Department of Tourism and Hotel Management Kurukshetra University, Kurukshetra

Under Faculty of Commerce and Management, Kurukshetra University, Kurukshetra

PROGRAMME TITLE

MASTER OF HOTEL MANAGEMENT & CATERING TECHNOLOGY (MHM&CT)

Under (CBCS / LOCF)

w.e.f Session: 2020-2022

Program Outcomes for the Faculty of Commerce and Management

On successful completion of a program under Faculty of Commerce and Management, students will be able to develop:

- PO1. Soft skills and Working Skills: To comprehend, communicate and execute effectively and efficiently in all of their dealings.
- PO2. Leadership: To develop abilities to both lead and respect the views, positions and beliefs of others and to plan and manage effectively
- PO3. Innovativeness and Entrepreneurship: To explore issues and problems that needs solutions with entrepreneurial orientation
- PO4. Ethics and Values: To recognize, appreciate and follow ethical standards in all walks of life
- PO5. Adaptability and Sociability: Ready to understand and adapt the changing environment.
- P06. Research and Analytical abilities: To Explore, analyses and provide solutions on emerging issues concerning various fields including public policy.
- PO7. Practical exposure and Employability: Exposure to actual working environment leading to employability
- PO8. Environmental Consciousness: In every action, dealing, service and manifestation

Programme Specific Objectives (PSO) of MHM &CT Programme

- PSO 1To prepare students for entry level / middle managerial positions in hotels / allied areas (such as food & beverage service outlets; retails outlets; event / MICE companies; Tourism services companies; entertainment ; hospitality academics etc.)
- PSO 2 Knowledge of hotel functions & management
- PSO 3Ability to work in different departments of the hotels / allied areas (such as food & beverage service outlets; retails outlets; event / MICE companies; Tourism services companies; entertainment hospitality academics etc.)
- PSO 4Apply standard hotel management practices to operational & managerial work requirements.
- PSO 5 Becoming socially responsible hotel professional

Master of Hotel Management & Catering Technology Programme (MHM&CT Programme) under (CBCS / LOCF)

A postgraduate degree in Master of Hotel Management & Catering Technology Programme (MHM&CT Programme) under Choice based credit system (CBCS / LOCF) will be awarded if the student complete 12 Core courses / papers in the discipline, 02 AECC courses, 3 SEC courses and 13 DSE courses / papers.

Proposed syllabus Structure of Master of Hotel Management & Catering Technology Programme (MHMCT Programme) under CBCS / LOCF

Sem	CORE	Ability	Skill Enhancement	Discipline
ester	COURSE(CC)	Enhancement	Courses (SEC)	Specific
		Compulsory	@2 CREDITS	Elective (DSE)
	@6CREDITS	Courses(AECC)		@6 CREDITS
		@2 CREDITS		
1	CC-MHMCT-1	AECC-MHMCT-1	SEC-MHMCT-1	DSE-MHMCT-1
	CC-MHMCT-2		SEC-MHMCT-2	DSE-MHMCT-2
				DSE-MHMCT-3
				DSE-MHMCT-4
2	CC- MHMCT-3	AECC-MHMCT-2	SEC-MHMCT-3	DSE-MHMCT-5
	CC- MHMCT-4			DSE-MHMCT-6
				DSE-MHMCT-7
3	CC- MHMCT-5 A			DSE-MHMCT-8
	CC- MHMCT-5 B			DSE-MHMCT-9
	CC- MHMCT-5 C			DSE-MHMCT-10
	Or			DSE- MHMCT-11
	CC- MHMCT-5 D			
	CC- MHMCT-5 E			
	CC- MHMCT-5 F			
	CC- MHMCT-6			
4	CC- MHMCT-7A			DSE-MHMCT-12
	CC- MHMCT-7B			DSE-MHMCT-13
	CC- MHMCT-7 C			
	Or			

CC- MHMCT-7 D		
CC- MHMCT-7 E		
CC- MHMCT-7 F		
Or		
CC- MHMCT-7 G		
CC- MHMCT-7H		
CC- MHMCT-7 I		
CC- MHMCT-8		

AECC will be offered according to the time table adjustments in the University Teaching Department /College. *MOOC Course from Swayam portal

General instructions:

- 1. One credit equivalent to 1 hour of teaching/2 hours of Practical work
- 2. One credit (teaching /Practical) equivalent to 20 marks

Total credit hours for Master of Hotel Management & Catering Technology Programme (MHMCT Programme) under Choice based credit system (CBCS / LOCF)

Course	Number of	Contact hrs	Credits
	courses		
Core Course	12	6	72
(CC)		(6x12=72)	
Ability Enhancement	2	2	4
compulsory course		(2x2=4)	
(AECC)			
Skill Enhancement course	3	6	6
(SEC)		(3x2=6)	
Discipline Specific	13	6	78
Elective		(13x6=78)	
Course (DSE)			
Total	30	160	160

MHM & CT

(Detail Syllabus)

w.e.f

Session: 2020-2022

Department of Tourism and Hotel Management Kurukshetra University, Kurukshetra

Programme- MHM&CT -2 Years w.e.f Session: 2020-2022

Semester I										
Course Code		Course Title		T P/ T	C	Max	Mark	Total Mark	Pas	
				u.	u.	Inte rnal	Т	Р	s	Ma rks
CC- MHMCT-1	A	Front Office Operations (Theory)	4	0	4	16	64	-	80	32
	В	Front Office Operations (Practical)	0	4	2	08	-	32	40	16
CC- MHMCT-2	A	Housekeeping Operations (Theory)	4	0	4	16	64	-	80	32
	В	Housekeeping Operations (Practical)	0	4	2	08	-	32	40	16
DSC-MHMCT-1		Introduction to Hotel Industry	5	1	6	20	80	-	100	40
DSC-MHMCT-2		Fundamental of Management in Hotels	5	1	6	20	80	-	100	40
DSC-MHMCT-3		Hygiene, Sanitation & Medical Protocols	5	1	6	20	80	-	100	40
DSC-MHMCT-4		Tourism Business	5	1	6	20	80	-	100	40
SEC-MHMCT-1		ICT in Hotels	2	-	2	8	32	-	40	16
SEC-MHMCT-2		Hotel French –I	2	-	2	8	32	-	40	16
AECC-MHMCT	-1	Communication Skills in Hotels	2	0	2	08	32	-	40	16
			34	12	42				760	

T-Theory, P- Practical, C-Credits, AECC - Ability Enhancement Compulsory Course, Skill Enhancement Course (SEC), Discipline Specific Elective (DSE)

Semester II										
Course Code		Course Title	Т	T P	С	Max Marks			Total	Pa
						Inter nal	Т	Р	S	M ar ks
CC- MHMCT- 3	А	Food Production (Theory)	4	0	4	16	64	-	80	32
	В	Food Production (Practical)	0	4	2	08	-	32	40	16
CC- MHMCT-4	Α	Food & Beverage Service (Theory)	4	0	4	16	64	-	80	32
	В	Food & Beverage Service (Practical)	0	4	2	08	-	32	40	16
DSE-MHMCT- 5		Hotel Laws	5	1	6	20	80	-	100	40
DSE-MHMCT-6		Basics of Event Management	5	1	6	20	80	-	100	40
DSE-MHMCT-7		Service Marketing	5	1	6	20	80	-	100	40
SEC- MHMCT-3		Hotel French –II	2	-	2	8	32		40	16
AECC-MHMCT-2	2	Environmental Practices in Hotels	2	-	2	8	32	-	40	16
			27	11	34				620	

T-Theory, P- Practical, C-Credits, AECC - Ability Enhancement Compulsory Course, Skill Enhancement Course (SEC)

03 MONTHS VOCATIONAL TRAINING / HOTEL INDUCTION TRAINING

		Semester	r I	Ι						
Course Code		Course Title		P	C	Max	Marks		Total Mark	Pass Marks
						Inter nal	Т	Р	S	TVILLING
DSE-MHMCT-8		HRM in Hotels	5	1	6	20	80	-	100	40
DSE-MHMCT-9		Entrepreneurship and Innovation in Hotels	5	1	6	20	80	-	100	40
DSE-MHMCT-10		Customer Relationship Mgt.	5	1	6	20	80	-	100	40
DSE-MHMCT-11		Financial management in hotels	5	1	6	20	80	-	100	40
		OPTIONAL SPECIA (any one clu	LIZA ster)	TION	[
		Specialization in Roo	m Div	vision						
	Α	Advance Accommodation Management	5	1	6	20	80	-	100	40
СС-МНМСТ-5	В	Advance Front Office Management	5	1	6	20	80	-	100	40
	С	Management of Housekeeping in Allied Sectors	5	1	6	20	80	-	100	40
Or		Specialization in Food & Bev	verage	e Serv	ice Ma	anageme	nt			<u> </u>
	D	Specialized Catering Management	5	1	6	20	80	-	100	40
CC-MHMCT-5	Е	F& B Control Management	5	1	6	20	80	-	100	40
	F	Bar operation & Management	5	1	6	20	80	-	100	40
COMPULSORY						1			1	
CC- MHMCT-6		Training Report & Viva- voce examination	-	-	12				300	
			35	7	54				1000	

T-Theory, P- Practical, C-Credits, SEC – Skill Enhancement Course

		Semester IV (Spe	cia	liza	ati	on)				
Course Code		Course Title	T	P/ T	C	Max I	Marks		Total Mark	Pas s
				u.		nal	Т	Р	S	rks
DSE- MHMCT-12		Research Methodology	5	1	6	20	80	-	100	40
DSE- MHMCT-13		Decision Science in Hotels	5	1	6	20	80	-	100	40
		Optional Specializ (any one cluster)	ation							
		Specialization (Event Ma	anage	ment)					
	A	Event Product & Logistics Planning	5	1	6	20	80	-	100	40
CC-MHMCT-7	B	MICE Events Planning & Management	5	1	6	20	80	-	100	40
	С	Specialized Events in Hotels	5	1	6	20	80	-	100	40
Or		Specialization (Hotel M	larket	ting)	•		•	•		
	D	Hotel Marketing Research	5	1	6	20	80	-	100	40
СС-МНМСТ-7	Е	Sales Management in Hotels	5	1	6	20	80	-	100	40
	F	Digital and Social Media Marketing	5	1	6	20	80	-	100	40
Or		Specialization (Human	Reso	ource)						
	G	Strategic HRM	5	1	6	20	80	-	100	40
СС-МНМСТ-7	Н	Training & Development in Hotels	5	1	6	20	80	-	100	40
	I	Employee Motivation and Welfares in Hotel	5	1	6	20	80	-	100	40
Compulsory										
СС-МНМСТ-8	D Se	issertation in the area of specialization in emester IVth & Viva Voce	-	-	12	-	-	-	300	
	•		25	5	42				800	

T-Theory, P- Practical, C-Credits, Core, SEC- Skill Enhancement Course

TOTAL SEMESTERS & CREDITS

Marks Distribution	Sem 1	Sem 2	Sem 3	Sem 4	Total
Credits allocated	42	34	54	42	172
Marks in Each Sem	760	620	1000	800	3,180
Grand Total Marks	3,180				
Grand Total credits	172				

MHM&CT COURSE W.E.F 2020- 22

<u>GENERAL INSTRUCTIONS FOR EXAMINERS / PAPER SETTERS / SUBJECT</u> <u>TEACHERS</u>

EVALUATION:

The performance of the students will be evaluated on the basic of:

- class participation
- house tests
- regularity and
- assignment Carrying 20 percent of the credit and the rest through Terminal Examination (3 hours duration)

MODE OF PAPER SETTING:

CORE PAPERS

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 12 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions

AECC PAPERS

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 8 marks (4 short-answer type questions of 2 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 6 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions

SEC PAPERS

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 8 marks (4 short-answer type questions of 2 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 6 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions

DSE PAPERS

There will be nine questions in all. The candidate has to attempt five questions. Question No. 1, of 16 marks (4 short-answer type questions of 4 marks each) shall be compulsory. The candidate has to attempt four other questions selecting one question from each Unit. Each question shall be of 16 marks. The question No. 1 shall be covering all the four Units of the syllabus.

These questions shall judge both theoretical and applied knowledge of students. Case studies may also be given as questions

SEMESTER II

CC-MHMCT-3 A FOOD PRODUCTION (THEORY)

Credits -04 External Marks -64

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	Internal	Marks -16
GOUDGE O	Tota	IMarks-80
COURSE O	BJECTIVES:	
Co 1: Lea Co 2: Kn Co 3: lea Co 4: far	arning the functioning of kitchen and familiarize with culinary terms lowledge and identify various commodities and their use in cooking rn and practice of vegetables cuts, sauces and stocks used in cooking niliar with standard recipes of soups, salads	
UNIT-I	 INTRODUCTION TO COOKERY: Levels of skills and experiences, Attitudes and behavior in the kitchen, Personal hygiene, Uniforms & protective clothing, Safety procedure in handling equipment CULINARY HISTORY: Origin of modern cookery Classical and New World Cuisine, Different styles cookery: oriental, European, Continental, Pan American HIERARCHY AREA OF DEPARTMENT AND KITCHEN: Classical Brigade, Modern staffing in various category hotels, Roles of executive chef, Duties and responsibilities of various chefs, Cooperation with other departments General Layout Of the kitchen in organisations, layout of receiving areas, layout of service & wash up CULINARY TERMS: List of culinary (common and basic) terms, Explanation with examples AIMS & OBJECTIVES OF COOKING FOOD: Aims and objectives of cooking food, Various textures, Various consistencies, Techniques used in preparation. 	CO 1
	reeninques used in pre-preparation, reeninques used in preparation	
UNIT-II	 COMMODITIES: SHORTENINGS (Fats & Oils): Role of Shortenings, Varieties of Shortenings, Advantages and Disadvantages of using various Shortenings, Fats & Oil – Types, varieties RAISING AGENTS: Classification of Raising Agents, Role of Raising Agents, Actions and Reactions THICKENING AGENTS: Classification of thickening agents, Role of Thickening agents HERBS & SPICES : Uses its Importance & it's different types BASIC COMMODITIES: Milk-Introduction, Processing of Milk, Pasteurisation – Homogenisation, Types of Milk – Skimmed and Condensed, Nutritive Value, Cream-Introduction, Processing of Cream, Types of Cream Cheese-Introduction, Processing of Cheese, Types of Cheese, Classification of Cheese, Uses of Cheese Butter-Introduction, Processing of Butter. Sugar: Its Importance, types of sugar, cooking Of Sugar- Various Temperature 	CO 2
UNIT-III	BASIC PRINCIPLES OF FOOD PRODUCTION	CO 3
	VEGETABLE AND FRUIT COOKERY: Introduction – classification of vegetables, Pigments and colour changes, Effects of heat on vegetables, Cuts of vegetables, Classification of fruits, Uses of fruit in	

	cookery. STOCKS: Definition of stock, Types of stock, Preparation of stock, Recipes, Storage of stocks, Uses of stocks, Care and precautions SAUCES: Classification of sauces, Recipes for mother sauces, Storage & precautions	
UNIT-IV	 SOUPS: Classification with examples, Basic recipes of Consommé with 10 Garnishes and other soups. SALADS AND SANDWICHES: Salads & its compositions Types Of Lettuce, Types of Dressing, Emerging trends in salad making, Sandwiches History origin and its Different types EGG COOKERY: Introduction to egg cookery, Structure of an egg, Selection of egg, Uses of egg in cookery 	CO 4

TEXT BOOKS:

