Kurukshetra University, Kurukshetra

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

Syllabus of the Programme
for
Post Graduate Programme

M.Sc. FORENSIC SCIENCE

as per NEP 2020
Curriculum and Credit Framework for Postgraduate Programme

With Multiple Entry-Exit, Internship and CBCS-LOCF
With effect from the session 2024-25 (in phased manner)

DEPARTMENT OF ZOOLOGY
FACULTY OF LIFE SCIENCES

KURUKSHETRA UNIVERSITY, KURUKSHETRA -136119

HARYANA, INDIA

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Deptt. of Zoology
K.U. Kurukshetra

Session: 2024-25	
Part A – Introduction	
Name of Programme	**M.Sc. Forensic Science**
Semester	**1**
Name of the Course	**General Forensic Science**
Course Code	**M24-FSC-101**
Course Type	**CC-1**
Level of the course	**400-499**
Pre-requisite for the course (if any)	**Science Subjects at UG Level**
Course Learning Outcomes (CLO)	CLO1: Students will be able to understand the history and background of forensic science. CLO2: Students will be able to understand crime scene management and have knowledge about the handling of crime exhibits. CLO3: Students will be able to describe the reconstruction of a crime scene, the basic principles of photography, and its relevance. CLO4: Students will gain knowledge of the structure of police and judiciary 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	**Forensic Science:** History, development, and need of Forensic Science; basic concept of Forensic Science; branches of Forensic Science. Basic Principles of Forensic Science, Ethics in Forensic Science, and Function and Responsibilities of Forensic Scientists. Organizational setup of Forensic Science Laboratories: CFSL, SFSL, GEQD, DFSS, NICFS, NCRB, Mobile Forensic Science Laboratory. **Physical evidence:** classification and role of physical evidence in criminal investigations and trials. Type of physical evidence. Processing of physical evidence-discovering, recognizing, and examination of physical evidence. Introduction to fingerprints, classification, and types of fingerprints; Evidence related to firearms; types of firearms; components of firearms; cartridge composition.	15
II	**Crime Scene Management:** Introduction, characteristics and types of crime scenes, role of the first responding officer, Protection and recording methods of crime scene, crime scene documentation, crime scene sketching searching techniques of crime scene, 3D scanning techniques. Collection, preservation, packing, labelling, and forwarding of physical clues, safety measures in evidence collection, maintaining chain of custody, mobile kits	15

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	and equipment's their utility on crime scene, blood pattern analysis.	
III	**Forensic Photography:** Basic principles and techniques of photography, types of cameras, working of digital cameras, and basics of digital imaging, lenses, shutters, depth of field, film exposure, development, and printing techniques. UV, IR, and fluorescence illumination guided photography. digital photography, videography, and surveillance photography. Crime scene and laboratory photography, microphotography, macrophotography, and photogrammetry.	15
IV	**Criminal Justice System**: Structure of Police and Judicial Organizations. Introduction of sections of IPC, IEA, and CrPC 1973 related to inquest, evidence in inquiries and trials, bailable or non-bailable offenses, cognizable or non-cognizable, summons and warrant cases, expert witnesses, admissibility of forensic reports in court, and expert testimony: admissibility of expert testimony, pre-court preparation and court appearance, examination in chief, cross-examination, and re-examination. Indian Constitution, Articles 20, 21.	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 R. Redsicker: The Practical Methodology of Forensic Photography, Second Edition CRC Press, 2001.
3. James, S.H and Nordby, J.J.: Forensic Science: An introduction to scientific and investigative techniques 3rd edit. CRC Press, USA.
4. Nanda, B.B. and Tewari, R.K.: Forensic Science in India: A vision for the twenty first century Select Publisher, New Delhi (2001)
5. Richard Saferstein. Criminalistics: An Introduction to Forensic Science. 10th edit. Prentice-Hall, New Jersey.
6. Upshaw Downs, Swienton A. R.: Ethics in Forensic Science, Academic press. 2012.
7. H.L. Blitzer and J. Jacobia: Forensic Digital Imaging and Photography, Academic Press (2002).

