C4		
Level of the course (As per Annexure-I	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes (CLO):	1: Explain the role, ethics, and responsibilities of an interior designer in professional practice. 2: Analyze procedures for establishing and managing different types of interior design firms. 3: Apply knowledge of contracts, legal frameworks, and fee structures in client-designer agreements. 4: Develop strategies for marketing, branding, and client relationship management in interior practice. 5: Draft a professional contract, fee proposal, and personal marketing portfolio for an interior project.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks:50(T) +20(P) =70		Time:3hrs.(T) 4 hrs.(P)	

Part B- Contents of the Course		
<u>Instructions for Paper-Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the candidate:</u> The candidate will have to attempt five questions in all, selecting at least one question from each unit as well as compulsory question.		
Unit	Topics	Contact Hours
I	Role of the Interior Designer -Scope of services, professional ethics, codes of conduct, role in society, relationship with allied professionals	9
II	Setting up Practice -Types of firms (sole proprietorship, partnership, LLP, private limited), registration, licensing, GST, business development	12
III	Contracts & Legal Framework, Fee Structures & Billing -Letter of agreement, standard forms of contract, client-designer agreements, consultancy contracts, professional liabilities, dispute resolution, Methods of charging (percentage, lump sum, hourly), fee schedules, cost-plus basis, payment milestones, invoicing	12
IV	Marketing & Client Relations - Brand building, networking, client acquisition, presentation skills, handling negotiations, retaining clients	12
V*	Drafting a complete professional contract for a hypothetical interior project, preparing a fee proposal, and developing a personal marketing portfolio	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory ● Class Participation:05 ● Seminar/presentation/Assignment/quiz/classtest etc.:05 ● Mid-TermExam:10 ➤ Practicum ● Class Participation: ● Seminar/Demonstration/Viva-voce/Labrecordsetc.:10 ● Mid-TermExam:NA		End Term Examination: 50 20

Part C- Learning Resources

Recommended Books/e-resources/LMS:

- Christine M. Piotrowski, Professional Practice for Interior Designers -Industry-standard guide for business and ethics in interior design.
- AIA, Architect's Handbook of Professional Practice -Adaptable for interior design contracts and management.
- Roshan Namavati, Professional Practice -Legal and procedural aspects for design professionals.
- Fred Lawson, Design and Project Management for Architects and Interior Designers - Integrating design and business operations.
- David Kent Ballast, Interior Design Business Handbook - Fee structures, client contracts, and marketing strategies.
- Interior Designers of Canada (IDC), Code of Ethics & Professional Standards - Ethics and practice guidelines.

Session:2025-26			
Name of the Course	Bachelor of Interior design		
Semester	VI		
Subject	Computer Applications		
Course Code	B23-IDS-604		
Course Type: (CC/MCC/MDC/CCM/DSEC/VOC/DSE /PC/AEC/VA C)	CC-C4		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	Senior Secondary (10+2)		
Course Learning Outcomes (CLO):	1: Develop advanced 2D drawings using AutoCAD with appropriate layers and plotting standards. 2: Construct 3D interior models using SketchUp/3ds Max/Revit. 3: Apply rendering techniques with materials, textures, and lighting for photorealistic outputs. 4: Create walkthroughs and animated presentations for interior projects. 5 : Execute a complete project presentation combining 2D, 3D, and rendered visuals with professional layouts.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 InternalAssessmentMarks:20(T)+10(P)=30 End Term Exam Marks:50(T) +20(P) =70		Time:3hrs.(T) 4 hrs.(P)	

Part B- Contents of the Course		
<u>Instructions for Paper-Setter:</u> The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. <u>Instructions for the candidate:</u> The candidate will have to attempt five questions in all, selecting at least one question from each unit as well as compulsory question.		
Unit	Topics	Contact Hours
I	Advanced 2D Drafting and 3D Modeling for Interiors- Layers, blocks, dynamic components, parametric constraints in AutoCAD; setting up sheets for plotting, creating complex interior spaces, furniture, and joinery using SketchUp/3ds Max/Revit, BIM	10
II	Rendering Techniques- Applying materials, textures, lighting setups, camera views; introduction to V-Ray/Lumion/ AR/VR	15
III	Walkthrough & Animation- Creating virtual tours and animated sequences for interior spaces	10
IV	Presentation Graphics- Integrating 2D/3D outputs with Adobe Photoshop/Illustrator/InDesign for professional layouts	10
V*	Complete modeling, rendering, and presentation of a commercial or residential interior project with working drawings	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory ● Class Participation:05 ● Seminar/presentation/Assignment/quiz/class test etc.:05 ● Mid-Term Exam:10 ➤ Practicum ● Class Participation: ● Seminar/Demonstration/Viva-voce/Lab record etc.:10 ● Mid-Term Exam:NA		End Term Examination: 50 20