- Theory of Catering By Kinton & Cessarani
- Parvinder S Bali International Cuisine & Food Production Oxford University Press
- Theory of Cookery By K Arora, Publisher: Frank Brothers

REFERENCE BOOKS:

- Accompaniments & Garnishes from waiter, Communicate: Fuller J. Barrie & Jenkins
- Modern Cookery (Vol-I) By Philip E. Thangam, Publisher: Orient Longman
- Practical Cookery By Kinton&Cessarani
- The Professional Chef (4th Edition) By Le RolA.Polsom
- The Professional Pastry Chef, Fourth Edition By Bo Friberg Publisher: Wiley & Sons INC
- Practical Professional Cookery By Kauffman & Cracknell

CC-MHMCT-3 B FOOD PRODUCTION (PRACTICAL)
Credits –02
External Marks -32

	Internal Marks -08 Total Marks-40
1	i) Equipments - Identification, Description, Uses & handling
	ii) Hygiene - Kitchen etiquettes, Practices & knife handling
	iii) Safety and security in kitchen
2	i) Vegetables – classification
	ii) Cuts - julienne, jardinière, macedoines, brunoise, payssane, mignonettes, dices,
	cubes, shred, mirepoix
	III) Preparation of salad dressings
3	Identification and Selection of Ingredients -
4	i) Basic Cooking methods and pre-preparations
-	ii) Blanching of Tomatoes and Cansicum
	iii) Preparation of concasse
	iv) Boiling (potatoes, Beans, Cauliflower, etc)
	v) Frying - (deep frying, shallow frying, sautéing) Aubergines, Potatoes, etc.
	vi) Braising - Onions, Leeks, Cabbage
	vii) Starch cooking (Rice, Pasta, Potatoes)
5	i) Stocks - Types of stocks (White and Brown stock)
	ii) Emergency stock
	iii) Fungi stock
6	Sauces - Basic mother sauces
	Béchamel
	• Espagnole
	• Veloute
	• Hollandaise
	Mayonnaise
	Tomato
7	Egg cookery - Preparation of variety of egg dishes
	• Boiled (Soft & Hard)
	• Fried (Sunny side up, Single fried, Bull's Eye, Double fried)
	• Poaches
	• Scrambled
	• Omelette (Plain, Stuffed, Spanish)
0	• En cocotte (eggs Benedict)
8	Simple Salads:
	• Cole slaw,
	Polato salad, Destruct echel
	• Beet root salad,
	• Green salad,
	• Fruit salad,
	Consomme Simple Egg preparations:
	• Scotch egg,
	• Assorted omelletes,
	• Oeur Florentine
	• Oeuf Benedict
	• Oeut Farci
	Oeuf Portugese

Oeuf Deur Mayonnaise Soups Preparations:
Cream Soups
Puree Soups
• Consomme
Simple potato preparations
Baked potatoes
Mashed potatoes
French fries
Roasted potatoes
Boiled potatoes
Lyonnaise potatoes
Allumettes Vegetable preparations
Boiled vegetables
Glazed vegetables
• Fried vegetables
Stewed vegetables. Sandwiches
• Open
• Club
• Closed
• Canapé
• Zukuskis
• Pin wheel
Checkers board
Preparation of menu
Salads & soups- Waldrof salad, Fruit salad, Russian salad, salade nicoise,
Soups prepration: Chowder, Bisque, Veloute, Broth International
soups
Indian cookery-
Kice disnes, Breads, Main course, Basic Vegetables, Paneer Preparations
warmaues, raste and randoori Preparation of vegetables and raneer

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PO											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8			
Co 1	2	2	2	1	1	2	3	1			
Co 2	2	2	2	1	1	2	3	1			
Co 3	2	2	2	1	1	2	3	1			
Co 4	2	2	2	1	1	2	3	1			
	2	2	2	1	1	2	3	1			

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO										
	PSO1	PSO2	PSO 4	PSO 5						
Co 1	3	3	1	2	1					
Co 2	3	3	1	3	1					
Co 3	3	3	1	3	1					
Co 4	3	3	1	3	1					
	3	3	1	2.75	1					

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

	Mapping: CO-PO-PSO												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1	2	2	2	1	1	2	3	1	3	3	1	2	1
Co 2	2	2	2	1	1	2	3	1	3	3	1	3	1
Co 3	2	2	2	1	1	2	3	1	3	3	1	3	1
Co 4	2	2	2	1	1	2	3	1	3	3	1	3	1
	2	2	2	1	1	2	3	1	3	3	1	2.75	1

CC-MHMCT-4 A FOOD AND BEVERAGE SERVICE

Credits - 04

External Marks - 80 Internal Marks - 20 Total marks – 100

COURSE	OBJECTIVES:	
Co 1 Gai	n the Knowledge on catering industry and understand organizational structure of Food &	
bev	erage service department in Hotels.	
Co 2 Fai	miliar with Food & Service areas and back up areas	
Co 3 Lea	arn about different types of food & beverage equipment & meals.	
CO 4 Ke	Introduction to Catering Inductry	CO 1
UN11-1	Introduction to Catering industry: Introduction and Growth of Catering industry in India Types of Catering Establishments	01
	- Commercial (Non Residential/ Residential) Welfare (Industrial Institutional). Transport	
	(Air Road, Rail, Sea). General overview of different types of F & B outlets.	
	Departmental Organization & Staffing; Organizational Structure of F& B Department in	
	small, medium and large hotel, Duties and Responsibilities of & B Staff and their	
	Attributes; Inter Department relations of F and B department.	
UNIT- II	Food Service Area and their Layout:	CO 2
	Food Service Areas: Specialty restaurant, coffee shop. Cafeteria, Fast Food Service.	
	Room service Banquets, Bars, Vending Machine.	
	Layout of Food Service Areas: various Considerations while planning a layout of coffee	
	shop, fast food, full-service restaurant, specialty restaurant, Banquets, Room Service,	
	Vending Machines.	
	Back areas: Still Room, Wash-up, Hot-Plate, Plate Room, Kitchen Stewarding,	
	Kitchen Stores.	
UNIT-	Introduction of Restaurant Equipment and introduction to different Meals	CO 3
III	Restaurant Equipment's Classification of equipment; Criteria for selection of various	
	types of Crockery, Tableware, Glassware, Linen, Furniture etc.; Sideboard- its uses. Care	
	& Maintenance of these equipment's.	
	Meals and Menu: Planning Concept of Menu and Meal Types of Meals: Breakfast,	
	Lunch, Dinner, Supper, Brunch, High tea etc.	
UNIT-	Menu planning & forms of Service	CO4
IV	Menu: Origin of menu & menu planning objectives, types of menu (table d'hôte, A la	
	Carte, Carte jour), menu planning-consideration & constraints, menu designing, courses,	
	of menu - French: classical and modified, Indian courses: Planning menus,	
	Accompaniments, Garnishing & Cover for each course. Breakfast Menu: English,	
	American, Continental, Indian	
	Restaurant Service: Forms and Methods of service - Table Service - Silver/English,	
	Family, American, Butler/ French, Russian; Self Service - Buffet and Cafeteria Service;	
	Specialized Service – Gueridon, Tray, Trolley, Lounge, Room etc.: Single Point Service-	
	Takeaway, Vending, Kiosks, Food Courts, Bars Room Service	

REFERENCE:

- S.N Bagchi and Anita Sharma, Food And Beverage Service. Aman Publication, New Delhi.
- Sudhir Andrew, Food And Beverage Manual, Tata Mc. Hills. New Delhi.
- Brain Vergese, Profdssional Food And Beverage Service Management, Macmillan Pub. New Delhi.
- Vijay Dhawan, Food AndVeverage Service. Frank Brothers And Company, New Delhi.

CC-MHMCT-4 B FOOD & BEVERAGE SERVICE (PRACTICAL)

Credits – 02

External Marks - 32

Internal Marks - 08

Total marks – 40

- Opening and Inspecting, Cleaning a Restaurant: Routine cleaning and Non Routine Cleaning.
- Identification of Restaurant Equipments with Diagrams.
- Mis en Scene, Mis- en Place.
- Table laying simple covers: A I' carte & Table d'hote
- Napkin folding, spreading & changing tablecloth.
- Laying table for Iunch /dinner: procedure for laying the table A I carte & Table d'hote and for breakfast.
- Arranging of side Board /Dummy Water.
- Wiping of Glassware, Cutlery and Crockery.
- Special Equipments used in Restaurants.
- Polishing Silver, Silver method , burnishing method

Mapping: CO-PO										
PO 1 PO 2 PO 3 PO 4 PO 5 PO6 PO7 PO8										
Co 1	3	3	3	2	2	3	3	2		
Co 2	3	3	3	2	2	3	3	2		
Co 3	3	3	3	2	2	3	3	2		
Co 4	3	3	3	2	2	3	3	2		
	3	3	3	2	2	3	3	2		

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO										
PSO1 PSO2 PSO3 PSO 4 PS										
					5					
Co 1	3	3	3	3	3					
Co 2	3	3	3	3	3					
Co 3	3	3	3	3	3					
Co 4	3	3	3	3	3					
	3	3	3	3	3					

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

	Mapping: CO-PO-PSO												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	2	2	3	3	2	3	3	3	3	3
Co 2	3	3	3	2	2	3	3	2	3	3	3	3	3
Co 3	3	3	3	2	2	3	3	2	3	3	3	3	3
Co 4	3	3	3	2	2	3	3	2	3	3	3	3	3
	3	3	3	2	2	3	3	2	3	3	3	3	3

DSE-MHMCT-5 HOTEL LAW

Credits –06 External Marks -20 Internal Marks -80 TotalMarks-100

COUDERO		viai K5-100					
COURSE O	BJECTIVES:						
Co 2: Learnin	a various Hotel Licences and Regulations mandatory for Hotel Business.						
Co 3: Familia	arize with Indian Food Legislation applicable for all catering Businesses						
Co 4: Knowle	edge of Liquor Licensing.						
UNIT-I	Commercial Law & Business Contracts	CO 1					
	• Memorandum of Association, Articles of Association,						
	• Commencement of Business- Sole Proprietorship,						
	Partnership, Limited Liability Partnerships, Private Limited						
	Companies, Public Limited Companies, Joint Venture						
	Company, Foreign Exchange Management Act-1999, and						
	Foreign Direct Investment Regulatory Issues related with						
	Taxes.						
	Introduction: Indian Contract Act, 1872						
	• Understanding Essential Elements of a Contract, Void,						
	Voidable and unenforceable Contracts, Types of Contract						
	• Negotiable Instruments Act, 1881						
	Breach of Contracts						
	 Hospitality Contracts: Function Prospectus- Banquets, 						
	Purchase Contract, Franchisee Agreement, Management						
	Contract, Technical Services Agreement						
	Hatal Licenses And Deculations	<u> </u>					
UN11-11	Constal Hotel Operating License	02					
	• General Hotel Operating Licence						
	Important Licences for Food & Beverage Operations Mandatamy magistrations and partifications for Demonstral						
	Mandatory registrations and certifications for Personnel Department and Accounts Department						
	Department and Accounts Department						
UNIT-III	Food Legislation	CO 3					
	Introduction to Food Adulteration	000					
	The Prevention of Food Adulteration Act, 1954						
	Important Legal Term in Food Adulteration Act						
	Food Safety and Standard Act, 2006						
	Recommended Food Safety Management Plan for Hotels						
UNIT-IV	Liquor Licensing	CO 4					
	Introduction: Non-Alcoholic Beverages and Alcoholic Beverages						
	Liquor Legislation in India: Prohibition, Dry Days, Legal Age for						
	Diniking Liquor Ligansing Procedure						

Mandatory Compliances of a Liquor Licence	
Service of Alcohol Beverages	
Behavioural Traits of an Intoxicated Person	
Sale of Cigarettes and Tobacco	

SUGGESTED READINGS:

- Hotel Law by Amitabh Devendra, Oxford University Press
- Hotel & Tourism Laws by JagmohanNegi
- Related Guidelines & Reports from Ministry of Tourism, Govt of India
- HOSPITALITY LAW: Managing Legal Issues in the Hospitality Industry by Barth, S
- Food & Beverage Law: Food Safety and Hygiene by Negi, J

	Mapping: CO-PO											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8				
Co 1	2	1	2	1	1	3	3	1				
Co 2	2	1	2	1	1	3	3	1				
Co 3	2	1	2	3	1	3	3	3				
Co 4	2	1	2	1	1	3	3	1				
	2	1	2	1.5	1	3	3	1.5				

MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO											
	PSO1	PSO2	PSO3	PSO 4	PSO 5						
Co 1	1	1	2	1	1						
Co 2	1	1	2	1	1						
Co 3	1	1	2	1	3						
Co 4	1	1	2	1	1						
	1	1	2	1	1.5						

MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

	Mapping: CO-PO-PSO												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
0 1	2	1	2	1	1	2	2	1	1	1	2	1	1
Col	2	1	2	1	1	3	3	1	1	1	2	1	1
Co 2	2	1	2	1	1	3	3	1	1	1	2	1	1
Co 3	2	1	2	3	1	3	3	3	1	1	2	1	3
Co 4	2	1	2	1	1	3	3	1	1	1	2	1	1
	2	1	2	1.5	1	3	3	1.5	1	1	2	1	1.5