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Session: 2024-25	
Part A – Introduction	
Name of Programme	**M.Sc. Forensic Science**
Semester	**1**
Name of the Course	**Instrumental Analysis-I**
Course Code	**M24-FSC-102**
Course Type	**CC-2**
Level of the course	**400-499**
Pre-requisite for the course (if any)	**Science Subjects at UG Level**
Course Learning Outcomes (CLO)	CLO1: The students will be able to understand the principles and workings of optical and electronic microscopes used for the characterization of micro evidence. CLO2: Students will be able to gain knowledge about the concept of different chromatographic techniques that are used to separate chemical compounds. CLO3: Students will be aware of the basics of spectroscopy, sources of radiation, their utility, and their limitations. CLO4: The student will be able to recognize the best-suited techniques to be employed for the examination of 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	**Microscopy**: Principles and Techniques of Microscopy: Light Microscope, Phase Contrast, Fluorescence, Stereomicroscope, Polarizing, Comparison, Electron Microscope (Scanning, Transmission), Forensic Application of Microscopy; Microspectrophotometer.	15
II	**Chromatography:** Basic principles and types of chromatography. Thin Layer Chromatography: Theory and Instrumentation of TLC, HPTLC, Stationary Phases, Visualization Methods, Densitometers, and Applications. **Gas chromatography:** Principle and Instrumentation of GC, Types of GC (GLC and GSC), Column Types and Structure, Detectors for GC (TCD, FID, ECD, NPD, etc.), and Evaluation of the Chromatograph; Pyrolysis GC, GC-MS; Applications. **High-performance liquid chromatography:** principles and instrumentation of HPLC, injection system, column structure, detectors for HPLC, advantages and limitations of HPLC, applications.	15
III	**Spectroscopy**: Basic concept, property of EMR, interaction of radiation with matter, types of spectrometry, components of optical spectroscopy, source of	15

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	radiation, wavelength selector, optical detectors. UV-Visible, IR, and Raman spectroscopy: principles, instrumentation, single beam and double beam spectrophotometers, interpretation of spectra, qualitative and quantitative analysis. Atomic absorption and emission spectroscopy: principles, instrumentation, types of AAS and ICP-AES, quantitative and qualitative analysis, advantages and limitations of AAS and AES, and their forensic applications.	
IV	**Mass Spectroscopy:** Principle, instrumentation, ion sources, type of mass analyzer (quadrupole, time of flight, double focusing, tandem mass spectroscopy, detectors for mass spectroscopy, and their applications. **NMR spectroscopy and neutron activation analysis:** principles, techniques, and forensic application. X-ray spectroscopy: principles and techniques of X-ray diffraction and X-ray florescence spectrometers and their 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. Barbara Wheeler and Lori J. Wilson. Practical Forensic Microscopy: A Laboratory Manual, Wiley
2. Lee and Caensstem. Advances in Forensic Science, Vol. 2. Instrumental Analysis.
3. B. K. Sharma. Instrumental Methods of Chemical Analysis, Goel Publishing House, 26th Edition (2007).
4. D. A. Skoog, D. M. West, F. James Holler and S. R. Crouch, Fundamentals of Analytical Chemistry, 8th Edition, Thomson, 2004.
5. G.Chatwal and S. Anand, Instrumental Methods of Chemical Analysis, 7th Edition Himalaya Publishing House.
6. Hobart H. Willard, Instrumental Methods of Analysis (Chemistry) Wadsworth Publishing Company.

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Session: 2024-25			
Part A – Introduction			
Name of Programme	**M.Sc. Forensic Science**		
Semester	**1**		
Name of the Course	**Forensic Biology**		
Course Code	**M24-FSC-103**		
Course Type	**CC-3**		
Level of the course	**400-499**		
Pre-requisite for the course (if any)	**Science Subjects at UG Level**		
Course Learning Outcomes (CLO)	CLO1: Students will be able to understand the microscopic and macroscopic examination of biological samples like hair, fibers, and diatoms recovered from crime scenes. CLO2: It will explicate the insect development and geographical distribution for assistance in estimating the time since death and locating the probable crime scene. CLO3: It will also provide information about poaching and hunting of protected animal species and trade in the international market. CLO4: Students will be skilled forensic biologists so as to gain knowledge of forensic analysis of biological evidence to help investigating agencies.		
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 biology:** types of biological evidence, identification, collection, preservation, and significance of biological evidence. Hair-morphology of hair, hair growth cycle, human and animal hair, and its microscopic examination, determination of origin, race, sex, and body site. Fibers: classification, characteristics, and forensic analysis of animal and plant origin fibers. Blood- composition and identification; species identification; blood grouping. Composition and examination of semen evidence. Sex chromatin. **Biological characterisation** of saliva-visual examination, salivary amylase test. Identification of other body fluids like sweat, urine, milk, and fecal matter.	15
II	**Forensic Microbiology:** Definition, Types, and Identification of Bacteria and Viruses in Forensic Science; Microbial Profiles as Identification Tools; Use of Microorganisms in Bioterrorism; Anthrax; Transmission of HIV as a Criminal Act; Role of Microbes in Food Poisoning. **Forensic Entomology:** Introduction, general entomology and arthropod biology, insects and invertebrates of Forensic importance, collection of	15