Part C- Learning Resources

Recommended Books/e-resources/LMS:

- George Omura, Mastering AutoCAD -Advanced drafting techniques.
- Bonnie Roskes, SketchUp for Interior Design -Modeling workflows for interiors.
- Kelly L. Murdock,Autodesk 3ds Max Bible - 3D modeling, animation, and rendering.
- Brian Bradley, Photorealistic Rendering with V-Ray -Rendering techniques for realistic outputs.
- Evan Troxel, Rendering in SketchUp -Practical guide to producing visuals.
- Adobe Creative Team, Adobe Photoshop Classroom in a Book - Image editing for design presentations.
- Daniel Tal, Rendering in SketchUp and Layout -Combining modeling and presentation for client work.

KURUKSHETRA UNIVERSITY KURUKSHETRA



**Modified Scheme of Examination and Syllabus
For
Under-Graduate Programme
Subject: Home Science
(5th & 6th Semester)**

Scheme - A

**Under Multiple Entry-Exit
Internship and CBCS-LOCF in accordance to NEP-2020
w.e.f. 2025-26**

KURUKSHETRA UNIVERSITY KURUKSHETRA

**Modified Scheme of Examination for Under-Graduate Programme in the Subject Home
Science as per NEP 2020
Under Multiple Entry-Exit, Internships & CBCS-LOCF-CCF in accordance to
w. e. f. 2025-26**

SEMESTER-5								
Course	Paper (s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-5 4 credit	B23-HSE-501	Normal and Therapeutic Nutrition	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
CC-M5 (V) 4 credits	From Available CC-M5(V) pool list of four credits as per NEP							
SEMESTER-6								
Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-6 4 credit	B23-HSE-601	Human Development	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
CC-M7(V) 4 credits	From Available CC-M7(V) pool list of 4 credits as per NEP							

Session: 2025-26			
Part A - Introduction			
Subject	Home Science		
Semester	V		
Name of the Course	Normal and Therapeutic Nutrition		
Course Code	B23-HSE-501		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/ VAC)	CC-5 (Core Course)		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	12 th		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand nutritional requirements across various stages of life 2. To develop the skills for meal planning at various life stages using recommended dietary intake and reference values. 3. To understand the diet modifications for therapeutic purposes & gain knowledge about dietary management of diseases 4. To modify normal diets to best suit therapeutic conditions 5* Acquire practical knowledge in planning and preparing both normal and therapeutic diets.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks: 50(T)+20(P)=70		Time: 3hrs (T) 4hrs(P)	

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Un it	Topics	Contact Hours
I	➤ Meal Planning: Definition, Principles and Factors affecting it ➤ Nutritional Requirements and Principles of Meal Planning of the following: • Infants • Pre School Age (4-6 years) • School Age Children(7-11years) • Adolescents	10
II	➤ Nutritional Requirements and Principles of Meal Planning of the following: • Adult • Pregnant women • Lactating women • Old Age	11
III	➤ Diet Therapy: Definition and Principles ➤ Modification of normal diet: Clear fluid, Full fluid, Soft, Bland diet ➤ Causes, Symptoms and Dietary management in disorders: Diarrhoea and Constipation	12
IV	➤ Causes, Symptoms and Dietary management in disorders: • Typhoid Fever • Peptic ulcer • Obesity • Diabetes • Hypertension	12
V*	➤ Planning and Preparation of diet for the following: • Infant, Preschoolers, School going children and Adolescents (girl and boy) • Adult: Male, Female • Pregnant and Lactating women • Old age ➤ Planning and Preparation of diet for following disorders: • Diarrhoea and Constipation • Typhoid Fever • Peptic ulcer	30

	• Obesity • Diabetes • Hypertension	
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam:10 ➤ Practical • Class Participation: 05 • Seminar/Demonstration/Viva-voce/Lab records etc.:05 • Mid-Term Exam: NA		End Term Examination: 50 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: ➤ Srilakshmi, B. (2019). Dietetics. New Age International Publishers. ➤ Gopalan, C. et al. (Revised Edition). Nutritive Value of Indian Foods. NIN, ICMR. ➤ Mudambi, S.R. & Rajagopal, M.V. (2012). Fundamentals of Foods, Nutrition and Diet Therapy. New Age International. ➤ Antia, F.P. & Abraham, P. (2009). Clinical Dietetics and Nutrition. Oxford University Press. ➤ Swaminathan, M. (2003). Handbook of Food and Nutrition. BAPPCO. ➤ Tikoo, S.S. (2022). Food and Nutrition. Modern Publication, Jullunder.		