	DSE-MHMCT- 6 BASICS OF EVENT MANAGEME	NT
		Credits –04
		External Marks -04
		TotolMarks -10
80		1 Otanviai KS-
COURSE OF	BJECTIVES:	
Co 1	Define the concept, its advantages & disadvantages & types of	of event.
Co 2	Explain key elements of pre-events planning.	
Co 3	Point out event marketing & HR Requirement.	
Co 4	Create knowledge about various issues of events such as a	event catering, event
	entertainment, financial & crowed management for events.	
UNIT- I	Introduction to event:	CO 1
	The Concept, Nature, Definition and scope, C's of Events,	
	advantage and disadvantage of Events, Various Categories	
	and Typologies, Organization structure of event	
	management companies, Emerging trends in event industry.	~~~
UNIT- II	Organizing & Designing of Events,	CO 2
	Event planning – Concept, Process and Design, Pre- Event Descarch Studying Event feasibility legal compliances	
	Event Venue Finding Logistics and Ambience	
UNIT-III	Event Marketing & Human Resource for event	CO 3
	Marketing & Promotion of Events: Nature of Event	
	Marketing, Process of Event Marketing, The Marketing	
	Mix, Sponsorship. Promotion: Image/ Branding,	
	Advertising, Publicity and Public Relation.	
	The Human Research Planning Process: Need Assessment; Policies and Procedures: Job Description: Recruitment and	
	selection: training and development of event staff:	
	Developing Leadership and Supervision skills during	
	Events, Group development, Skills required to be a Good	
	event planner	
		~~~
UNIT-IV	Important Issues in Event planning	CO4
	Event Catering, Events Decorations, Entertainment	
	Protocols during Events. Time Management Events	
	Financial Management of Events.	
	Safety and Security: Occupational Safety and Health,	
	Incident Reporting, Crowd Management and Evacuation.	
	Notes An Erent such as Conference/Section/Theorem to the head of the	
	Note: An Event such as Conference/ Seminar/ Theme event may be planned and	

organized to supplement learning of students.

#### **Suggested Readings:**

- 1. A.K. Bhatia, 'Event Management', Sterling Publishers Pvt. Ltd. Delhi.
- 2. Anton Shone & Bryn Parry, 'Successful Event Management, Coleman, Lee & Frankle, Powerhouse Conferences. Educational Institute of AHMA
- Hoyle, Dorf & Jones, Meaning conventions & Group business. Educational institute of AH & MA.
- 4. Joe Jeff Goldblatt, "Special Events: Best Practices in Modern Event Management (Hospitality, Travel & Tourism)", John Willy and Sons, New York
- 5. Leonard H. Hoyle, Jr, 'Event Marketing', John Willy and Sons, New York
- 6. Lynn Van Der Wagen, Carlos, Event Management, Pearson, New Delhi.
- 7. Sanjay Singh Gaur, Sanjay V Saggere, Event Marketing Management, Vikas Publication, New Delhi
- 8. John Beech, Sebastian Kaiser, Robert Kaspar The Business of Events Management Pearson Publications

#### Mapping

CO- PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	2	3	3	3	3	3	3	2
CO3	3	3	3	3	3	3	3	2
CO4	3	3	3	3	3	3	3	2
	2.5	3	3	3	3	3	3	2

00 100					
	PSO1	PSO2	PSO3	PSO 4	PSO 5
Co 1	3	3	3	3	3
Co 2	3	3	3	3	3
Co 3	3	3	3	3	3
Co 4	3	3	3	3	3
	3	3	3	3	3

#### CO- PSO

#### CO – PO- PSO

	PO	PO	PO	РО	PO	РО	PO	РО	PSO	PSO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	1	2	3	4	5
Co 1	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 2	2	3	3	3	3	3	3	2	3	3	3	3	3
Co 3	3	3	3	3	3	3	3	2	3	3	3	3	3
Co 4	3	3	3	3	3	3	3	2	3	3	3	3	3
	2.5	3	3	3	3	3	3	2	3	3	3	3	3

#### **DSE-MHMCT-7 SERVICE MARKETING**

Credits -06 External Marks -20 Internal Marks -80 TotalMarks-100

#### **COURSE OBJECTIVES:**

Co 1: Identify unique marketing challenges due to the nature of the tourism and learning hospitality marketing system.

Co 2: Analyze the relationship between market and consumer behaviour for segmentation and target marketing

Co 3: Learn 4 P's of Marketing Mix for Hospitality Product

Co 4: Develop the understanding of expanded service marketing Mix Strategies

UNIT-I	Marketing of Services	CO 1
	Introduction – Growth of the Service Sector, The Concept of	
	Service, and Characteristics of Services in reference with	
	Hospitality Industry. Challenges to hospitality and tourism	
	marketing. Marketing Concepts (Need, Want, Demand, TQM,	
	Product, Customer value, Customer satisfaction, Exchange	
	&Transaction, Market), Difference between marketing and	
	Selling, Marketing Orientation (Product concept, Production	
	concept, Selling concept, Marketing concept, Societal marketing	
	concept).	
	Hospitality Marketing System: Internal environment, External	
	Environment (Micro environment, Macro environment)	
	Introduction to the Concept of Marketing Mix.	
UNIT-II	<b>Relationship between Market and Consumer</b>	CO 2
	Consumer Behaviour,	
	Three stage model of service consumption: Pre Purchase Stage-	
	factors influencing Decision Making.	
	Purchase- factors influencing Purchase	
	Post encounter Stage	
	Factors influencing Buying Process	
	Positioning services in competitive market: Introduction	
	Consumer- Driven Services Marketing Strategy	
	Segmenting Service Market	
	Targeting Service Market	
	Principles of Positioning	
	Developing an effective positional Strategy	

UNIT-III	4 P's of Service Marketing	CO 3
	Product: Concept of Hospitality Product, Package as a Product,	
	New, Managing Product, New Product Development, Product Life	
	Cycle, Brand and Branding, hospitality product marketing	
	strategies	
	<b>Place</b> : Concept of Hospitality Distribution, Distribution Channels, Management of Channels	
	<b>Price:</b> Concept of price & pricing, factors affecting hospitality	
	pricing, methods of pricing, pricing Strategies, Price Fixation in	
	Hospitality.	
	Promotion: Concept of Promotion & Promotion Mix,	
	Developing Promotion for Hospitality Product, Advertising,	
	Personnel Selling, Sales Promotion, Public Relation,	
	Important Promotion tools in Hospitality.	
		00.4
UNIT-IV	Expanded Service Marketing Mix	CO 4
	<b>People:</b> Service Encounters, People in Tourism service encounters- Consumers, Employees, Residents, Important practices of managing people and service encounters in hospitality- CRM and its Techniques, Internal Marketing and Capacity Building.	
	<b>Process:</b> Procedures, Mechanisms, Time & cost Management, Balancing Capacity and demand management of hospitality services using process.	
	<b>Physical evidence</b> : Concept & function of physical evidence, service capes and servuction frameworks, components of physical evidence, and managing evidence in hospitality industry.	

Text Books:

1. Chaudhary, M. (2010). Tourism Marketing (1st ed.). New Delhi, India: Oxford University Press.

Recommended Books / Suggested Readings:

1. Philip, K., John, T. & James M,(2016). Marketing for hospitality and tourism (6TH ed.). New Delhi, India: Pearson India education.

2. Prasana, K. (2016). Marketing of hospitality and tourism services (2nd ed). New Delhi, India: Mc Graw Hill education India.

3. Devashish, D. (2011). Tourism marketing (1st ed). New Delhi, India: Pearson India education service.

#### MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

	Mapping: CO-PO												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8					
Co 1	2	1	3	1	3	2	3	1					
Co 2	2	1	3	1	3	2	3	1					
Co 3	2	1	3	1	3	2	3	1					
Co 4	2	1	3	1	3	2	3	1					
	2	1	3	1	3	2	3	1					

#### MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

	Mapping: CO-PSO											
	PSO1	PSO2	PSO3	PSO 4	PSO 5							
Co 1	3	1	2	1	1							
Co 2	3	1	2	1	1							
Co 3	3	1	2	2	1							
Co 4	3	1	2	2	1							
	3	1	2	1.5	1							

#### MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

	Mapping: CO-PO-PSO												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
Co 1		1	3	1	3	2	3	1	3	1	2	1	1
Co 2	2	1	3	1	3	2	3	1	3	1	2	1	1
Co 3	2	1	3	2	3	2	3	1	3	1	2	2	1
Co 4	2	1	3	1	3	2	3	1	3	1	2	2	1
	2	1	3	1	3	2	3	1	3	1	2	1.5	1

	SEC-MHMCT-3 HOTEL FRENCH -II						
	Cred	lits –02					
	External Ma	rks -32					
	Internal Ma	rks -08					
	TotolMa	rlzg_40					
	1 Otalivia	185-40					
CO 1 Ide	ntify & use small French expression, vocabulary, articles indefinite & d	lefinite,					
auxi	liary 1 st group verbs						
CO 2 Rea	d & Recite Expressions/vocabulary used for seasons, colors & telling the	e time;					
Counting (51-100); Translation; Comprehension based on simple text basic Frenc							
intro	oduction, fruits, vegetables & 1st group French verbs.						
CO 3 Des	cribe & role play conversation situations related to airport; taxi; hotel & res	staurant					
etc.							
Co 4 Des	cribe & role play conversation situations related to customs; telephone exchange	ange &					
rest	aurant etc.	U					
Unit I	Book: bon Voyage, Unit II: Renseignement	CO1					
	Vocabulary & written expression: expressions of time, Hotel facilities vocabulary						
	preparing itinerary Place description						
	Grammar: Prepositions, Imperative tenses: Simple future and recent future,						
	Situation 1 Ce matin on va visiter le Taj, situation 2: Ici il est huit heures,.						
	(Includes grammar exercises associated with it)						
Unit II	Book: bon Voyage, Unit II: Renseignement (Conti)	CO2					
	Vocabulary & written expression: Place description, direction, preposition of						
	location						
	Grammar: Adjectifs,						
	Situation 3: c'est un petite hotel deux etoiles ,Situations 4: Pardon Monsieur , je						
	cherche le palais ; Situations 5: En premiere classe ca fait.						
	(Includes grammar exercises associated with it)	GOG					
Unit III	Book: Bon Voyage, Unit III: conseils	CO3					
	Vocabulary & written expression: country description ; taking messages,						
	Grammar: tenses: simple past and Impartait, Partatrive, Personal Pronoun etc.						
	Situations 1 je te conseille ; situations -2 Qu est -ce que je peux acheter (includes						
TT:4 TX7	Pook: Pon Voyage Unit III: conseil (Conti	CO4					
	Vocabulary & written expression: vocabulary used for describing racines (any 05)	004					
	telling about the hotel and its tariff						
	Grammar: tenses: simple past Partatrive Personal Pronoun etc.						
	Situations: 3: C'est du noulet aux champignons: Situations: 4: couchez vous tôt ce						
	soir						
	(Includes grammar exercises associated with it)						

#### **REFERENCE:**

- Vasanti Gupta, Malini Gupta, Usha Ramchandran, Bon Voyage, W. R. goyal Publishes and Distributions, New Delhi.
- Odilechantellauvechiari, Sophie, C and Chantal, D., Les Metiers de Tourism, Hachette, Paris.
- French for hotels, frank brothers, New Delhi

#### MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	3	3	2
CO2	3	3	3	1	2	3	3	2
CO3	2	2	3	2	2	2	3	2
CO4	3	3	3	2	3	3	3	2
	2.5	2.75	3	2	2.5	2.75	3	2

#### MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PSO										
	PSO1	PSO2	PSO3	PSO 4	PSO 5					
Co 1	2	3	3	3	3					
Co 2	3	3	3	3	3					
Co 3	3	3	3	3	3					
Co 4	3	3	3	3	3					
	2.75	3	3	3	3					

# MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

Mapping: CO-PO-PSO													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO 4	PSO 5
CO 1	2	3	3	3	3	3	3	2	2	3	3	3	3
CO 2	3	3	3	1	2	3	3	2	3	3	3	3	3
CO 3	2	2	3	2	2	2	3	2	3	3	3	3	3
CO 4	3	3	3	2	3	3	3	2	3	3	3	3	3
	2.5	2.75	3	2	2.5	2.75	3	2	2.75	3	3	3	3
AECC-MHMCT-2 ENVIRONMENTAL PRACTICES IN HOTELS													
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------	--	--	--	--							
	Ci External N	redits –02 Aarks -32											
	Internal Marks -08												
	Total	Marks-40											
COURSE (	DBJECTIVES:												
<ul> <li>- Co 1: Understanding environmental issues and their impact on Hospitality industry.</li> <li>- Co 2: Identifying practices adopted by hospitality industry towards water and energy management.</li> </ul>													
- Co 3: Dev	velop sensitivity and high work ethics towards waste management												
- Co 4: Eva	luating environmental certification for hospitality industry.												
UNIT-I	<ul> <li>Introduction Environment and Ecology</li> <li>Environmental Threat: Global warming, Greenhouse gases, Carbon foot print, Climate Change, Acid rain, Disaster: Natural and Man made</li> <li>Importance and impact of Environment on Hospitality Industry</li> </ul>	CO 1											
	Sustainable Development in Hospitality												
UNIT-II	<ul> <li>Water &amp; Energy Management</li> <li>Sources of water pollution by hotels (Laundry, Kitchen, Cleaning agents, Polishing machines, Sewage)</li> <li>Importance of water conservation</li> <li>Control of water consumption (Kitchen, Housekeeping, Guest room, Rest room)</li> <li>Principles of energy management</li> <li>Types of energy sources – (Renewable, nonrenewable)</li> <li>Energy Efficiency &amp; Energy - conservation measures adopted by hotel industry</li> <li>Alternative energy sources for hospitality industry)</li> <li>Practices adopted by hotels for water and energy management</li> </ul>	CO 2											
UNIT-III	Waste Management	<b>CO 3</b>											
	<ul> <li>Introduction : Waste Management</li> <li>Types of wastes (dry/wet, organic / inorganic, biodegradable / non bio-degradable)</li> <li>Sources of solid waste found in hotels (e- waste &amp; paper waste, organic-waste, glass, plastic, metals)</li> </ul>												

	<ul> <li>3R's principle (Reduce, Reuse, Recycle)</li> <li>Strategies and Practices adopted by hotel for managing waste.</li> </ul>	
UNIT-IV	<ul> <li>Environmental protection practices as part of Corporate Social Responsibility in the Hospitality Industry</li> <li>Environmental Certification for Hotels &amp; Tourism Businesses in India: LEED, TERI, ISO (14,000,14001:2004, 14004:2004), ECO MARK SCHEME IN INDIA</li> <li>Sustainability,</li> <li>Ecotel in India– Definition, Scope and Importance</li> </ul>	CO 4

#### **SUGGESTED READINGS:**

- 1. Environment Management for Hotels: A students Handbook-David Kirk
- 2. Managing Hotels and Restaurant-Dr. Jag Mohan Negi
- 3. Managing Environment for Leisure and Recreation-Rich Board Hurst
- 4. The Human Impact on the Natural Environment, Oxford-Blackwell
- 5. Hotel Management "Educational and Environment Aspects-Yogendra K. Sharma
- 6. Best Designed Ecological Hotels-Martin N. Kunz
- 7. Environment Management in the Hospitality Industry –Kathryn Webster
- 8. Environment Management for Hotels, Oxford, Butterwort-Heinemann

Mapping: CO-PO								
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8
Co 1	1	2	1	3	3	3	1	3
Co 2	1	2	1	3	3	3	1	3
Co 3	1	2	1	3	3	3	1	3
Co 4	1	2	1	3	3	3	1	3
	1	2	1	3	3	3	1	3

#### MAPPING OF COURSE OBJECTIVE AND PROGRAM OBJECTIVE

Mapping: CO-PSO						
	PSO1	PSO2	PSO3	PSO 4	PSO 5	
Co 1	1	2	2	2	3	
Co 2	1	2	2	2	3	
Co 3	1	2	2	2	3	
Co 4	1	2	2	2	3	
	1	2	2	2	3	

#### MAPPING OF COURSE OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

#### MAPPING OF COURSE OBJECTIVE, PROGRAM OBJECTIVE AND PROGRAM SPECIFIC OBJECTIVE

					Μ	apping	g: CO-I	PO-PS	)				