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	entomological evidence, their life cycle, the role of aquatic insects in Forensic investigations. Insect succession on carrion and its relationship to determining time since death, insect applications to medical-legal entomology.	
III	**Forensic Botany:** Introduction, types, significance, location, collection, and Forensic evaluation of botanical evidences such as pollen grains, leaves, seeds, etc. Wood: types of wood, soft and hard wood. Identification and comparison. Diatoms: types, life cycle, morphology, methods of extraction from tissue and bones, their identification, and significance.	15
IV	**Wild life Forensic:** scope, different protected and endangered species of animals. Wild life crime investigation: procedure, tools, and techniques. Wild Life Protection Act-1972and their schedules and appendix of CITES, red data book, animal poaching, animal abuse, wild life trading. Identification of pug marks. Identification of wild life clue materials such as hair, skin, fur, bones, nails, horns, teeth, etc. by conventional and modern methods. Application of DNA fingerprinting in wild life forensic. Case studies related to wild life crime.	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,* 2nd Edition, John Wiley and Sons. 2009
3. Eckert, W. G. & James, S.H.: Interpretation of Blood Stain, Evidence, Elsevier, New York (1989).
4. Bruce Budowle, et al.: Microbial Forensics 2nd Edition, Academic Press, Wiley-Blackwell, 2012.
5. Robertson, J. Forensic Examination of Hair. Taylor and Francis, USA. 1996.
6. Heather Miller Coyle, Forensic Botany: Principles and Applications to Criminal Casework. 1st edition, CRC Press; 2004.
7. Jane E. Huffman, and John R. Wallace, Wildlife Forensics: Methods and Applications, Wiley Blackwell. 2011
8. Chowdhari, S., Forensic Biology B.P.R. &D, Govt. of India

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Session: 2024-25			
Part A – Introduction			
Name of Programme	**M.Sc. Forensic Science**		
Semester	**1**		
Name of the Course	**Forensic Psychology and Statistics**		
Course Code	**M24-FSC-104**		
Course Type	**CC-4**		
Level of the course	**400-499**		
Pre-requisite for the course (if any)	**Science Subjects at UG Level**		
Course Learning Outcomes (CLO)	CLO1: The students will be able to understand the role of psychology and psychiatry in resolving forensic cases, preparing written psychological reports, and interviewing criminals. CLO2: The students will acquire skills in scientific methods of interrogation like polygraph tests, brain mapping, etc. CLO3: The study of statistics will aid the students in verifying the laboratory findings, thus establishing the variability of the outcome of any analysis so conducted in forensic investigations. CLO4: To learn about the research methodology, sampling methods, and statistical analysis of data.		
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 Psychology**: Introduction to Forensic Psychology; scope & ethics; distinction between Forensic and therapeutic evaluation. Genetic basis of Psychology, Legal aspect of Forensic psychology practice. **Forensic Psychiatry**: Introduction, classification of mental disorders, Forensic psychiatric examination. Difference between real and feigned insanity. Mental disorder and criminal and civil responsibilities. Tests for determining criminal responsibility, Me Naughten Rule.	15
II	**Crime investigation**-Types and classification of crimes and criminals, criminal profiling, and modus operandi. Brain Fingerprinting, Polygraph, Hypnosis, Narco Analysis- Principle, technique and their role in criminal justice system. Brain Electrical Oscillation Signature (BEOS), Layered Voice Analysis (LVA), Suspect Detection System (SDS).	15
III	**Measures of central value:** Arithmetic mean, mode and median Definition, calculation and its properties. **Measures of Dispersion:**	15