*Applicable for courses having practical components.

Session: 2025-26			
Part A - Introduction			
Subject	Home Science		
Semester	VI		
Name of the Course	Human Development		
Course Code	B23-HSE-601		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-6 (Core Course)		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	12 th		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Describe the stages of human development and associated tasks and problems. 2. Understand key psychological concepts related to child behavior and learning. 3. Explain intelligence and personality development and their influencing factors. 4. Evaluate the importance of maternal care and nutrition in early development. 5* Apply skills of observation, report writing, and communication through community-based practicals and understand ground-level challenges and practices related to public health and child development.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 Internal Assessment Marks:20(T)+10(P)=30 End Term Exam Marks: 50(T)+20(P)=70		Time: 3hrs (T) 4hrs(P)	

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory.

Instructions for the Candidate: The candidates will attempt five questions in all, selecting one question from each unit and the compulsory question as well.

Unit	Topics	Contact Hours
I	➤ Meaning, Definition, Scope and Stages of Human Development ➤ Prenatal Development: Conception, Course of prenatal development ➤ Conditions affecting Prenatal Development ➤ Infancy: Characteristics, Developmental tasks and Problems	10
II	➤ Early Childhood: Characteristics, Developmental tasks and Behaviour problems ➤ Middle Childhood: Characteristics, Developmental tasks and Behaviour problems ➤ Adolescence: Characteristics, Developmental tasks and Socio emotional problems ➤ Adulthood: Characteristics, Developmental tasks and Problems	11
III	➤ Child Psychology: Definition, Subject matter and objectives of studying ➤ Learning: Meaning, importance, Method of learning, Factors effecting learning ➤ Intelligence: Definition, Measurement of intelligence ➤ Personality Development: Definitions, Types and Factors affecting Development of the Personality	12
IV	➤ The Expectant mother: Sign and Discomforts of Pregnancy ➤ Care of the expectant mother in brief ➤ Ill effects of an early marriage ➤ Feeding of an infant: Breast feeding verses Artificial feeding	12
V*	➤ Immunization Schedule Survey in PHC and local hospitals ➤ Acquaintance with First aid techniques ➤ Prepare a Play Material for infants/ preschooler ➤ Prepare a survey report on Diet, Health and Hygiene of at least five adolescent girls (17-19years)	30

Suggested Evaluation Methods	
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.:05 • Mid-Term Exam:10 ➤ Practical • Class Participation: 05 • Seminar/Demonstration/Viva-voce/Lab records etc.:05 • Mid-Term Exam: NA	End Term Examination: 50 20
Part C-Learning Resources	
Recommended Books/e-resources/LMS: ➤ Tikoo, S.S. (2022). Human Development. Modern Publication, Jullunder. ➤ Hurlock, E. B. (2001). <i>Child development</i> (6th ed.). New Delhi: McGraw-Hill Education. ➤ Santrock, J. W. (2019). <i>Life-span development</i> (17th ed.). New York: McGraw-Hill Education. ➤ Berk, L. E. (2018). <i>Development through the lifespan</i> (7th ed.). Boston: Pearson Education. ➤ Park, K. (2023). <i>Preventive and social medicine</i> (27th ed.). Jabalpur: Banarsidas Bhanot Publishers. ➤ Rao, C. (2012). <i>A textbook of midwifery and obstetrical nursing</i> (2nd ed.). New Delhi: Elsevier India. ➤ Nair, M. K. C., & Paul, M. K. (2014). <i>Adolescent girl's health: Issues and challenges</i>. New Delhi: Jaypee Brothers Medical Publishers.	

*Applicable for courses having practical component.