	PO	PO 2	РО	PO	PO	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
	1		3	4	5								
Со	1	2	1	3	3	3	1	3	1	2	2	2	3
1													
Со	1	2	1	3	3	3	1	3	1	2	2	2	3
2													
Со	1	2	1	3	3	3	1	3	1	2	2	2	3
3													
Со	1	2	1	3	3	3	1	3	1	2	2	2	3
4													
	1	2	1	3	3	3	1	3	1	2	2	2	3

## 03 MONTHS VOCATIONAL TRAINING / HOTEL INDUCTION TRAINING

(20th May to 20th August)

### DEPARTMENT OF HISTORY KURUKSHETRA UNIVERSITY KURUKSHETRA Syllabus and the Rectified Scheme of Examination For the Course of B. A. (General) Semester System Under the Choice Based Credit System (CBCS)/Learning Outcomes Curriculum Framework (LOCF) Subject: History (Option – I & II) To be Introduced at the Institute of Integrated and Honors Studies (IIHS) w.e.f. the Session 2020-21 in Phased Manner

B. A. General Course in History subject shall be a three years degree course containing of six semesters. The candidates shall have to select one option paper out of the two options in each semester i. e. six papers in the full course. Each paper will carry 150 marks out of which 30 marks shall be earmarked for Internal Assessment. The Scheme of the Examinations will be as under:

Time:	3 Hours
Maximum Marks:	150 Marks
Theory:	120 Marks
Internal Assessment:	30 Marks, Divisions of Marks as given below:

Two Assignments:50 % (for each Assignment)One Class Test:25 % (One Period Duration)

Attendance: 25 % Marks of Attendance will be given as under:

91 % Onwards	7.5 Marks
81% to 90%	6.5 Marks
75 % to 80 %	5.5Marks
70 % to 74 %	4.5 Marks
65 % to 69 %	3.5 Marks*

* For students engaged in Co-Curricular Activities of the University only/ authenticated medical grounds duly approved by the concerned Principal.

The examination system will further be based on CBCS (Choice Based Credit System)/ Learning Outcomes Curriculum Framework (LOCF) as per UGC / University guidelines. Under this system, the students will have a choice to study one more paper from two options specifically offered in the syllabi for Non-History Courses of the Under-graduate Degree for such students in  $3^{rd}$  semester. Similarly, in History subject of B. A. General degree course such one additional paper from other subject will be offered in the course of  $3^{rd}$  semester to the students of History course of Under-Graduate Degree.

The B. A. General in History subject (Regular) has been divided into six semesters spread over three years. Every student of History subject has to pass minimum 36 + 2 Credits (24 Compulsory out of 72 Credits of all subjects and 12 Credits optional out of 48 credits (24 DSE and 12 GE Plus 2 SEC) and 2 Credits out of 8 Credits SEC in Semester – III from additional papers from other department/discipline out of total 120 Credits as necessary to earn the Degree under the new Scheme.

First four semesters, 24 Compulsory Credits and 12 DSC Credits shall be offered to the students of history. In addition to this one Optional Paper from other department / subject of 2 Credit in Semester – III shall be offered to the Students. However, the choice of optional Credits is subjected to the availability of infrastructure/ teaching faculty in the Institute / College.

**Note:** There shall be two Optional Papers in each Semester  $1^{st}$ ,  $2^{nd}$ ,  $3^{rd}$ , 4h,  $5^{th}$  and  $6^{th}$ . The Candidate shall take any one of the two Optional Papers in each Semester. The Candidate who may select Option-I in Semester-I will continue to select the Option-I in the Semester  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ . The Candidate who may select Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ .

### Syllabus and Scheme of Examination for B. A. (General) Under Choice Based Credit System(CBCS)/Learning Outcomes Curriculum Framework (LOCF) Kurukshetra University Kurukshetra Subject: History (Option – I & II)

Semester	Course Code	Paper	Nomenclature	Credit	Contact Hours	Internal Marks	External Marks	Total	Time of
									Exam
1	CC- History A	History 101 (I)	Political History of India (From Earliest	6	5+1	30	120	150	3 Hrs
			Times to 1206)						
		History 101	Social and Economic	6	5+1	30	120	150	3 Hrs
		(II)	History of India (From Earliest Times to 1206)						
2	CC- History B	History 201(I)	Political History of Haryana (From Harappan Age to 1966)	6	5+1	30	120	150	3 Hrs
		History 201 (II)	Social and Economic History of Haryana (From Harappan Age to 1966)	6	5+1	30	120	150	3 Hrs
3	CC History C	History 301 (I)	Political History of India (1206-1757)	6	5+1	30	120	150	3 Hrs

		History	Social and	6	5+1	30	120	150	3 Hrs
		301	Economic	-	• · -				
		(II)	History of India						
		()	(1206-1757)						
	SEC-3	History	Indian National	2	2	10	40	50	2 Hrs
	History	S1 (I)	Movement						
	С		(1885-1919)						
		History	Indian National	2	2	10	40	50	2 Hrs
		S2 (II)	Movement						
			(1920-1947)						
			SEC 1	4					
			Computer						
			Science/MOOC						
			Course from						
			Swayam Portal						
4	CC	History	Modern India	6	5+1	30	120	150	3 Hrs
	History	401 (I)	(1757-1947)						
	D								
		History	Social and	6	5+1	30	120	150	3 Hrs
		401	Economic						
		(II)	Transformation						
			During						
			Colonial India						
			(1757-1947)	4					
			SEC 2	4					
			Personality						
5	DCE	Histomy	World History	6	5 1	20	120	150	2 I Ima
5	USE	501 (I)	(From Angiont	0	3+1	30	120	150	5 118
		JUI (I)	$(170111)$ Ancient to $17^{\text{th}}$ Century)						
	$\mathbf{\Lambda}$		to 17 Century)						
			OR			30	120	150	
		History	Contemporary	6	5+1	30	120	150	3 Hrs
		502 (I)	India: State and	0	5+1	50	120	150	51115
		502 (I)	Politics (1947-						
			1966)						
		History	World History	6	5+1	30	120	150	3 Hrs
		501	Social and	0	511	50	120	150	5 1115
		(II)	Economic						
		(11)	Trends (From						
			Ancient to 17 th						
			Century)						
			OR						
		Historv	Social and	6	5+1	30	120	150	3 Hrs
		502	Economic	-		-	_		
		(II)	History of						
			Contemporary						
			India						
			(1947 – 1966)						

6	DSE	History	Modern World	6	5+1	30	120	150	3 Hrs
	History	601 (I)							
	В		OR			30	120	150	
		History	Social and	6	5+1	30	120	150	3 Hrs
		602 (I)	Economic						
			History of						
			Contemporary						
			India						
			(1947 – 1966)						
		History	Modern Europe	6	5+1	30	120	150	3 Hrs
		601	(1789-1919)						
		(II)							
			OR			30	120	150	
		History	Contemporary	6	5+1	30	120	150	3 Hrs
		602	India: State and						
		(II)	Politics (1947-						
			1966)						

## **B. A. History Programme Outcomes:**

- 1. There are different scopes in different areas like sericulture department as demonstrator, care taker of the farm, trainer for others, etc.
- 2. Archeologist: Archeological Survey of India with private Firms related to archeology.
- 3. Historian: With so much debate over the authenticity of historical books, there is ever increasing demand for historians.
- 4. Public Service: for history graduates, the option of public service like UPSC, HPSC, Banking, Police Department, Army, etc. are always opened.
- 5. Teacher: After BA in history one can always find employment as a history/social science teacher.
- 6. Social Worker/Subject Expert: Nowadays a lot of publishing houses seek subject matter experts for the publication of school textbooks or supplementary reading materials.
- 7. Travel and Tourism Expert: With an extensive knowledge of history and historical monuments, history graduates can work as a travel expert for tourism spot of historical importance.
- 8. Develop the ability to work independently as well as effectively in the changing environment.
- 9. Build skills to work as part of a team and lead others, setting directions and formulating inspiring vision.
- 10. Develop the capability of defining problems, formulate hypothesis, collect relevant data, develop empirical evidence and interpret the results of such analyses.
- 11. Articulate and apply ethics, values and ideas that demonstrate awareness of current societal challenges.
- 12. Use investigative skills necessary for conducting disciplinary-appropriate projects/research documents/term papers etc.

## DEPARTMENT OF HISTORY KURUKSHETRA UNIVRSITY KURUKSHETRA B.A. (GENERAL), HISTORY (SEMESTER SYSTEM) UNDER THE CHOICE BASED CREDIT SYSTEM (CBCS) /LEARNING OUTCOMES CURRICULUM FRAMEWORK (LOCF) W.E.F. 2020-21 in Phased Manner

**Note:** There shall be two Optional Papers in each Semester 1st, 2nd, 3rd, 4th, 5th and 6th. The Candidate shall take any one of the two Optional Papers in each Semester. The Candidate who may select Option-I in Semester-I will continue to select the Option-I in the Semester 2nd, 3rd, 4th, 5th and 6th. The Candidate who may select Option-II in the Semester-I will continue to select the Option-II i

		LIST OF PA	APERS			
Subject	Paper	Nomenclature	Internal	Theory	Total	Time
Code	No.		Assessment	Paper	Marks	
				Marks		
CC	101	Political History of India	30	120	150	3 Hrs.
History	Option-I	(From Earliest Times to				
А		1206)				
CC	101	Social and Economic	30	120	150	3 Hrs.
History	Option-II	History of India (From				
A	_	Earliest Times to 1206)				

## B. A. (General) History – Part-I, Semester – 1st Course – CC History - A

### Syllabus and Course Reading Under the Choice Based Credit System (CBCS)/ Learning Outcomes Curriculum Framework (LOCF)

Subject Code : CC History A Paper No. : 101 (Option – I)

### Political History of India (From Earliest Times to 1206)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes :** To introduce the students to the major element of politics and administration in Ancient India. It intends to present and overview of changes in historical context. A few introductory lectures on the meaning and scope of history, expansion of Harappan civilization, Vedic polity, Mauryan polity, Post-Mauryan State, expansion of Gupta Empire, rise of Rajput power and invasions of Mahmood Ghaznavi and Muhammad Ghori would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- List the sources and evidence for reconstructing the history of Ancient India.
- Discuss the main features of Harappan and Saraswati Civilization.
- Analysis the way of earlier historians interpreted the history of India and while doing so they can write the alternative ways of looking at the past.
- Analysis Vedic polity and state, rise of Magdha Empire.
- Examine the Mauryan polity under Chandra Gupta Maurya and Ashoka.
- Discuss the Achievements of Kushanas and Satvahanas.
- Examine the expansion of Gupta Empire under Samudragupta and Chandragupta- II.
- Describe the achievements of Harshvardhana, Chalukaya and Kushana.
- Explain the rise of Rajputs and Invasions of Mahmood Ghaznavi and Muhammad Ghori
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

#### Unit – I

Meaning of History and Sources of Ancient Indian History Harappan and Saraswati Civilization: Origin, Extent, Urbanization and Decline Vedic Age: Polity and State Mahajanapada: Rise of Magdha Empire

#### Unit – II

Polity of Mauryan Empire: Chandragupta Maurya and Ashoka Post-Mauryan State: Kushanas and Satvahanas Gupta Empire: Samudragupta and Chandragupta II Post-Gupta Period: Harshvardhana and Chalukayas

## Unit III

Struggle for Hegemony: Pritihara, Pala and Polity and Administration of Chola Rise of Rajput Power with Special Reference to Tomars Mahmood Ghaznavi and Muhammad Ghori: Conflicts with Indian States and Effects

## Unit – IV

Maps (India): Important Sites of Harappan Culture Expansion of Ashoka's Empire Expansion of Kanishka's Empire Expansion of Harsha's Empire

## **Suggested Readings:**

Allchin, B. and Allchin R.,	Origins of a Civilization: Te Prehistory and Early Archaeology of South Asia, Viking, New Delhi, 1997.
Basham, A. L.,	<i>The Wonder that was India</i> , Rupa Publications, Bombay, 1971.
Bhandarkar, D. R.	Some Aspects of Ancient Hindu Polity, Benares, 1929.
Bogucki, P.	<i>The Origin of Human Society</i> , Wiley-Blackwell, Massachusetts, 1999.
Burton, Stein,	History of India, OUP, New Delhi, 1998.
Carr, E. H.	Itihas Kya hai, Macmillan Publication, New Delhi 1976.
Chandra Satish	<i>Medieval India From the Sultanate to the Mughals</i> , Delhi 1997.
	<i>History of Medieval India</i> , Orient Blackman, Reprint Hyderabad, 2018
	Madhyakalin Bharat: Rajniti Samaj and Sanskirti, Delhi, 2007.
Farukhi, A.	Prachin Evam Madhyakalin Samajik Sanrachanaye aur Sanskritiya, Manak Prakashan, Delhi, 2015.
Habib, Irfan,	The Indus Civilization, Tulika, New Delhi, 2002.
Jayasval, K. P.,	Hindu Polity, Calcutta, 1924.
Jha, D. N. and Shrimali, K. M.	Prachin Bharat Ka Itihas, New Delhi, 1990.
Kosambi, D. D.	Prachin Bhartiya Sabhyata Evam Sanskriti, Rajkamal, New Delhi.
Lahri, Nayanjot, ed.,	<i>The Decline and Fall of the Indus Civilization</i> , Permanent Black, New Delhi, 2000.
Majumdar, R. C.	<i>History and Culture of the Indian People</i> , V Vols., Bhartiya Vidhya Bhavan Series, Bombay, 1970, 1979, 1980.
Sharma, R. S.,,	India's Ancient Past, OUP, New Delhi, 2007. Looking for the Aryans, Orient Longman Publishers, Delhi, 1995.
	Aspects of Political Ideas and Institution in Ancient
	India, Motilal Banarsidas, New Delhi, 1991.
Rao, N. S. Subba,	Lectures on the Economic Condition of Ancient
	India, Being an Analytical Study of the Jatakas,
	Mysore, 1911.
Thapar, Romila,	<i>The Past Before Us: Historical Traditions of Early India</i> , Permanent Black, Part – I, Delhi, 2013.

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Tripathi, Ramashankar,

A History of Ancient India, Vol. IPenguin India, New Delhi, 2000. History of Ancient India, Motilal Banarsidas Publishers Pvt. Ltd., New Delhi, 2006.

Table I: CO-PO Matrix for the course CC History-A 101 (Option – I)												
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
CC	3	3	3	3	3	2	3	2	3	3	3	2
History-A												
101 (I).1												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
101(I).2												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
101 (I).3												
CC	3	3	3	3	2	3	3	3	3	3	3	3
History-A												
101 (I).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

Mapping Matrix of Course CC History- A 101(Option – I)
able I: CO-PO Matrix for the course CC History-A 101 (Option -

Table II: CO-PSO Matrix for the course CC History 101 (Option – I)

СО	PSO 1	PSO 2	PSO 3	PSO 4
CC History-A	3	3	3	3
101 (I).1				
CC History-A	3	3	3	3
101 (I).2				
CC History-A	3	3	3	3
101 (I).3				
CC History-A	3	3	2	3
101 (I).4				
Average	3	3	2.75	3

#### Subject Code : CC History-A Paper No. : 101 (Option – II)

Social and Economic History of India (From Earliest Times to 1206)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit: 06