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	a. Range, Interquartile range, Quartile deviation. b. Mean deviation and standard deviation. **Correlation:** Methods studying correlation – Scatter diagram method, Graphic method, Karl Pearson coefficient of correlation, Rank correlation. **Regression analysis** (Regression lines and regression equation.)	
IV	**Concept of sampling and sampling methods:** Definition and law of sampling, judgment sampling, Random sampling, stratified sampling, systematic sampling, multi-stages sampling and quota sampling. **Test of significance** for large samples and small samples. **Chi-square analysis** **Analysis of variance** **Probability**: Law of probability, Theoretical probability distribution: Binomial distribution, Poison distribution, Normal distribution. **Computer in Forensic statistics:** MS excel, Data library, Statistical softwares.	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. Bruce A. Arrigo: Introduction to Forensic Psychology, Academic press London.
2. CR Kothari: Research methodology, Methods and Techniques, 2nd edt. New age International Publishers.
3. Daniel, Wayne W. Bio-statistics: A Foundation for Analysis in the Health Sciences, 7th edition. John Wiley, 2000.
4. David L. Shapiro: Forensic Psychology Assessment and Investigative Approach, Allyn and Bacon Publisher.
5. Goon, A.M, Gupta, M.K and Dasgupta: B Fundamental of Statistics Vol. I.
6. Hess, A. K. and Weiner, I. B.: Handbook of Forensic Psychology, John Wiley & Sons.
7. Smoller: Biostatistics and Epidemiology: A Primer for Health and Biomedical Professionals, Sylvia Wassertheil.

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Session: 2024-25			
Part A – Introduction			
Name of the Programme	**M.Sc. Forensic Science**		
Semester	**1**		
Name of the Course	**Practical based on Papers M24-FSC-101 & M24-FSC-102**		
Course Code	**M24-FSC-105**		
Course Type	**PC-1**		
Level of the course	**400-499**		
Pre-requisite for the course (if any)	**Science Subjects at UG Level**		
Course Learning Outcomes (CLO)	**CLO1:** Students will be able to understand the recording methods of crime scenes. **CLO2:** Students will be able to understand crime scene management and have knowledge about the handling of crime exhibits. **CLO3:** Students will gain experimental knowledge on the handling of various types of microscopes of forensic significance. **CLO4:** Students will gain experimental knowledge on chromatographic and spectroscopic 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	0	4 hours	

Part B- Contents of the Course

	Practicals	**Contact Hours**
Practical Contents	1. Sketching and photography of mock crime scene. 2. Collection, preservation and packing of physical evidences. 3. Reconstruction and evaluation of various mock crime scene e.g. accident, theft etc. 4. Report Writing in respect of crime scene. 5. Searching of evidence by Polylight. 6. Evaluation of bloodstain patterns 7. Various types of microscopes – their components and working. 8. To demonstrate polygraph test. 9. Prepare TLC plate and identify dyes. 10. Separation of components by column chromatography. 11. To understand the working of GC, GC-MS and HPLC. 12. Visit to Forensic Science laboratory and preparation of report 13. Estimation of macromolecules by spectrophotometry. 14. Recoding of fingerprints	120

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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. Chemistry Working Manual Directorate of Forensic Science MHA, Government of India.
2. Online manuals contain details of each experiment

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Session: 2024-25			
Part A – Introduction			
Name of the Programme	**M.Sc. Forensic Science**		
Semester	**1**		
Name of the Course	**Practical based on Papers M24-FSC-103 & M24-FSC-104**		
Course Code	**M24-FSC-106**		
Course Type	**PC-2**		
Level of the course	**400-499**		
Pre-requisite for the course (if any)	**Science Subjects at UG Level**		
Course Learning Outcomes (CLO)	CLO1: Students will gain practical knowledge on the forensic analysis of biological samples like hair, fibers, etc. for personal identification. CLO2: Students will gain practical skills to identify botanical evidence of forensic interest. CLO3: Students will gain practical knowledge of the analysis of blood and semen. CLO4: The students will be skilled forensic biologists who have the knowledge of forensic analysis of biological evidence to help investigate agencies.		
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 examination of human and animal hairs 2. Preparation of slide for scale pattern study of hairs 3. Identification of blood by chemical, micro-chemical test and UV-Visible spectrophotometer. 4. Identification of sex from blood samples 5. Detection of species of origin by immune double diffusion method. 6. ABO typing from dried blood stains. 7. Identification of spermatozoa from dried seminal stains 8. Microscopic study of fur and feathers of various birds 9. Pug marks collection and identification 10. Identification of various body fluids e.g. urine, semen, saliva, milk, etc. 11. Microscopic and chemical examination of different plants, and animal's fibers **12.** Microscopic examination of soft and hard woods	120

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	13. Extraction and morphological study of various diatom and pollen grain.	