KURUKSHETRA UNIVERSITY KURUKSHETRA



Modified Scheme of Examinations and Syllabus

For Under-Graduate Programme

Subject: FASHION DESIGNING

Multidisciplinary Scheme – A

5th & 6th Semester

Under Multiple Entry-Exit

Internship and CBCS-LOCF in accordance to NEP-2020

w.e.f. 2025-26

Department of Home Science

KURUKSHETRA UNIVERSITY KURUKSHETRA

Modified Scheme of Examination For Under-Graduate Programme in Subject Fashion Designing as per NEP 2020

Under multiple Entry-Exit, Internship & CBCS-LOCF-CCF in accordance to

w.e.f. 2025-26

SEMESTER-5

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal Marks	External Marks	Total Marks	Exam Duration
CC-5 4 Credit	B23-FDS-501	Pattern Making & Garment Construction	3	3	20	50	70	3 hrs.
		Pattern Making & Garment Construction - Practical	1	2	10	20	30	4 hrs.
CC-M5(V) 4 Credit	From Available CC M5(V) pool list of four credit as per NEP							

KURUKSHETRA UNIVERSITY KURUKSHETRA

Modified Scheme of Examination For Under-Graduate Programme in Subject Fashion Designing as per NEP 2020

Under multiple Entry-Exit, Internship & CBCS-LOCF-CCF in accordance to

w.e.f. 2025-26

Fashion Designing

SEMESTER-6

Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal Marks	External Marks	Total Marks	Exam Duration
CC-6 4 Credit	B23-FDS-601	Marketing & Merchandising	3	3	20	50	70	3 hrs.
		Marketing & Merchandising- Practical	1	2	10	20	30	4 hrs.
CC-M7(V) 4 Credit	From Available CC-M7(V) pool list of four credit as per NEP							

Session: 2025-26			
Part A - Introduction			
Subject	Fashion Designing		
Semester	5		
Name of the Course	Pattern Making & Garment Construction		
Course Code	B23-FDS-501		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-5		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	12 th Pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Know about pattern making techniques & garment construction terminology. 2. Acquire understanding of different tools & equipment used for pattern making and garment construction. 3. Attain knowledge of process of garment construction. 4. Know about how to select fabrics. 5* Gain skills relating to drafting & stitching of various garments.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5

Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50(TH) 20(P) =70		Time:3hrs(T) 4hrs(P)
Part B-Contents of the Course		
<u>Instructions for Paper- Setter:</u>The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question. <u>Instructions for the candidate:</u> The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.		
Unit	Topics	Contact Hours
I	- Pattern Making- Definition & Importance. - Garment Construction - Meaning and Importance - Pattern & Garment Construction Terminology- Pattern, Block/ Sloper, Drafting, Draping, Grading, Seam Allowance, Ease, Notches, Grain Line, Bias Seam, Hem, Dart, Pleat, Gathers, Tucks, Stay Stitch, Top Stitch, Lining, Interlining, Facing, Plackets, Princess Seam, Yoke.	12
II	- Tools & Equipment Used for Pattern Making and Garment Construction - Measuring Tools, Marking Tools, Cutting Tools, Sewing Tools, Pressing Tools. - Measurements- Importance of Body Measurements. Correct Procedure of Taking Body Measurements.	12
III	- Process of Garment Construction - Selection of Patterns, Prints and Fabrics for Particular Garments Clothing and Embellished Articles	12
IV	- Selection of Fabrics for Infants and Children - Selection of Fabrics according to Occasion, Use and Need	9
V*	Drafting & Stitching o:f - Circular Skirt -Blouse/ Bodice	30

Semester-6

Session: 2025-26			
Part A - Introduction			
Subject	Fashion Designing		
Semester	6		
Name of the Course	Marketing and Merchandising		
Course Code	B23-FDS-601		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)	12 th Pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Gain knowledge about marketing, merchandising, presentation and export marketing. 2. Know about retailing & fashion Forecasting 3. Know the importance of export and procedure. 4. Gain knowledge about international and national market. 5.*Learn about sourcing of fabric fasteners, trims, and layout, design and illustration for dissimilar kinds of store display.		
Credits	Theory	Practical	Total