**Programme Specific Outcomes:** To introduce the students to the major element of Society and Economy during earliest times to 1206. It intends to present and overview of changes in historical context. A few introductory lectures the expansion of Harappa civilization, Vedic society and economy, Dhamma of Ashoka, Gupta Art, Architecture, Science and Technology, feudal society and economy and impacts of invasions of Mahmood

Ghaznavi and Muhammad Ghori on Indian Society and Economy would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the main features of society and economy of Harappan and Saraswati Civilization.
- Analysis Vedic society, economy, religion and literature.
- Discuss new religious movements.
- Examine the Dhamma of Ashoka.
- Examine the Art, Architecture, Science and Technology.
- Describe the development of art and architecture during Post-Gupta period.
- Explain features of feudal society and economy
- Impacts of Invasions of Mahmood Ghaznavi and Muhammad Ghori on society and economy.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24

marks.

- 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
- 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

## Unit – I

Harappan and Saraswati Civilization: Society and Economy Vedic Age: Economy and Trade, Society, Religion and Literature Religious Movements: Jainism and Buddhism

## Unit – II

Dhamma of Ashoka The Guptas: Society, Economy and Trade The Guptas: Art, Architecture, Science and Technology Post-Gupta Period: Art and Architecture

## Unit - III

Feudalism: Social and Economic Trends Harshvardhana: Religious Conferences and Literature Islam and India: Social and Cultural Impacts Invasions of Mohammad Ghori: Social Impacts

## Unit – IV

Maps (India): Important Sites of Harappan Civilization Major Centers of Jainism Major Centers of Buddhism Pillars and Edicts of Ashoka

## **Suggested Readings:**

Ashraf, K. M.	<i>Life and Conditions of the People of Hindustan,</i> Delhi 1965
Basham, A. L.,	The Wonder that was India, Rupa Publications,
	Bombay, 1971.
Bogucki, P.	The Origin of Human Society, Wiley-Blackwell,
-	Massachusetts, 1999.
Burton, Stein,	History of India, OUP, New Delhi, 1998.
	Vijaynagar, Cambridge University Press,
	Cambridge, 1989.
Chandra Satish	<i>Medieval India From the Sultanate to the Mughals</i> , Delhi 1997.
	History of Medieval India, Orient Blackman,
	Reprint Hyderabad, 2018
	Madhyakalin Bharat: Rajniti Samaj and Sanskirti, Delhi 2007
	20m, 2007.
Habib Irfan,	Technology in Medieval India, c. 650-1750, Tulika,
,	New Delhi, 2008.
	The Indus Civilization, Tulika, New Delhi, 2002.
Habibillah, A. B. M.	The Foundation of Muslim Rule in India, Central
	Book Depot, Allahabad, 1967.
Jackson, Pater	The Delhi Sultanate, Cambridge University Press,
	Cambridge, 2001.
Jha, D. N. and Shrimali, K. M.	Prachin Bharat Ka Itihas, New Delhi, 1990.
Kosambi, D. D.	Prachin Bhartiya Sabhyata Evam Sanskriti,
	Rajkamal, New Delhi.
Jayasval, K. P.,	Hindu Polity, Calcutta, 1924.
Majumdar, R. C.	History and Culture of the Indian People, V Vols.,
	Bhartiya Vidhya Bhavan Series, Bombay, 1970,
	1979, 1980.
Majumdar, R. C., A. D. Pusalkar,	<i>The Delhi Sultanate</i> , Vol. 6, Bharti Vidhya Bhawan,
	Bombay, 1960.
Majumdar, R. C.	History and Culture of the Indian People, V Vols
	Bhartiya Vidhya Bhavan Series, Bombay, 1970,
	1979, 1980.
Sharma, R. S.,	India's Ancient Past, OUP, New Delhi, 2007.
,	Looking for the Aryans, Orient Longman
	Publishers, Delhi, 1995.
	Aspects of Political Ideas and Institution in Ancient
	India, Motilal Banarsidas, New Delhi, 1991.

	Table	1. 00-						OIY-A	101 (C	puon –	II)	
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
CC	3	3	3	3	3	2	3	2	3	3	3	2
History-A												
101 (II).1												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
101(II).2												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
101 (II).3												
CC	3	3	3	3	2	3	3	3	3	3	3	3
History-A												
101 (II).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

Mapping Matrix of Course CC History- A 101(Option – II) Table I: CO-PO Matrix for the course CC History-A 101 (Option – II)

Table II: CO-PSO Matrix for the course CC History 101 (Option – II)

СО	PSO 1	PSO 2	PSO 3	PSO 4
CC History-A	3	3	3	3
101 (11).1				
CC History-A 101 (II).2	3	3	3	3
CC History-A 101 (II).3	3	3	3	3
CC History-A 101 (II).4	3	3	2	3
Average	3	3	2.75	3

## DEPARTMENT OF HISTORY KURUKSHETRA UNIVRSITY KURUKSHETRA B.A. (GENERAL), HISTORY (SEMESTER SYSTEM) UNDER THE CHOICE BASED CREDIT SYSTEM (CBCS) /LEARNING OUTCOMES CURRICULUM FRAMEWORK (LOCF) W.E.F. 2020-2021

**Note:** There shall be two Optional Papers in each Semester 1st, 2nd, 3rd, 4th, 5th and 6th. The Candidate shall take any one of the two Optional Papers in each Semester. The Candidate who may select Option-I in Semester-I will continue to select the Option-I in the Semester 2nd, 3rd, 4th, 5th and 6th. The Candidate who may select Option-II in the Semester-I will continue to select the Option-II i

#### B. A. (General) History – Part-I, Semester – 2nd Course – CC History - B

Subject	Paper	Nomenclature	Internal	Theory	Total	Time
Code	No.		Assessment	Paper	Marks	
				Marks		
CC	201	Political History of	30	120	150	3 Hrs.
History	Option-I	Haryana (From Harappan				
В		Age to 1966)				
CC	201	Social and Economic	30	120	150	3 Hrs.
History	Option-II	History of Haryana (From				
В		Harappan Age to 1966)				

#### LIST OF PAPERS

Syllabus and Course Reading Under the Choice Based Credit System (CBCS)/ Learning Outcomes Curriculum Framework (LOCF)

### Subject Code : CC History-B Paper No. : 201(Option – I)

#### Political History of Haryana (From Harappan Age to 1966)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major element of political History of Haryana from Harappan Age to 1966. It intends to present and overview of changes in historical context. A few introductory lectures on concept of regional history and sources of History of Haryana, expansion of Harappan Civilization, Vedic polity and Mahabharata, Mauryan polity, battles of Tarain, rise of Tomars and Chauhans, invasions of

Mahmood Ghaznavi and Muhammad Ghori, establishment of Turiksh Rule, expansion of Delhi Sultanate and Mughal Empire in Haryana, Expansion and Administration of East India Company, Uprising of 1857, Gandhi and National Movement in Haryana and Formation of Haryana State would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- List the sources and evidence for reconstructing the history of Haryana.
- Discuss the main features of Harappan and Saraswati Civilization in Haryana.
- Analysis Vedic polity, state and battle of Mahabharata.
- Examine the rise of Tomars, Chauhans and Battle of Tarain.
- Describes of the main Invasions of Mahmood Ghaznavi and Muhammad Ghori and its impacts on Haryana.
- Critically examine the expansion and administration of the Sultans of Delhi and Mughals in Haryana.
- Describe the expansion and administration of East India Company in Haryana.
- Describe the expansion of uprising of 1857 in Haryana and its impacts.
- Explain the Gandhian movements in Haryana.
- Discuss the formation of Haryana state.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

## Unit-I

Concept of Regional History and Sources of History of Haryana Harappan and Sraswati Civilization and Haryana Vedic Age: State, Polity and Mahabharata Tomars, Chauhans and Battles of Tarain

## Unit – II

Mahmood Ghazanvi and Muhammad Ghori: Conquests and Political Impacts Resistance to the Establishment of the Turkish Rule Delhi Sultanate: Political Expansion and Administration in Haryana Mughal Rule and Haryana: Expansion and Administration

## Unit – III

East India Company Rule: Expansion and Administration Uprising of 1857 in Haryana: Nature, Expansion and Political Impacts Gandhi and National Movement in Haryana Formation of Haryana State

### Unit-IV

Maps (Haryana):

Major Centers of Harappan Civilization Historical Places Under the Mughals Major Centers of the Uprising of 1857 Important Places of National Movement

## **Suggested Readings:**

Ashraf, K. M.	<i>Life and Conditions of the People of Hindustan</i> , Delhi, 1965.
Basham, A. L.,	<i>The Wonder that was India</i> , Rupa Publications, Bombay, 1971.
Burton, Stein,	History of India, OUP, New Delhi, 1998.
	Vijaynagar, Cambridge University Press,
	Cambridge, 1989.
Habib Irfan,	Technology in Medieval India, c. 650-1750, Tulika,
	New Delhi, 2008.
Habibillah, A. B. M.	The Foundation of Muslim Rule in India, Central
	Book Depot, Allahabad, 1967.
Jackson, Pater	The Delhi Sultanate, Cambridge University Press,
	Cambridge, 2001.
Majumdar, R. C.	History and Culture of the Indian People, V Vols.,
	Bhartiya Vidhya Bhavan Series, Bombay, 1970,
	1979, 1980.
Majumdar, R. C., A. D. Pusalkar,	The Delhi Sultanate, Vol. 6, Bharti Vidhya Bhawan,
	Bombay, 1960.
and A. K. Majumdar	
Mittal. S. C.	Harvana: A Historical Perspective, Atlantic
	Publishers & Distributors, New Delhi, 1986.
Nigam, S. B. P.	Nobility Under the Sultans of Delhi, Munshiram
	Manoharlal, Delhi, 1971.
Phadke, H. A.	Haryana: Ancient and Medieval, Delhi, 1986.
Phogat, S. R.	Inscriptions of Haryana, Kurukshetra, 1978.
Qureshi, I. H.	The Administration of the Sultans of Delhi,
-	Munshiram Manoharlal, New Delhi, 1968.
Raychaudhary, Tapan & Irfan Habib	, The Cambridge Economic History of India, Vol. I,
	Orient Longman, Hyderabad, 1984.
Rizvi, S. A. A.	
	A History of Sufism in India, Vol. I, Munshiram
	A History of Sufism in India, Vol. I, Munshiram Manoharlal, Delhi, 1997.
Satish Chandra	A History of Sufism in India, Vol. I, Munshiram Manoharlal, Delhi, 1997. Medieval India From the Sultanate to the Mughals,
Satish Chandra	A History of Sufism in India, Vol. I, Munshiram Manoharlal, Delhi, 1997. Medieval India From the Sultanate to the Mughals, Delhi 1997.
Satish Chandra	<ul> <li>A History of Sufism in India, Vol. I, Munshiram Manoharlal, Delhi, 1997.</li> <li>Medieval India From the Sultanate to the Mughals, Delhi 1997.</li> <li>History of Medieval India, Orient Blackman,</li> </ul>
Satish Chandra	A History of Sufism in India, Vol. I, Munshiram Manoharlal, Delhi, 1997. Medieval India From the Sultanate to the Mughals, Delhi 1997. History of Medieval India, Orient Blackman, Reprint Hyderabad, 2018
Satish Chandra	<ul> <li>A History of Sufism in India, Vol. I, Munshiram Manoharlal, Delhi, 1997.</li> <li>Medieval India From the Sultanate to the Mughals, Delhi 1997.</li> <li>History of Medieval India, Orient Blackman, Reprint Hyderabad, 2018</li> <li>Madhyakalin Bharat: Rajniti Samaj and Sanskirti,</li> </ul>
Satish Chandra	<ul> <li>A History of Sufism in India, Vol. I, Munshiram Manoharlal, Delhi, 1997.</li> <li>Medieval India From the Sultanate to the Mughals, Delhi 1997.</li> <li>History of Medieval India, Orient Blackman, Reprint Hyderabad, 2018</li> <li>Madhyakalin Bharat: Rajniti Samaj and Sanskirti, Delhi, 2007.</li> </ul>

Sharma, Krishna	Bhakti and the Bhakti Movement: A New Perspective, Munshiram Manoharlal, Delhi, 1987.
Sharma, R. S.	Aspects of Political Ideas and Institution in Ancient India, Motilal Banarsidas, New Delhi, 1991.
Sastri, K. A. N	The Cholas, 2 Vols. University of Madras, 1974.
Verma, Harish Chandra, ed.	Madhyakalin Bharat, Hindi Madhyam Karyanvay
	Nideshalaya, Delhi University, Delhi, 1993.
Singh Fauja, ed.,	History of Punjab, Punjabi University, Patiala,
	1975.
Verma, D. C.	Haryana, Delhi, 1972.
Yadav, K. C.	Haryana Itihas, 3 Vols. Macmillan, New Delhi, 1981.
	Haryana Itihas Evam Sanskriti, Vol. I, Manohar,
	New Delhi, 2003.
	Modern Haryana: History and Culture (1803- 1966), Manohar, New Delhi, 2001.

	Tuole	1. CO					C IIIst	OIY D	201 (0	puon	1)	
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
CC	3	3	3	3	3	3	3	2	3	3	3	2
History-B												
201 (I).1												
CC	3	3	3	3	2	3	3	2	3	3	3	2
History-B												
201(I).2												
CC	3	3	3	3	2	3	3	2	3	3	3	2
History-B												
201 (I).3												
CC	3	3	3	3	2	3	3	3	3	3	3	3
History-B												
201 (I).4												
Average	3	3	3	3	2.25	3	3	2.25	3	3	3	2.25

Mapping Matrix of Course CC History- B 201(Option - I)Table I: CO-PO Matrix for the course CC History-B 201 (Option – I)

## Table II: CO-PSO Matrix for the course CC History-B 201 (Option – I)

СО	PSO 1	PSO 2	PSO 3	PSO 4
CC History-B	3	3	3	3
201 (I).1				
CC History-B	3	3	3	3
201 (I).2				
CC History-B	3	3	3	3
201 (I).3				
CC History-B	3	3	2	2
201 (I).4				
Average	3	3	2.75	2.75

## Subject Code : CC History-B Paper No. : 201 (Option – II)

## Social and Economic History of Haryana (From Harappan Age to 1966)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the transformation of Haryana from earliest times to 1966 in the context of society and economy. To understand developments of the post-formation of Haryana State and unique features of the social and economic history of the region.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the main features of the society and economy of Harappan and Saraswati Civilization in Haryana.
- Analysis Vedic Society, Economy and the composition of Vedic literature and Gita.
- Examine the social and economic trends under Feudalism in Haryana.
- Describes the social and economic impacts of Islamic invasions on Haryana.
- Critically examine the Social and economic transformation under Delhi Sultanate
- Describe the main features of Society, economy and architecture under the Mughals in Haryana.
- Throw light on the social and economic impacts of East India Company on Haryana.
- Write an essay on the development of Modern Education in Haryana.
- Explain socio-cultural movements in Haryana.
- Discuss the socio-cultural trends of Gandhian Movements in Haryana.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

#### Unit – I

Harappan and Saraswati Civilization: Society and Economy Vedic Age: Composition of Religious Literature and Gita Vedic Age: Society and Economy Feudal Age in Haryana: Social and Economic Trends

#### Unit – II

Islamic Invasions: Social and Economic Impacts on Haryana Delhi Sultanate and Haryana: Social and Cultural Transformation Economic Trends of Haryana from 1206 to 1526 Mughals in Haryana: Society, Economy and Architecture

#### Unit – III

Social and Economic Change in Haryana during British Rule Growth of Modern Education in Haryana Socio-Cultural Movement: Arya Samaj and Sanatana Dharma Gandhian Movements in Haryana: Socio-Cultural Trends

#### Unit-IV

Maps (Haryana): Important Sites of Harappan Civilization Major Trade Centers during Mughal Period Major Centers of Uprising of 1857 Major Centres of Arya Samaj and Sanatana Dharma

#### **Suggested Readings:**

Ashraf, K. M.	<i>Life and Conditions of the People of Hindustan,</i> Delhi, 1965.
Basham, A. L.,	<i>The Wonder that was India</i> , Rupa Publications, Bombay, 1971.
Burton, Stein,	History of India, OUP, New Delhi, 1998.