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. Forensic Biology, Working Manual of Directorate of Forensic Science Services MHA, Government of India.
2. Online manuals contain details of each experiments

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Session: 2024-25	
Name of the Programme	**M.Sc. Forensic Science**
Semester	**1**
Name of the Course	Seminar
Course Code	**M24-FSC-107**
Course Type: (CC/DEC/PC/Seminar/CHM/OEC/EEC)	Seminar
Level of the course	400-499
Course Learning Outcomes (CLO)	CLO1: To enhance the communication skill of students to express the subject effectively during academic and professional discourse and to improve their ability to comprehend, and integrate academic text.
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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Session: 2024-25			
Part A – Introduction			
Name of Programme	**M.Sc. Forensic Science**		
Semester	**2**		
Name of the Course	**Forensic Chemistry and Toxicology**		
Course Code	**M24-FSC-201**		
Course Type	**CC-5**		
Level of the course	**400-499**		
Pre-requisite for the course (if any)	**Science Subjects at UG Level**		
Course Learning Outcomes (CLO)	CLO1: The students will understand the chemical tests that are used in forensic chemistry. CLO2: It will also provide information about the general chemistry and analysis of legal and illegal alcoholic substances, as well as evidence related to petroleum products and drugs of abuse. CLO3: The students will learn about the medico- legal aspects of different types of toxic substances. CLO4: The students will be skilled in the collection, preservation, and identification of poisons from different types of biological and non-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 Chemistry:** Introduction, Colour and Spot Tests, Microcrystal Tests, Inorganic and Organic Analysis. Beverages: alcoholic and non-alcoholic beverages, country-made liquor, illicit liquors, medicinal preparations containing alcohol constituents. detection and estimation of ethanol. Breathe alcohol analyzer. Analysis of trace evidence—cosmetic dyes, pigments, clues to trap cases. **Drug of Abuse:** classification of drugs, drugs of abuse in sports. Narcotic drugs and psychotropic substances such as cocaine, cannabis, barbiturates, benzodiazepines, amphetamine, opium, and designer drugs. NDPS act.	15
II	**Analysis of Petroleum Products:** Analysis of petrol, kerosene, diesel, and lubricants by BIS methods and ASTM methods. Detection of adulterants in gasoline, diesel, and engine oils, including parameters like- flash point, distillation range, density, kinematic viscosity, smoke point, and aniline point (Commodity Act and Petroleum Act). Arson Investigation: Chemistry of Fire, Fire Pattern, Extraction of Fire	15

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	Accelerants from Fire Debris, Analysis of Fire Accelerants by UV-visible Spectrophotometry, TLC, Head Space GC. Analysis of oils and fats, analysis of gold in cheated cases.	
III	**Forensic Toxicology:** Introduction and scope of Forensic Toxicology, classification of poisons, legal aspects of poisoning, law related to poisoning, drug paraphernalia, types of poisoning. Antidotes, factors modifying the action of poisons, LD-50, ED50, and signs and symptoms of common poisons. Collection and preservation of post-mortem material for poison analysis; extraction and isolation methods of poisons from post-mortem material. Format of autopsy report.	15
IV	**General Studies and Analysis of Vegetable Poisons**: Abrus, Dhatura, Marking Nuts, Nux-Vomica, Oleander, and Aconite. Snake venoms and insect poisons, Irrespirable gases, and food poisoning. **Insecticides and Metallic Poisons:** Types of agriculture poisons, organophosphorus compounds, organochlorinated compounds, carbamates, pyrethroids, aluminum phosphite, and zinc phosphite. Arsenic, mercury, and phosphorous: introduction, poisoning characteristics, and analysis.	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.K. Parikh. Parikh's test book of medical jurisprudence Forensic medicine and toxicology,
2. Dettean J. D. Kirk's Fire Investigation, 5th Ed., Prentice Hall, Eaglewood Cliffs, N.J (2002)
3. EGC Clarke, Analysis of drugs and poisons. 3rd edition. Vol. 1 and 2, pharmaceutical press.
4. Maudham Bassett et al. Vogel's Textbook of Quantitative Chemical Analysis, 6th Ed., Longman Essex (2004).
5. Modi: Textbook of Medical jurisprudence &Toxicology, M.M. Tripathi Publication.
6. R.T. Morrison, R.N. Boyd; Organic Chemistry, 6th Ed., Prentice Hall, New Delhi (2003)
7. S.N. Tiwari: Analytical Toxicology, Govt. of India Publications, New Delhi, 1987.
8. Saferstein, R: Forensic Science Hand Book, Vol I, II and III, Pretince Hall, NI, 1982.