	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 20(T)+10(P)=30 End Term Exam Marks :50(TH) 20(P) =70		Time:3hrs(T) 4hrs(P)	
Part B-Contents of the Course			
<u>Instructions for Paper- Setter:</u> The examiner will set nine questions in all, selecting four questions from each unit and one compulsory objective type question.			
<u>Instructions for the candidate:</u> The candidates will attempt five questions in all, selecting atleast one question from each unit as well as compulsory questions.			
Unit	Topics	Contact Hours	
I	• Marketing Terminology: Marketing, Market Niche, Target Customers, Customer, Vendor, Supplier, Franchise, Market Research, Sales, Mood Board. • Fashion Market, Introduction to Marketing Environment (Macro & Micro). • Sales Promotion Techniques.	12	
II	• Retailing: Introduction, Different Retail Operations, Factors Affecting Retailing. • Fashion Forecasting : Process, Sources Of Fashion Forecasting Information.	12	
III	• Merchandising-Introduction, Role Of Merchandiser, Types Of Merchandising. • Export Documentation: Export Marketing, Global Scenario. • Export and Import Policies.	12	
IV	• Prospects of Indian Apparel in Overseas Market. • Importance of Textile Industry in Indian Economy.	9	
V*	• Survey on Famous Brands Available in Market for Men, Women & Children. • Sourcing of Fabrics, Fasteners and Trims.	30	

	• Layout, Design and Illustration for Different Kinds of Store Displays. • Window Display for a Specific Store and Boutique. • Thematic Window Display.	
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam: 10 > Practicum • Class Participation: - • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: -		End Term Examination: 50 20
Part C-Learning Resources Recommended Books/e-resources/LMS: • Eascy M.: FashionMarketing"BlackwellScience,1994. • Kotler Philip: MarketingManagement“prenticeHall,NewDelhi,2000. • J. Jarnow And K.G. Dickerson: “Inside the Fashion Business", Prentice Hall, 1997. • Elaine Stone, Jean : ,"FashionMerchandising",McGrawHill book, 1985. • Colbornbe Robert: VisualMerchandising;TheBusinessofMerchandise Presentaion", Thomson Delinar Learning, USA.		

**KURUKSHETRA UNIVERSITY
KURUKSHETRA**



Modified Scheme of Examination and Syllabus

3rd Semester

For

Under-Graduate Programme Multidisciplinary

Scheme A

(Subject: Clinical Nutrition & Dietetics)

**Under Multiple Entry-Exit,
Internship and CBCS- LOCF in accordance to NEP-2020
w.e.f. 2025-26**

DEPARTMENT OF HOME SCIENCE

DEPARTMENT OF HOME SCIENCE KURUKSHETRA UNIVERSITY KURUKSHETRA
 Modified Scheme of Examination for Under-Graduate Programme
Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020
 w.e.f. 2025-26

Subject: Clinical Nutrition & Dietetics

SEMESTER-3								
Course	Paper(s)	Nomenclature of Paper	Credit	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
CC-3 4 credit	B23-CND-301	Human Nutrition I	3	3	20	50	70	3 hrs.
		Practicum	1	2	10	20	30	4 hrs.
CC-M3 4credit	B23-CND-302	Nutrition throughout Life Cycle	3	3	20	50	70	3 hrs.
		Practicum	1	2	10	20	30	4 hrs.

Session: 2025-26			
Part A – Introduction			
Subject	Clinical Nutrition & Dietetics		
Semester	III		
Name of the Course	Human Nutrition I		
Course Code	B 23- CND-301		
Course Type: (CC/MCC/MDC/CC-M /DSEC/VOC/DSE/PC/AEC/VAC)	CC-3		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	12 th pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the concept and principles of meal planning 2. To know about nutritional requirements during infancy and breast feeding 3. To understand the nutritional requirements of toddlers and pre-schoolers 4. To know the nutritional needs of school going children 5*. To prepare nutritious meals for different age groups		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 20 (T) + 10 (P) =30 End Term Exam Marks: 50 (T) + 20 (P) =70		Time: 3hrs (T) 4 hrs (P)	

Part B- Contents of the Course		
<u>Instructions for Paper- Setter</u> Instructions for the examiner: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. Instructions for the candidates: The candidate will attempt five questions in all, selecting one question from each unit and one compulsory question.		
Unit	Topics	Contact Hours
I	Introduction to meal management – Balanced diet, Basic principles of meal planning, objectives and steps in meal planning.	10
II	Nutrition during infancy – Nutritional requirements, Breast feeding, Formula feeding, Introduction of supplementary food.	15
III	Nutrition during early childhood (Toddler / Pre School) growth and nutrient needs, nutrition related problems.	10
IV	Nutrition of school children – Nutritional requirements, School lunch programmes: ANP, SNP and MDM	10
V*	Planning, calculation and preparation of meals for all age groups mentioned in theory	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: 50 20