	Vijaynagar, Cambridge University Press,
	Cambridge, 1989.
Chandra Bipan,	History of Modern India, Orient Blackman,
	Hyderabad, 2019, Reprint.
Chandra Satish	Medieval India From the Sultanate to the Mughals,
	Delhi 1997.
	History of Medieval India, Orient Blackman,
	Reprint Hyderabad, 2018
	Madhyakalin Bharat: Rajniti Samaj and Sanskirti,
	Delhi, 2007.
Chaurasia, R. S.	History of Modern India, Atlanic, New Delhi, 2002.
Habib, Irfan	The Agrarian System of Mughal India, 1526-1707,
	OUP, New Delhi, 1999.
Majumdar, R. C.	History and Culture of the Indian People, V Vols.,
	Bhartiya Vidhya Bhavan Series, Bombay, 1970, 1979, 1980.
Mittal, S. C.	Haryana: A Historical Perspective, Delhi, 1986.
Phadke, H. A.	Haryana: Ancient and Medieval, Delhi, 1986.
Phogat, S. R.	Inscriptions of Haryana, Kurukshetra, 1978.
Prakash, Buddha	Glimpses of Haryana, Kurukshetra University
	Press, Kurukshetra, 1967.

Rizvi, S. A. A.	A History of Sufism in India, Vol. I, Munshiram Manoharlal Delhi 1997
Satish Chandra	Medieval India From the Sultanate to the Mughals, Delhi 1997.
	<i>History of Medieval India</i> , Orient Blackman, Reprint Hyderabad, 2018
	Madhyakalin Bharat: Rajniti Samaj and Sanskirti, Delhi, 2007.
Sharma, Krishna	Bhakti and the Bhakti Movement: A New Perspective, Munshiram Manoharlal, Delhi, 1987.
Rai Gulshan	Formation of Haryana, Delhi, 1981.
Sharma, R. S.,	India's Ancient Past, OUP, New Delhi, 2007.
,	Looking for the Aryans, Orient Longman
	Publishers, Delhi, 1995.
	Aspects of Political Ideas and Institution in Ancient
	India, Motilal Banarsidas, New Delhi, 1991.
Singh Fauja, ed.,	History of Punjab, Punjabi University, Patiala, Sastri,
K. A. N	The Cholas, 2 Vols. University of Madras, 1974.
Singh Fauja, ed.,	History of Punjab, Punjabi University, Patiala,
Verma, Harish Chandra, ed.	Madhyakalin Bharat, Hindi Madhyam Karyanvay Nideshalaya, Delhi University, Delhi, 1993.
Verma, D. C.	Haryana, Delhi, 1972.
Yadav, K. C.	Haryana Itihas, 3 Vols. Macmillan, New Delhi, 1981.
	Haryana Itihas Evam Sanskriti, Vol. I, Manohar, New Delhi, 2003.
	Modern Haryana: History and Culture (1803- 1966), Manohar, New Delhi, 2001.

Tuble I. CO TO Maink for the course CO History D 201 (Option 11)												
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
CC	3	3	3	3	3	2	3	2	3	3	3	2
History-B												
201 (II).1												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-B												
201(II).2												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-B												
201 (II).3												
CC	3	3	3	3	2	3	3	3	3	3	3	3
History-B												
201 (II).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

Mapping Matrix of Course CC History- B 201(Option – II) Table I: CO-PO Matrix for the course CC History-B 201 (Option – II)

CO	PSO 1	PSO 2	PSO 3	PSO 4									
CC History-B	3	3	3	3									
201 (II).1													
CC History-B	3	3	3	3									
201 (II).2													
CC History-B	3	3	3	3									
2101 (II).3													
CC History-B	3	3	2	2									
201 (II).4													
Average	3	3	2.75	2.75									

Table II: CO-PSO Matrix for the course CC History-B 201 (Option – II)

# DEPARTMENT OF HISTORY KURUKSHETRA UNIVRSITY KURUKSHETRA

## B.A. (GENERAL), HISTORY (SEMESTER SYSTEM) UNDER THE CHOICE BASED CREDIT SYSTEM (CBCS) /LEARNING OUTCOMES CURRICULUM FRAMEWORK (LOCF) W.E.F. 2021-22

**Note:** There shall be two Optional Papers in each Semester  $1^{st}$ ,  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ . The Candidate shall take any one of the two Optional Papers in each Semester. The Candidate who may select Option-I in Semester-I will continue to select the Option-I in the Semester  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ . The Candidate who may select Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ .

B.	A.	. (	(G	ene	era	l) I	Hist	ory	- 1	Part	-II,	Sem	ester	: _	3rd
					C	our	se -	- C(	CH	Histo	ory	- C			

Subject	Paper No.	Nomenclature	Internal	Theory	Total	Time
Code	_		Assessment	Paper	Marks	
				Marks		
CC	301	Political History of	30	120	150	3
History	Option (I)	India (1206-1757)				Hrs.
C	_					
CC	301	Social and Economic	30	120	150	3
History	Option	History of India (1206-				Hrs.
С	(II)	1757)				
SEC-3	S1	Indian National	10	40	50	2
History	Option (I)	Movement (1885-1919)				Hrs.
С						
SEC-3	S2	Indian National	10	40	50	2
History	Option	Movement (1920-1947)				Hrs.
C	(II)					

LIST OF PAPERS

### Syllabus and Course Reading Under the Choice Based Credit System (CBCS)/ Learning Outcomes Curriculum Framework (LOCF)

## Subject Code : CC History-C Paper No. : 301 (Option – I)

## Political History of India (1206-1757)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of political history of India from 1206 to 1757. It intends to present and overview of political changes in historical context. A few introductory lectures on the emergence of Delhi Sultanate, establishment of Mughal Empire in sub-continent and resistance to the establishment of British Rule would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the expansion of Delhi Sultanate under Qutubuddin Aibek, Iltutmish, Balban, Alauddin Khilji and Muhammad Tughlaq.
- Analysis the main features of Administration and Iqta System under Delhi Sultanate.
- Throw light on the administration of Bahmani and Vijaynagar.
- Describes the establishment of Mughal Empire under Babur and Humayun.
- Describe the administrative reforms of Shershah Suri.
- Describe the relation of Mughals with Rajputs.
- Throw light on the Deccan Policy of Aurangzeb, Administration of Mughals with special reference to Land Revenue System.
- Write an essay on the Mansabdari and Jagirdari systems.
- Describe the emergence of regional powers in Maharashtra, Bengal and Punjab.
- Discuss the circumstances of the battles of Carnatika and establishment of British Rule in Bengal.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

#### Unit-I

Emergence of Delhi Sultanate: Qutubuddin Aibek, Iltutmish and Balban Consolidation of Delhi Sultanate: Alauddin Khilji and Muhammad Tughlaq State Under Delhi Sultanate: Administration and Iqta System Bahmani and Vijaynagar: Administration

#### Unit – II

Establishment of Mughal Rule: Babur and Humayun Shershah Suri and His Administration Akbar: Relation with Rajputs Aurangzeb: Deccan Policy Mughal Administration and Revenue System

#### Unit – III

Mughal Institutions: Mansabdari and Jagirdari Emergence of Regional Powers: Marathas, Bengal and Sikhs Rivalry between French and English in India: Wars of Carnatika Resistance to the Establishment of British Rule: Battle of Plessey

Unit – IV

Maps (India): Expansion of Tughlaq Empire Political Condition of India in 1526 Mughal Empire at the Death of Akbar (1605) Mughal Empire at the Death of Aurangzeb (1707)

#### **Suggested Readings:**

Aziz, A.	The Mansabdari System and the Mughal Army,
	Idarah-i-Adabiyat, New Delhi, 1954.
Chandra Bipan,	History of Modern India, Orient Blackman,
-	Hyderabad, 2019, Reprint.
Chandra Satish	Medieval India From the Sultanate to the Mughals,
	Delhi 1997.
	History of Medieval India, Orient Blackman,
	Reprint Hyderabad, 2018
	Madhyakalin Bharat: Rajniti Samaj and Sanskirti,
	Delhi, 2007.
Chaurasia, R. S.	History of Modern India, Atlanic, New Delhi, 2002.
Habib, Irfan	The Agrarian System of Mughal India, 1526-1707,
	OUP, New Delhi, 1999.
Habibillah, A. B. M.	The Foundation of Muslim Rule in India, Central
	Book Depot, Allahabad, 1967.

Grover, B. L. and Alka Mehta	Modern Indian History, S. Chand and Company, New Delhi, 2018.
Majumdar, R. C., J. N. Chaudhri,	
and S Chaudhari	The Mughal Empire, Vol. 7, Bharti Vidhya
	Bhawan, Bombay, 1960.
Moreland, W. H.	The Agrarian System of Moslem India, Central
	Books, Allahabad, 1920.
Prasad, Beni	History of Jahangir, OUP, London, 1922.
Prasad,Ishwari,	The Life and Times of Humayun, Orient Longman,
	Calcutta, 1955.
Raychaudhary, Tapan & Irfan Habib,	, The Cambridge Economic History of India, Vol. I,
	Orient Longman, Hyderabad, 1984.
Richards, J. F.	The Mughal Empire, Foundation Books, New
	Delhi, 1993.
Sarkar, J. N.	History of Aurangzeb, 5 Vols. J. Sarkar & Sons,
	Calcutta, 1912-14.
Sastri, K. A. Nilakanta	A History of South India, OUP, New Delhi, 1976.
Srivastava, A. L.	Akbar the Great, 2 Vols. Shil Lal Agarwal & Co.,
	Agra, 1962, 1967.
Tripathi, R. P.	<i>Rise and Fall of the Mughal Empire</i> , Central Book
	Depot., Allahabad, 1956.
Quereshi, I. H.	The Administration of the Mughal Empire, OUP,
	Karachi, 1866.

Mapping Matrix of Course CC History- C 301(Option – I) Table I: CO-PO Matrix for the course CC History-C 301 (Option – I)

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
CC	3	3	3	3	3	2	3	2	3	3	3	2
History-C												
301 (I).1												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-C												
301(I).2												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-C												
301 (I).3												
CC	3	3	3	3	2	3	3	3	3	3	3	3
History-C												
301 (I).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

СО	PSO 1	PSO 2	PSO 3	PSO 4
CC History-C	3	3	3	3
301 (I).1				
CC History-C	3	3	3	3
301 (I).2				
CC History-C	3	3	3	3
301 (I).3				
CC History-B	3	3	3	3
301 (I).4				
Average	3	3	3	3

Table II: CO-PSO Matrix for the course CC History-C 301 (Option – I)

### Subject Code : CC History-C Paper No. : 301 (Option –II)

## Social and Economic History of India (1206-1757)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of Social and Economic history of India from 1206 to 1757. It intends to present and overview of Socio-Economic changes in historical context. A few introductory lectures on the emergence of Ruling Class, Religious Class, Society, development of education and architecture under Delhi Sultanate, Bhakti and Sufi Movements, Mughal Society, Peasants and Artisans, development of education and architecture under Mughals and economy in the first-half of the eighteenth century would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the emergence of the Ruling Class, Religious Class and Society under Delhi Sultanate.
- Analysis the development of agriculture, industry, trade and commerce under Delhi Sultanate.
- Throw light on the growth of education and architecture under Delhi Sultanate.
- Describe the main teachings of Bhakti Movement and Sufi Movement.
- Describe the emergence of Ruling Class, Religious Class and condition of Peasants and Artisans under the Mughals.
- Throw light on the economy of the Mughals.
- Throw light on the Sufi Silsilas.
- Write an essay on the growth of education, literature and architecture under the Mughals.
- Write an essay on the economy in the first-half of the 18th century.
- Discuss the position of peasantry under regional powers.

- **Note:** 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

#### Unit – I

Delhi Sultanate: Ruling Class, Religious Class and Society Economy Under Delhi Sultanate: Agriculture, Industry, Trade and Commerce Education and Architecture during Delhi Sultanate Bhakti Movement and Sufi Movement

#### Unit – II

Mughal Society: Ruling Class, Religious Class, Peasants and Artisans Economy under the Mughals: Agriculture, Industry, Trade and Currency Religious Trends and Sufi Silsilas

#### Unit – III

Education, Literature and Architecture under the Mughals Economy in the First-Half of 18th Century: Handicraft Industry, Trade and Commerce and Village Community Peasantry under Regional Powers: Sikhs, Bengal and Marathas

Unit – IV

Maps (India)

Major Trading Centers under Delhi Sultanate Major Centers of Bhakti and Sufi Movements Centers of Mughal Monuments Major Trading Centers of French and English

Suggested Readings:	
Ashraf, K. M	Life and Conditions of the People of Hindustan,
	Munshiram Manoharlal, New Delhi, 1967.
Aziz, A.	The Mansabdari System and the Mughal Army,
	Idarah-i-Adabiyat, New Delhi, 1954.
Brown, Percy	Indian Architecture Islamic Period, CBS
-	Publication, Delhi, nd.

Chand Tara,	<i>Influence of Islam on Indian Culture</i> , Read Books, Delhi, 2006, Originally Published in 1936.
Chandra Bipan,	History of Modern India, Orient Blackman, Hyderabad, 2019, Reprint.
Chandra Satish	Medieval India From the Sultanate to the Mughals, Delhi 1997.
	History of Medieval India, Orient Blackman, Reprint Hyderabad, 2018
	Madhyakalin Bharat: Rajniti Samaj and Sanskirti, Delhi, 2007.
Chaurasia, R. S.	History of Modern India, Atlanic, New Delhi, 2002.
Habib, Irfan	<i>The Agrarian System of Mughal India, 1526-1707,</i> OUP, New Delhi, 1999.
Habibillah, A. B. M.	<i>The Foundation of Muslim Rule in India</i> , Central Book Depot, Allahabad, 1967.
Grover, B. L. and Alka Mehta	<i>Modern Indian History</i> , S. Chand and Company, New Delhi, 2018.
Majumdar, R. C., J. N. Chaudhri,	
and S Chaudhari	<i>The Mughal Empire</i> , Vol. 7, Bharti Vidhya Bhawan, Bombay, 1960.
Mehra, Umashankar	Madhyakaleen Bhartiya Sabhyata Evam Sanskriti, Vinod Pustak Mandir, Agra, 1963.
Moreland, W. H.	<i>The Agrarian System of Moslem India</i> , Central Books, Allahabad, 1920.
Prasad. Beni	History of Jahangir, OUP, London, 1922.
Prasad, Ishwari,	<i>The Life and Times of Humayun</i> , Orient Longman, Calcutta, 1955.
Raychaudhary, Tapan & Irfan Habib	, <i>The Cambridge Economic History of India</i> , Vol. I, Orient Longman, Hyderabad, 1984.
Richards, J. F.	<i>The Mughal Empire</i> , Foundation Books, New Delhi, 1993.
Sarkar, J. N.	<i>History of Aurangzeb</i> , 5 Vols. J. Sarkar & Sons, Calcutta, 1912-14.
Sastri, K. A. Nilakanta	A History of South India, OUP, New Delhi, 1976.
Srivastava A L	Akbar the Great, 2 Vols, Shil Lal Agarwal & Co.
	Agra 1962 1967
Tripathi, R. P.	Rise and Fall of the Mughal Empire, Central Book
Quereshi, I. H.	<i>The Administration of the Mughal Empire</i> , OUP, Karachi 1866
Watt, Sir George,	Indian Art at Delhi, Motilal Banarsidass, New Delhi, 1987.

		. CO-f	U Mai		the cou			Ty-C 3	$\mathbf{O}$	-1	()	
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
CC	3	3	3	3	3	2	3	2	3	3	3	2
History-C												
301 (II).1												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-C												
301(II).2												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-C												
301 (II).3												
CC	3	3	3	3	2	3	3	3	3	3	3	3
History-C												
301 (II).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

Mapping Matrix of Course CC History- C 301(Option – II) Table I: CO-PO Matrix for the course CC History-C 301 (Option – II)

Table II: CO-PSO Matrix for the course CC History-C 301 (Option – II)

СО	PSO 1	PSO 2	PSO 3	PSO 4
CC History-C	3	3	3	3
301 (II).1				
CC History-C	3	3	3	3
301 (II).2				
CC History-C	3	3	3	3
301 (II).3				
CC History-B	3	3	2	2
301 (II).4				
Average	3	3	2.75	2.75