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Session: 2024-25	
Part A – Introduction	
Name of Programme	**M.Sc. Forensic Science**
Semester	**2**
Name of the Course	**Instrumental Analysis-II**
Course Code	**M24-FSC-202**
Course Type	**CC-6**
Level of the course	**400-499**
Pre-requisite for the course (if any)	**Science Subjects at UG Level**
Course Learning Outcomes (CLO)	CLO1: Students will gain knowledge of the basics of DNA extraction and amplification methods. CLO2: To understand basic principles and theory of centrifugation and electrophoresis techniques and their applications. CLO3: The learners will understand the principles and techniques of assay techniques and radio chemical techniques. CLO4: The students will get knowledge of the different immunological techniques and their assistance in Forensic investigations.

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	**Molecular Biology Techniques**: PCR –DNA amplification, autoradiography, blotting techniques and Forensic utility. Cell and tissue culture techniques: pH and buffers, culture media preparations, sterilization techniques.	15
II	**Centrifugation Techniques:** Centrifugation, cold and ultracentrifuges basic principle, instrumentation, G-value & relationship between RPM, applications of analytical centrifugation. **Electrophoresis:** Introduction, principles, factors affecting electrophoresis, types of electrophoresis. High and low voltage electrophoresis, capillary electrophoresis. immuno-electrophoresis, SDS-PAGE and iso- electric focusing; their application.	15
III	**Enzyme Techniques:** Enzyme kinetics, enzyme assay techniques such as visible UV spectrophotometric methods, Luminescence method, Radioisotope methods and Immuno-chemical methods. **Radio-chemical Techniques:** Radioisotope, nature of radioactivity, detection and measurements of radioactivity and applications.	15
IV	**Immunochemical Techniques:** Introduction, Antigen-Antibody	15

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	Reactions—Theory and Principles, Monoclonal and Polyclonal Antibodies, Production of Antibodies, Immunoprecipitation and agglutination-based techniques such as immune diffusion, cross-over electrophoresis, etc. Labelling of antibodies and their detection methods: ELISA, and RIA: their basic principles, techniques, and forensic applications	
	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. Thomas J. Kindt, et al. Kuby Immunology, 6th edition 2001
2. David. L.Nelson& Michael M, Cox Lenninges; Principles of Biochemistry, 4th edition, Freeman Pub. 2005.
3. Keith Wilson & John Walker; Practical Biochemistry-Principles & Techniques, 5th Edition, Cambridge University Press2000.
4. Peterson: Clinical and Forensic Application of Capillary Electrophoresis, 2001.

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Session: 2024-25			
Part A – Introduction			
Name of Programme	**M.Sc. Forensic Science**		
Semester	**2**		
Name of the Course	**Questioned Document Examination**		
Course Code	**M24-FSC-203**		
Course Type	**CC-7**		
Level of the course	**400-499**		
Pre-requisite for the course (if any)	**Science Subjects at UG Level**		
Course Learning Outcomes (CLO)	CLO1: The student will be able to identify the types of questioned documents and their handling processes. CLO2: It will provide information about the principles and handwriting examination procedure. CLO3: The student will be able to recognize the method of examination to be applied in forgeries, printing, or other manipulations done to the document. CLO4: The student will be skilled in evaluating the parameters required to prove or disapprove of the authenticity of the document.		
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	**Document Examination:** Introduction and classification of documents, genuine and forged documents, and holographic documents Preliminary examination of documents, ways of procurement, handling, and marking of documents Basic tools for forensic document examination. Ink and paper examination: their types, composition, and forensic examination. Various types of writing instruments—ball pen, gel pen, fountain pen, fiber tip pen, dating document.	15
II	**Handwriting:** principles, class and individual characteristics, natural variations, master pattern, Handwriting form. Handwriting forgery, disguise writing, anonymous letters, Identification of signature-characteristics of genuine and forged signatures and standards for comparison.	15
III	**Examination of various printing devices and printed documents.** Photostat scanned and faxed document examination. Examination of typewriters and typed documents, inkjet printers, LaserJet printers, thermal jet printers, and dot matrix printers Identification of printed materials and ink and toner. Working and examination of electronic and	15