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Modern Nutrition in Health and Disease – Goodhearth, R. S.
2. Recommended dietary allowance for Indians – I.C.M.R., 1980
3. Nutrition and Development- Winick 1973, Univ. of Calombia.
4. Biology of Nutrition – Eclames 1972, Palaniuma Press
5. Foods & Nutrition – Krause 1972, Saunders.
6. Proteins and Human Foods 1970, Lowrie, Avi. Pub. Co.
7. Nutrition & Physical fitness – BoGert L.J.
8. Principles of Nutrition – Wilson, L.D. and Fisher. K.H.
9. Standardised diets for Hospital – National Nut. Advisory Committee
10. Nutrition in Health & Disease – Cooper, L. Barher, L. Mitehell, Hand Rynheraen.
11. Nutrition A comprehensive – Beaton and McHanery, Treatise Vol-1, II, & III.
12. Human Nutrition & Dietetics – Davidson S., Passmore, R., Brook, J.E. and Truswell.
13. Foods and Nutrition – Rankin, W. Munn. Hildath E.N.
14. Iron deficiency – Holiberth, H.C. Harvorth, Vannotti, N.Y.
15. Trace Elements in Human and Animal Nut. – Underwood, N.Y.

Session: 2025-26			
Part A – Introduction			
Subject	Clinical Nutrition & Dietetics		
Semester	III		
Name of the Course	Nutrition throughout Life Cycle		
Course Code	B23- CND-302		
Course Type: (CC/MCC/MDC/CC-M / DSEC/ VOC/DSE/PC/AEC/VAC)	CC-M3		
Level of the course (As per Annexure-I	200-299		
Pre-requisite for the course (if any)	12 th pass		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. To understand the concept and principles of meal planning 2. To know about nutritional requirements during infancy and breast feeding 3. To understand the nutritional requirements of toddlers and pre-schoolers 4. To know the nutritional needs of school going children 5*. To prepare nutritious meals for different age groups		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks: 100 Internal Assessment Marks: 20 (T) + 10(P) =30 Term Exam Marks: 50 (T) + 20 (P)=70		Time: 3hrs (T) 4hrs (P)	

Part B- Contents of the Course		
<u>Instructions for Paper- Setter</u> Instructions for the examiner: The examiner will set nine questions in all, selecting two questions from each unit and one compulsory objective type question. Instructions for the candidates: The candidate will attempt five questions in all, selecting one question from each unit and one compulsory question.		
Unit	Topics	Contact Hours
I	Introduction to meal management – Balanced diet, Basic principles of meal planning, objectives and steps in meal planning.	10
II	Nutrition during infancy – Nutritional requirements, Breast feeding, Formula feeding, Introduction of supplementary food. Nutrition during early childhood (Toddler / Pre School) growth and nutrient needs, nutrition related problems.	10
III	Nutrition during adolescence and adulthood – Nutritional requirements, food choices and eating habits. Problems of eating faced by adolescents and adults	13
IV	Geriatric nutrition – Nutritional requirements, nutrition related problems of elderly persons	12
V*	Planning, calculation and preparation of meals for all age groups mentioned in theory	30
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation: 05 • Seminar/presentation/assignment/quiz/class test etc.: 05 • Mid-Term Exam: 10 ➤ Practicum • Class Participation: 00 • Seminar/Demonstration/Viva-voce/Lab records etc.: 10 • Mid-Term Exam: NA		End Term Examination: 50 20

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Modern Nutrition in Health and Disease – Goodhearth, R. S.
2. Recommended dietary allowance for Indians – I.C.M.R., 1980
3. Nutrition and Development- Winick 1973, Univ. of Calombia.
4. Biology of Nutrition – Eclames 1972, Palaniuma Press
5. Foods & Nutrition – Krause 1972, Saunders.
6. Proteins and Human Foods 1970, Lowrie, Avi. Pub. Co.
7. Nutrition & Physical fitness – BoGert L.J.
8. Principles of Nutrition – Wilson, L.D. and Fisher. K.H.
9. Standardised diets for Hospital – National Nut. Advisory Committee
10. Nutrition in Health & Disease – Cooper, L. Barher, L. Mitehell, Hand Rynheraen.
11. Nutrition A comprehensive – Beaton and McHanery, Treatise Vol-1, II, & III.
12. Human Nutrition & Dietetics – Davidson S., Passmore, R., Brook, J.E. and Truswell.
13. Foods and Nutrition – Rankin, W. Munn. Hildath E.N.
14. Iron deficiency – Holiberth, H.C. Harvorth, Vannotti, N.Y.
15. Trace Elements in Human and Animal Nut. – Underwood, N