## Subject Code : SEC-3 History-C Paper No. : S1 (Option-I)

## Indian National Movement (1885-1919)

Marks: 40 Internal Assessment: 10 Time Allowed: 2 Hours Credit : 02

**Programme Specific Outcomes:** To introduce the students to the major elements of Indian National Movement (1885-1919). It intends to present and overview of political changes in historical context. A few introductory lectures on the emergence and growth of National Consciousness, founding of Indian National Congress and its role in national movement, Swadeshi and Boycott movement, Home Rule Movement, formation of Muslim League, Rowlett Act and Jallianwala Massacre would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the emergence and growth of national consciousness among the Indians.
- Analysis the circumstances of the formation of Indian National Congress.

- Throw light on the Ideology, Programmes of Moderates and Extremists.
- Describes the circumstances of the partition of Bengal and emergence of Swadeshi and Boycott Movement.
- Throw light on the Home Rule Movement.
- Describe growth of Revolutionary Movement during 1905 1919.
- Describe the circumstances of the formation of Muslim League and its role in communal politics during 1906 1919.
- Write an essay on Rowlett Satyagrah and Jallianwala massacre.
- Describe the main features of the Government of India Act of 1919.

**Note:** The question paper will consist of *Eight* questions. The candidate shall attempt *Four* questions in all selecting at least *one* from each unit. The paper will carry 50 marks out of which 10 marks will be earmarked for internal assessment. Each question will, therefore, carry 10 marks.

#### Unit – I

Origin and Growth of National Consciousness Founding of Indian National Congress Moderates: Ideology, Programmes and Politics Unit – II

Partition of Bengal and Emergence of Extremists Boycott and Swadeshi Movement Home Rule Movement

Unit – III

Growth of Revolutionary Nationalism (1905-1919) Formation of Muslim League

Lucknow Pact

### Unit IV

The Rowlett Satyagrah	
Jallianwala Massacre	
The Montagu-Chelmsford Reforms:	The Government of India Act, 1919
Suggested Readings:	
Chand, Tara	History of Freedom Movement, New Delhi, 1965.
Chandra Bipan,	History of Modern India, Orient Blackman,
	Hyderabad, 2019, Reprint.
	Adhanuk Bharat Ka Itihas, Delhi, 2009.
Chaurasia, R. S.	History of Modern India, Atlanic, New Delhi, 2002.
Desai, A. R.	Social Background of Indian Nationalism, Popular
	Book Depot., Bombay, 1959.
Dutt, R. C.	Economic History of India, 2 Vols. London, 1901,
	1903.
Fisher, Michael (ed.),	The Politics of the British Annexation of India,
	1757-1857, New Delhi, 1999.
Gopal, S.	British Policy in India, 1858-1905, Cambridge

University Press, Cambridge, 1965.

Grover, B. L. and Alka Mehta
Habibillah, A. B. M.
Habibillah, A. B. M.
Modern Indian History, S. Chand and Company, New Delhi, 2018.
The Foundation of Muslim Rule in India, Central Book Depot, Allahabad, 1967

Marshall, P. J.	The Eighteenth Century in Indian History, New Delhi, 2003.
Muir, R.	The Making of British India, 1756-1857, New Delhi, 1985.
Naoroji, Dadabhai	Poverty and Un-British Rule in India, London, 1901.
Pandey, Gyanendra,	The Construction of Communalism in Colonial North India, New Delhi, 1990.
Parshad Gopal	<i>Indian National Movement</i> (in Hindi), Luxmi Publishing House, Rohtak, 2015.
Sarkar, Sumit,	Aadhunik Bharat, New Delhi, 2000.
Singh, Amarjit	Divided Punjab: Politics of the Muslim League and
	Jinnah and Punjab: Shamsul Hasan Collection and Other Documents, (ed.), New Delhi, 2007.
	Gandhi and Muslims of India: Selections from the Collected Works of Mahatma Gandhi, (ed), New Delhi 2015
	Partition of India: Rethinking, (ed), New Delhi, 2017.
Spear, P.	Oxford History of India, New Delhi, 1974.
Stein, Burton	A History of India, Sussex, 2010.
Sukla, R. L,	Aadhunik Bharat Ka Itihas, New Delhi, Delhi, 2003.

Mapping Matrix of Course History- SEC 3 SI(Option – I)	)
Table I: CO-PO Matrix for the course History-SEC-3 SI (Optic	on – I)

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
SEC-3	3	3	3	3	3	2	3	2	3	3	3	2
History-C												
SI (I).1												
SEC-3	3	3	3	3	2	2	3	2	3	3	3	2
History-C												
SI(I).2												
SEC-3	3	3	3	3	2	2	3	2	3	3	3	2
History-C												
SI (I).3												
SEC	3	3	3	3	2	3	3	3	3	3	3	3
History-C												
SI (I).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

СО	PSO 1	PSO 2	PSO 3	PSO 4
SEC History-C	3	3	3	3
SI (I).1				
SEC History-C	3	3	3	3
SI (I).2				
SEC History-C	3	3	3	3
SI (I).3				
SEC History-C	3	3	2	2
SI (I).4				
Average	3	3	2.75	2.75

Table II: CO-PSO Matrix for the course SEC History-C -SI (Option – I)

#### Subject Code : SEC-3 History-C Paper No. : S2 (Option-II)

### **Indian National Movement (1920-1947)**

Marks: 40 Internal Assessment: 10 Time Allowed: 2 Hours Credit : 02

**Programme Specific Outcomes:** To introduce the students to the major elements of Indian National Movement (1920-1947). It intends to present and overview of political changes in historical context. A few introductory lectures on the emergence of Mahatma Gandhi, Gandhian movements, Bhagat Singh and HSRA, Round Table Conferences, Poona Pact, Shubhash Chandra Bose and INA, Communal Politics and Partition of India would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the emergence of Mahatma Gandhi in Indian politics.
- Analysis the circumstances and expansion of Non-Cooperation Movement.
- Throw light on the ideology, programmes of Moderates and Extremists.
- Describe the role of Bhagat Singh and HSRA in national movement.
- Throw light on Round Table Conferences and Poona Pact.
- Describe the causes and growth of Civil Disobedience Movement.
- Describe the circumstances and expansion of Government of India Act of 1935
- Write an essay on Subhash Chandra Bose and INA in National Movement.
- Critically examine the growth of communal politics and role of Muslim League in the Partition of India.
- **Note:** The question paper will consist of *Eight* questions. The candidate shall attempt *Four* questions in all selecting at least *one* from each unit. The paper will carry 50 marks out of which 10 marks will be earmarked for internal assessment. Each question will, therefore, carry 10 marks.

	Unit – I
Emergence of Mahatma Gandhi Non-Cooperation Movement Bhagat Singh and H.S.R.A	
	Unit – II
Round Table Conferences Poona Pact Civil Disobedience Movement	
	Unit – III
Government of India Act of 1935 Quit India Movement Subhash Chandra Bose and INA	
Communal Politics	Unit - IV
Cabinet Mission Plan Partition and Independence	
Suggested Readings:	
Chand, Tara Chandra Bipan,	History of Freedom Movement, New Delhi, 1965. History of Modern India, Orient Blackman,
	Hyderabad, 2019, Reprint. Adhanuk Bharat Ka Itihas, Delhi, 2009.
Chaurasia, R. S.	History of Modern India, Atlanic, New Delhi, 2002.
Desai, A. R.	Social Background of Indian Nationalism, Popular Book Depot., Bombay, 1959.
Dutt, R. C.	<i>Economic History of India</i> , 2 Vols. London, 1901, 1903.
Fisher, Michael (ed.),	<i>The Politics of the British Annexation of India, 1757-1857</i> , New Delhi, 1999.
Gopal, S.	<i>British Policy in India, 1858-1905</i> , Cambridge University Press, Cambridge, 1965.
Grover, B. L. and Alka Mehta	<i>Modern Indian History</i> , S. Chand and Company, New Delhi, 2018.
Habibillah, A. B. M.	<i>The Foundation of Muslim Rule in India</i> , Central Book Depot, Allahabad, 1967
Marshall, P. J.	<i>The Eighteenth Century in Indian History</i> , New Delhi, 2003.
Muir, R.	The Making of British India, 1756-1857, New Delhi, 1985.
Naoroji, Dadabhai	Poverty and Un-British Rule in India, London, 1901.
Pandey, Gyanendra,	The Construction of Communalism in Colonial North India, New Delhi, 1990
Parshad, Gopal	<i>Indian National Movement</i> (in Hindi), Luxmi Publishing House, Rohtak, 2015
Sarkar, Sumit,	Aadhunik Bharat, New Delhi, 2000.
Singh, Amarjit	Divided Punjab: Politics of the Muslim League and Partition, 1935-1947, New Delhi, 2001.

	Jinnah and Punjab: Shamsul Hasan Collection and
	Other Documents, (ed.), New Delhi, 2007.
	Gandhi and Muslims of India: Selections from the
	Collected Works of Mahatma Gandhi, (ed), New
	Delhi, 2015.
	Partition of India: Rethinking, (ed), New Delhi,
	2017.
Spear, P.	Oxford History of India, New Delhi, 1974.
Stein, Burton	A History of India, Sussex, 2010.
Sukla, R. L,	Aadhunik Bharat Ka Itihas, New Delhi, Delhi,
	2003.

Mapping Matrix of Course History- SEC 3 S2(Option – II) Table I: CO-PO Matrix for the course History-SEC-3 S2 (Option – II)

C	DO1	DOO	DO2	DO4	DOF	DOC	D07	DOO	DOO		$\frac{1}{DO11}$	DO12
Course	POI	PO2	PO3	PO4	PO5	PO6	PO/	PO8	PO9	POIO	POIT	PO12
Outcomes												
SEC-3	3	3	3	3	3	2	3	2	3	3	3	2
History-C												
S2 (II).1												
SEC-3	3	3	3	3	2	2	3	2	3	3	3	2
History-C												
S2(II).2												
SEC-3	3	3	3	3	2	2	3	2	3	3	3	2
History-C												
S2 (II).3												
SEC	3	3	3	3	2	3	3	3	3	3	3	3
History-C												
S2 (II).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

Table II: CO-PSO Matrix for the course SEC History-C -SI (Option – II)

СО	PSO 1	PSO 2	PSO 3	PSO 4
SEC History-C	3	3	3	2
S2 (II).1				
SEC History-C	3	3	3	2
S2 (II).2				
SEC History-C	3	3	3	2
S2 (II).3				
SEC History-C	3	3	2	2
S2 (II).4				
Average	3	3	2.75	2

## DEPARTMENT OF HISTORY KURUKSHETRA UNIVRSITY KURUKSHETRA

## B.A. (GENERAL), HISTORY (SEMESTER SYSTEM) UNDER THE CHOICE BASED CREDIT SYSTEM (CBCS) /LEARNING OUTCOMES CURRICULUM FRAMEWORK (LOCF) (W.E.F. 2021-22)

**Note:** There shall be two Optional Papers in each Semester  $1^{st}$ ,  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ . The Candidate shall take any one of the two Optional Papers in each Semester. The Candidate who may select Option-I in Semester-I will continue to select the Option-I in the Semester  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ . The Candidate who may select Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ .

#### B. A. (General) History – Part-II, Semester – 4th Course – CC History - D

		LIST OF FA	FERS			
Subject	Paper No.	Nomenclature	Internal	Theory	Total	Time
Code			Assessment	Paper	Marks	
				Marks		
CC	401	Modern India (1757-	30	120	150	3
History	Option-I	1947)				Hrs.
D						
CC	401	Social and Economic	30	120	150	3
History	Option-II	Transformation During				Hrs.
D		Colonial India (1757-				
		1947)				

## LIST OF PAPERS

Syllabus and Course Reading Under the Choice Based Credit System (CBCS)/ Learning Outcomes Curriculum Framework (LOCF)

### Subject Code : CC History-D Paper No. : 401 (Option – I)

#### Modern India (1757-1947)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of Modern India (1757-1947). It intends to present and overview of political changes in historical context. A few introductory lectures on the establishment of British Rule in India, resistance to the expansion of British Rule, Subsidiary Alliance and Doctrine of Lapse, Revolution of 1857, revolutionaries and national movement with special reference to Bhagat Singh, Gandhian Movements, communal politics and partition of India would be required to commence the paper.
**Course Outcomes:** After completing the course the students will be able to:

- Discuss the circumstances of the battle of Baxur and Aftermath.
- Describe resistance to the expansion of British Rule in Mysore, Maratha, and Nizam of Hyderabad.
- Throw light on the Subsidiary Alliance and Doctrine of Lapse.
- Describes the annexation of Punjab and Awadh in British Rule
- Throw light on the causes and expansion of the revolution of 1857.
- Describe the provisions of Government of India Act of 1858 and formation of Crown Rule in India.
- Critically analysis of the Indian Council Acts of 1909, 1919 and Indian Government Act of 1935.
- Describe the growth of Revolutionary Movement up to World War –I.
- Write an essay on Bhagat Singh in revolutionary movement.
- Describe the role of Mahatma Gandhi in national movement.
- Describe the growth of communal politics and partition of India.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

# Unit – I

Establishment of British Rule: Battle of Baxur and Aftermath Resistance to the Expansion of British Rule: Mysore, Maratha and Nizam of Hyderabad Subsidiary Alliance and Doctrine of Lapse British Rule and Indian States: Punjab and Awadh

# Unit – II

Revolution of 1857: Causes and Expansion Government of India Act of 1858 and the Rule of Crown British Rule and Princely States 1858-1905 Indian Council Acts 1909, 1919 and Indian Government Act of 1935

## Unit - III

Revolutionaries and Indian National Movement up to World War-I Revolutionary Movement with Special Reference to Bhagat Singh Mahatma Gandhi and Indian Nationalism: Non-cooperation, Civil Disobedience and Quit India Movement Subhash Chandra Bose and INA Communal Politics, Partition and Independence

Unit-IV

Maps (India):

Expansion of British Empire in 1856 Centers of the Revolution of 1857 Centers of Revolutionary Movement Centers of National Movement from 1920-1942

Bandopadhyaya, Shekhae	From Plassey to Partition: A History of Modern
	India, New Delhi,2004.
Chand, Tara	History of Freedom Movement, New Delhi, 1965.
Chandra Bipan,	History of Modern India, Orient Blackman,
	Hyderabad, 2019, Reprint.
	Adhanuk Bharat Ka Itihas, Delhi, 2009.
Chaurasia, R. S.	History of Modern India, Atlanic, New Delhi, 2002.
Desai, A. R.	Social Background of Indian Nationalism, Popular
	Book Depot., Bombay, 1959.
Dutt, R. C.	Economic History of India, 2 Vols. London, 1901,
	1903.
Fisher, Michael (ed.),	The Politics of the British Annexation of India,
	1757-1857, New Delhi, 1999.
Gopal, S.	British Policy in India, 1858-1905, Cambridge
<b>T</b> ,	University Press, Cambridge, 1965.
Grover, B. L. and Alka Mehta	Modern Indian History, S. Chand and Company.
,	New Delhi, 2018.
Habibillah, A. B. M.	The Foundation of Muslim Rule in India. Central
,	Book Depot, Allahabad, 1967
Marshall P. J.	The Eighteenth Century in Indian History New
	Delhi 2003
Muir. R.	The Making of British India, 1756-1857, New
	Delhi 1985
Naoroji, Dadabhaj	Poverty and Un-British Rule in India, London
	1901
Pandey Gyanendra	The Construction of Communalism in Colonial
Tundoy, Oyunonaru,	North India New Delhi 1990
Sarkar Sumit	Aadhunik Bharat New Delhi 2000
Singh Ameriit	Divided Punjab: Politics of the Muslim League and
Singh, Allarju	Partition 1035 1047 Now Dolbi 2001
	<i>Furmion</i> , 1933-1947, New Denn, 2001.

	Jinnah and Punjab: Shamsul Hasan Collection and
	Other Documents, (ed.), New Delhi, 2007.
	Gandhi and Muslims of India: Selections from the
	Collected Works of Mahatma Gandhi, (ed), New
	Delhi, 2015.
	Partition of India: Rethinking, (ed), New Delhi,
	2017.
Spear, P.	Oxford History of India, New Delhi, 1974.