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	daisy-wheel printers, cheque writers. Steganography. Printing processes: introduction and characteristics: letterpress, screen printing, intaglio printing, and digital printing processes.	
IV	**Examination of altered documents:** Methods and examination of alteration, obliterations, edition, erasures, secret writing, sequence of strokes, restoration of intended writing and other impressions and charred document. Examination of stamps and seal impressions. Examination of security documents, fake currency notes, passport, visa, credit cards and ATM. Study of advance techniques for examination of documents such as VSC and ESDA. **Miscellaneous:** Photographic techniques to questioned document-Discovery of facts by comparison with known material. Fry test and Daubert standards, Report writing, reasons for opinion, presentation of expert evidence on documents case. Concept of database of currency, Passport, VISA.	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) Ellen, D The scientific examination of Documents, Methods and techniques. 3rd ed.,Taylor & Francis Ltd. (2006).
2) Hilton, O. The Scientific Examination of Questioned Document, 1982, Elsaevier North Holland Inc. New York.
3) Huber, A. R. and Headrick, A.M.: Handwriting identification: facts and fundamental CRC Press, (1999)
4) Kelly J.S. and Lindblom B.S. Scientific examination of questioned documents. 2nd edition CRC press.
5) Morris R.N. Forensic Handwriting Identification (fundamental concepts and Principals) 1st edition Academic Press Inc. (2000).
6) Osborn, A. S. Questioned Documents 1929, Boyd Printing Co. Chicago.
7) Wilson R. Harrison; Suspect Documents Their Scientific Examination, Universal Law Pub. Delhi Indian.
8) Mehta, M. K. The identification of Handwriting & Cross Examination of Experts, N.M. Tripathi, Allahabad. 1970.

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Session: 2024-25			
Part A – Introduction			
Name of Programme	**M.Sc. Forensic Science**		
Semester	**2**		
Name of the Course	**DNA Profiling**		
Course Code	**M24-FSC-204**		
Course Type	**CC-8**		
Level of the course	**400-499**		
Pre-requisite for the course (if any)	**Science Subjects at UG Level**		
Course Learning Outcomes (CLO)	CLO1: Students will be able to understand the basic structure of the human genome and DNA molecules. CLO2: To understand various DNA typing methods, such as RFLP, STR, and SNPs, with their limitations and advantages. CLO3: To understand different methods of extraction of DNA by conventional and recent methods. CLO4: Students will be capable of performing DNA profiling on any biological samples aimed at investigations		
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 Human Genome:** Human chromosomes and karyotypes, human nuclear genome. Mutation-types and cause, gens and alleles, human genetics, and heredity. Calculation of allele frequencies. Basic structure, types, and properties of DNA and RNA, mt DNA, DNA modifying enzymes, DNA replication, and restriction enzymes.	15
II	**Forensic DNA Profiling:** History and Development of DNA Finger Printing Concept of length and sequence variation: VNTRs, STRs, mini-STRs, and SNPs. STR-markers-nomenclature of STR markers. **Methods of DNA Profiling:** Principles and Techniques of RFLP and STR Profiling, their Advantages and Limitations Gender identification: Y-STR and mt-DNA profiling. **DNA Amplification (PCR):** principle, method, DNA primers, factors affecting PCR, and advantages of PCR-based techniques over RFLP.	15
III	**DNA sample preparation:** Sample sources for DNA, collection and preservation of samples for DNA testing, conventional and recent methods of DNA extraction (for samples blood, tissue, hair, tooth and	15

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	bones), separation methods, DNA quality check, DNA Quantitation methods, DNA sequencing. DNA data base- CODIS, STRbase. NGS (New Generation Sequencing Rapid DMNA)	
IV	**Nucleic acid hybridization:** Preparation of nucleic acid probes for DNA profiling, Single locus and multi locus probes, and cDNA probes; Methods of labelling of DNA probes; detection methods. **Forensic Issues:** Degraded DNA, contamination, mixed samples and low copy number. Result interpretation, Quality assurance in DFP testing. Legal standards for admissibility of DNA profiling **Forensic Significance of DNA Profiling:** Personal identification, paternity testing, wild life Forensics, veterinary, agriculture and mass disaster. Report writing and presentation of report in case of DNA profiling.	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. Daniel L. Hartl& Elizabeth W. Jones; Genetics- Principle & Analysis, 4th Ed., Jones &Bartlet Pub. 1998.
2. Jaiprakash G. Shewale, Ray H. Liu Forensic DNA Analysis: Current Practices and Emerging Technologies, CRC Press, 2013
3. John M Butler: Forensic DNA Typing. Elsevier Academic Press.
4. Keith Immen and Norah Rudus, 1997. An introduction to Forensic DNA Analysis. CRC Press, New York.
5. Lee M.C. and Gaenesten, R.E: DNA and other Polymorphism in Forensic Science. Year book Medical Published.

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Session: 2024-25				
Part A – Introduction				
Name of the Programme		**M.Sc. Forensic Science**		
Semester		**2**		
Name of the Course		**Practical based on Papers M24-FSC-201 & M24-FSC-202**		
Course Code		**M24-FSC-205**		
Course Type		**PC-3**		
Level of the course		**400-499**		
Pre-requisite for the course (if any)		**Science Subjects at UG Level**		
Course Learning Outcomes (CLO)	CLO1: The students will gain experimental knowledge of various chemical tests that are used in forensic chemistry. CLO2: Learners will gain skills in forensic analysis of alcoholic substances and evidence related to petroleum products and drugs of abuse. CLO3: The students will be skilled in using various techniques, like TLC and spectroscopy, for differentiating toxic substances. CLO4: The students will be skilled in the identification of poisons from different types of biological and non-biological materials.			
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. Preparation of the Normal, Molar and Standard & buffer solutions. 2. Chemical and spectrophotometric analysis of phenolphthalein in trap cases. 3. Tests for metallic poisons- Preliminary and Confirmatory 4. Estimation of ethanol and methanol from blood/ urine samples. 5. Extraction and identification of insecticides from biological materials. 6. Identification of phosphine by colour tests 7. Identification of alcoholic beverages as per BIS. 8. Analysis of Petroleum products as per BIS. 9. Identification of dyes in the petroleum by TLC. 10. Practical demonstration of petroleum analysis by GLC 11. Screening of common drugs by UV – Vis spectrometry	120

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	12. Separation and identification of plant poisons and cosmetics dyes by TLC 13. To perform chemical tests for plant poisons 14. Demonstration of electrophoresis technique. 15. Preparation of media sterilization techniques maintenance of microbial culture and standard plate count.	

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 chemistry, Directorate of Forensic Science MHA, Government of India.
2. Working Manual Forensic Toxicology. Directorate of Forensic Science MHA, Government of India.
3. Online manuals contain details of each experiments

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Session: 2024-25			
Part A – Introduction			
Name of the Programme	**M.Sc. Forensic Science**		
Semester	**2**		
Name of the Course	**Practical based on Papers M24-FSC-203 & M24-FSC-204**		
Course Code	**M24-FSC-206**		
Course Type	**PC-4**		
Level of the course	**400-499**		
Pre-requisite for the course (if any)	**Science Subjects at UG Level**		
Course Learning Outcomes (CLO)	CLO1: The student will gain practical skills in the analysis of evidence related to questioned handwriting. CLO2: Students will be capable of performing an analysis of security documents. CLO3: Students will be capable of performing examinations on different forged documents. CLO4: Students will be research-oriented and have the have the ability to innovate in the subdomains of document analysis and DNA 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. Study the general and individual characteristics of handwriting 2. Examination of disguise handwriting. 3. Examination of alteration and obliteration in documents. 4. To study the natural variations in handwriting written in different circumstances 5. Detection of simulated and traced forgeries. 6. Examination of security documents. 7. Examination of mechanical and chemical erasure in documents. 8. To examine printed and type scripts document. 9. Examination of sequence of intersecting strokes 10. To examine intended writing. 11. To examine counterfeit currency. 12. Examination of rubber stamp impressions 13. Extraction of DNA from blood etc. **14.** DNA Quality check: Agarose gel electrophoresis. **15.** DNA Quantitation by UV Spectrophotometry.	120

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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. Questioned Documents Examination, Directorate of Forensic Science MHA, Government of India.
2. Working Manual. DNA Fingerprinting, Directorate of Forensic Science MHA, Government of India.
3. Online manuals contain details of each experiments

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Session: 2024-25			
Part A – Introduction			
Name of the Programme	**M.Sc. Forensic Science**		
Semester	**2**		
Name of the Course	**Constitutional, Human and Moral values, and IPR**		
Course Code	**M24-CHM-201**		
Course Type	**CHM**		
Level of the course (As per Annexure-I	**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: CLO 2: CLO 3: CLO 4:		
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	Syllabus will be provided by the central pool	
II		
III		
IV		
	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:

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