Stein, Burton	A History of India, Sussex, 2010.
Sukla, R. L,	Aadhunik Bharat Ka Itihas, New Delhi, Delhi,
	2003.

Mapping Matrix of Course CC History- D 401(Option – I) Table I: CO-PO Matrix for the course CC History-D 401 (Option – I)

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
CC	3	3	3	3	3	2	3	2	3	3	3	2
History-D												
401 (I).1												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-D												
401(I).2												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-D												
401 (I).3												
CC	3	3	3	3	2	3	3	3	3	3	3	3
History-D												
401 (I).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

Table II: CO-PSO Matrix for the course CC History-D 401 (Option – I)

СО	PSO 1	PSO 2	PSO 3	PSO 4
CC History-D	3	3	3	2
401 (I).1				
CC History-D	3	3	3	2
401 (I). 2				
CC History-D	3	3	3	2
401 (I).3				
CC History-D	3	3	2	2
401 (I).4				
Average	3	3	2.75	2

# Subject Code : CC History-D Paper No. : 401 (Option – II)

# Social and Economic Transformation During Colonial India (1757-1947)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme specific Outcomes:** To introduce the students to the major elements of Social and Economic Transformation during Colonial India (1757-1947). It intends to present and overview of political changes in historical context. A few introductory lectures on the land revenue system under British Rule, decline of handicraft industry and disintegration of village community, drain of wealth, social change, social reforms movement, rise of modern education, rise of middle class, depressed class movement etc. would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the main features of land revenue system of the British.
- Describe the main causes of the decline of handicraft industry.
- Throw light on the disintegration of village community.
- Describes social reforms of Brahmo Samaj, Arya Samaj and Ram Krishan Mission.
- Throw light on the drain of wealth.
- Describe the rise and growth of modern industry in India with special reference to cotton, coal, iron and steel.
- Describe the development of modern education and its impacts.
- Describe the rise of middle class in India.
- Discuss the development of press and literature.
- Describe peasant's movement and labour class movement
- Discuss the role of Dr. B. R. Ambedkar in depressed class movement.
- Describe Position of women during Colonial Rule.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

## Unit – I

Land Revenue System under Colonial India: Permanent Settlement, Rayotwari Settlement and Mahalwari Settlement Decline of Handicraft Industry and Disintegration of Village Community Drain of Wealth

## Unit – II

Social Reforms Movement: Brahmo Samaj, Arya Samaj and Ram Krishan Mission Social Change: Evangelical and Utilitarian Development of Railways and its Impact Rise of Modern Industries: Cotton, Coal, Iron and Steel Development of Modern Education and its Impacts

## Unit – III

Rise of Middle Class Press and Literature Peasant's Movement and Labour Class Movement Dr. B. R. Ambedkar and Depressed Class Movement Changing Position of Women

## Unit IV

Maps (India):

Areas Related to the different Land Revenue Settlements Major Centers of Modern Industries Important Centers of Social Reform Movements Major Centers of Peasant Movements

Bayly, C. A.	Indian Society and the Making of British Empire,
	Cambridge, 1987.
Bhambri C. P.	The Janata Party: A Profile, New Delhi, 1980.
Chandra Bipan, Mirdula Mukherjee,	
and Aditiya Mukheree	Azadi Ke Baad Bharat, New Delhi, 2009.
Desai, A. R.	Peasant Struggle in India, Delhi, 1979.
Dutt, R. P.	India Today, Bombay 1949.
Dutt, V. P.	India and the World, New Delhi, 1990.
	India's Foreign Policy, New Delhi, 1984.
Gandhi, Rajmohan	Patel: A Life, Ahemdabad, 1990.
Gopal, S.	Jawaharlal Nehru – A Biography, Vol. 2 and 3,
	London and Delhi, 1979, 1984.
Kaul, Jolly Mohan	Problems of National Integration, New Delhi, 1963
Kothari, Rajni,	Politics in India, New Delhi 1947.
Kumaramangalam, S. Mohan,	India's Language Crisis, Madras, 1965.
Masani, Jarir	Indira Gandhi – A Biography, London, 1975.
Menon, V. P.	Integration of the Indian States, Madras 1985.

Omvedit, G.	Dalits and Democratic Revolution, New Delhi, 1994.
Potter, David,	<i>India's Political Administrators, 1918-1983,</i> Oxford, 1968.
Prasad, Bimal	Gandhi, Nehru and J. P.: Studies of Leadership, Delhi, 1985.
Raj, K. N.	Indian Economic Growth: Performance and Prospects, New Delhi, 1965.
Roy, Trithankar	<i>The Economic History of India</i> , 1857-1947, Delhi, 2000.
Singh, Amrik, ed.	Punjab in Indian Politics, Delhi, 1985.
Singh, B. B.	<i>Economic History of India, 1857-1956</i> , Bombay, 1965
Singh, Amarjit	Divided Punjab: Politics of the Muslim League and Partition, 1935-1947, New Delhi, 2001.
	Jinnah and Punjab: Shamsul Hasan Collection and Other Documents, (ed.), New Delhi, 2007.
	Gandhi and Muslims of India: Selections from the Collected Works of Mahatma Gandhi, (ed), New Delhi, 2015.
	Partition of India: Rethinking, (ed), New Delhi, 2017.
Shiv Rao, R,	<i>The Framing of India's Constitution: A Study</i> , New Delhi, 1968.
Singh, Yogendra	Social Change in India, New Delhi, 1993.
Tharur,Shashi	India From Midnight to the Millennium, New Delhi, 1997.

]	Table I	CO-P	O Mat	rix for	the cou	irse CC	C Histo	ry-D 4	01 (Op	tion – I	()	
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
CC	3	3	3	3	3	2	3	2	3	3	3	2
History-D												
401 (II).1												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-D												
401(II).2												
CC	3	3	3	3	2	2	3	2	3	3	3	2
History-D												
401 (II).3												
CC	3	3	3	3	2	3	3	3	3	3	3	3
History-D												
401 (II).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

# Mapping Matrix of Course CC History- D 401(Option – II) Table I: CO-PO Matrix for the course CC History-D 401 (Option –

СО	PSO 1	PSO 2	PSO 3	PSO 4
CC History-D	3	3	3	2
401 (II).1				
CC History-D	3	3	3	2
401 (II).2				
CC History-D	3	3	3	2
401 (II).3				
CC History-D	3	3	2	2
401 (II).4				
Average	3	3	2.75	2

Table II: CO-PSO Matrix for the course CC History-D 401 (Option – II)

# DEPARTMENT OF HISTORY KURUKSHETRA UNIVRSITY KURUKSHETRA

# B.A. (GENERAL), HISTORY (SEMESTER SYSTEM) UNDER THE CHOICE BASED CREDIT SYSTEM (CBCS) /LEARNING OUTCOMES CURRICULUM FRAMEWORK (LOCF) (W.E.F. 2022-23)

**Note:** There shall be two Optional Papers in each Semester  $1^{st}$ ,  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ . The Candidate shall take any one of the two Optional Papers in each Semester. The Candidate who may select Option-I in Semester-I will continue to select the Option-I in the Semester  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ . The Candidate who may select Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester-I will continue to select the Option-II in the Semester  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ .

		LIST OF PA	APERS			
Subject	Paper	Nomenclature	Internal	Theory	Total	Time
Code	No.		Assessment	Paper	Marks	
				Marks		
DSE	501	World History (From	30	120	150	3 Hrs.
History	Option-I	Ancient to 17 th Century)				
Α	-					
		OR				
DSE	502	Contemporary India: State	30	120	150	3 Hrs.
History	Option-I	and Politics (1947-1966)				
Α						

# **B. A. (General) History – Part-III, Semester – 5th** Course – DSE History - A

DSE History A	501 Option-II	World History: Social and Economic Trends (From Ancient to 17 th Century)	30	120	150	3 Hrs.
		OR				
DSE	502	Social and Economic	30	120	150	3 Hrs.
History	Option-II	History of Contemporary				
А		India				
		(1947 – 1966)				

# Syllabus and Course Reading Under the Choice Based Credit System (CBCS)/ Learning Outcomes Curriculum Framework (LOCF)

# Subject Code : DSE History-A Paper No. : 501 (Option – I)

# World History (From Ancient to 17th Century)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of World History (From Ancient to 17th Century). It intends to present and overview of political, Social and Economic changes in historical context. A few introductory lectures on Ancient Civilizations Mesopotamia, Egypt, Greek and Rome, Feudalism in Europe, Medieval State and Church, Hazrat Mohammad and Politics of Islam, Islamic State, Ottoman Empire, Early Colonial Activities, Glorious Revolution etc. would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the main features of Mesopotamia Civilization.
- Describe social, economic and cultural life of the people of Egypt Civilization.
- Explain the main features of Greek Civilization.
- Describe the political, social, economic and religious life of the people of Roman Civilization.
- Throw light on Feudalism in Europe.
- Critically examine the relation between State and Church.
- Describe early life and teachings of Hazrat Mohammad.
- Describe the evolution of Islam under Umayyads and Abbasids.
- Discuss the origin and expansion of Ottoman Empire.
- Describe the early colonial activities of Spain, Portugal and French.
- Write an essay on the main causes and results of Glorious Revolution.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be

earmarked for internal assessment. Each question will, therefore, carry 24 marks.

- 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
- 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

# Unit – I

Mesopotamia Civilization Egypt Civilization Ancient Greek Ancient Rome

Unit – II

Feudalism in Europe Medieval State and Church Hazrat Mohammad and Politics of Islam Islamic State: The Umayyads and Abbasids

## Unit – III

Ottoman Empire: Origin, Expansion and Consolidation Decline of Feudalism: Causes Early Colonial Activities: Spain, Portugal and French Glorious Revolution: Origin and Results

### Unit-IV

Maps (World and Europe)

Extent and Important Places of Egypt Civilization Extent and Important Places of Roman Civilization Extent of Arab Empire up to 1258 Extent and Important Places of Ottoman Empire up to 17th Century

Adams, R. M.	<i>The Evolution of Urban Society</i> , London, 1966.
Alfody, G.	The Social History of Rome, London 1988.
Andrewes, A.	The Greek Society, London 1971.
Finley, M. I.	Ancient Slavery and Modern Ideology, London,
	1980.
Garnsey, P.D.A and Whittaker, C. R.	Imperialism in Ancient World, Cambridge, 1978.
Garnsey, P.D.A and Saller, R	The Roman Empire: Economy, Society and Culture,
	London, 1987.
Hansen, M. H.	The Athenian Democracy, Oxford, 1991
Hasebroeck, J.	Trade and Politics in Ancient Greece, New York,
	1965.
Hitti, P. K	History of the Arabs,

Hodgson, M.G.S.	The Venture of Islam
Jones, A.H.M.	The Roman Economy, Oxford, 1974.
Lee, R. B. and I de Vore	Man The Hunter, Chicago, 1968.
Parshad, Gopal	Pracheen Evam Madhyakaleen Vishva, Luxmin
	Publishing House, Rohtak, 2015.
Panday, Vonod Chandra and Singh,	K. Vishva Ki Pracheen Sabhyatayen, Lucknow, nd.
Panday, V. K.	Pracheen Vishva Ki Sabhyatayan, Allahabad, 2011.
Postage, J. N,	Early Mesopotamia, New York, 1992.
Reed, C.	Origins of Agriculture, The Hague, 1977.
Sahlins, M.	Stone Age Economics, London, 1974.
Sahu, Kishori Prasad	Islam: Udhbhav aur Vikas, Patna, 2008, reprint.
Simith, B. D.	The Emergence of Agriculture, New York, 1995.
Sunil Madhav,	Vishva Ki Pracheen Sabhyatao ka Itihas, Patna,
	2000, Reprint.
Thomas, P. K.	Understanding the Neolithic, New York, 1999.

Mapping Matrix of Course DSE History- A 501(Option –I) Table I: CO-PO Matrix for the course DSE History-A 501 (Option –I)

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
DSE	3	3	3	3	3	2	3	2	3	3	3	2
History-A												
501 (I).1												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
501(I).2												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
501 (I).3												
DSE	3	3	3	3	2	3	3	3	3	3	3	3
History-A												
501 (I).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

# Table II: CO-PSO Matrix for the course DSE History-A 501 (Option –I)

СО	PSO 1	PSO 2	PSO 3	PSO 4
DSE	3	3	3	3
History-A 501				
(I).1				
DSE	3	3	3	3
History-A 501				
(I).2				
DSE	3	3	3	3
History-A 501				
(I).3				
DSE	3	3	3	2
History-A 501				
(I).4				
Average	3	3	3	2.75

# Subject Code : DSE History-A Paper No. : 502 (Option – I)

# **Contemporary India: State and Politics (1947-1966)**

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of Contemporary India: State and Politics. It intends to present and overview of State and Politics in historical context. A few introductory lectures on Partition of India and rehabilitation, Making of Indian Constitution, problem of Kashmir, Foreign Policy, Indo-Pak relation, India's relation with USA and USSR, reorganization of states, nature of political parties, electoral politics etc. would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the circumstances of Partition and Rehabilitation.
- Describe main features of Indian Constitution.
- Explain problem of Kashmir.
- Describe the integration of Princely States.
- Throw light on foreign policy of India up to 1966.
- Describe the role of India in Non-Alignment Movement.
- Critically examine Indo-Pak Relation.
- Discuss Sino-India Relation.
- Describe foreign policy of India with special reference to India's relation with USA and USSR.
- Throw light on reorganization of States since 1950.
- Describe the nature of Centre-State relations.
- Write an essay on nature of political parties and electoral politics.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

## Unit-I

Partition and Rehabilitation Making of Indian Constitution and its Characteristics Problem of Kashmir Integration of Princely States

# Unit II

Foreign Policy up to 1966: India and Non- Alignment Movement Indo-Pak Relation Sino-India Relation India's Relation With USA and USSR

## Unit III

Reorganization of States Since 1950 Nature of Centre – State Relation Nature of Political Parties Electoral Politics at National Level

#### Unit IV

Maps (India) Partition and Rehabilitation Camps Integration of Princely States Countries of Non-Alignment Movement Reorganization of States Since 1950

Pouly C A	Indian Society and the Making of Pritich Empire
Bayly, C. A.	Cambridge 1987
Dhamhai C. D	The Lowertz Destrict A Destile New Delle: 1000
Bhambri C. P.	The Janata Party: A Profile, New Delm, 1980.
Chandra Bipan, Mirdula Mukherjee,	
and Aditiya Mukheree	Azadi Ke Baad Bharat, New Delhi, 2009.
Desai, A. R.	Peasant Struggle in India, Delhi, 1979.
Dutt, R. P.	India Today, Bombay 1949.
Dutt, V. P.	India and the World, New Delhi, 1990.
	India's Foreign Policy, New Delhi, 1984.
Gandhi, Rajmohan	Patel: A Life, Ahemdabad, 1990.
Gopal, S.	<i>Jawaharlal Nehru</i> – <i>A Biography</i> , Vol. 2 and 3,
	London and Delhi, 1979, 1984.
Guha Ram Chandra	Bharat: Gandhi Ke Baad, Penguin, New Delhi,
	2006.
Kaul, Jolly Mohan	Problems of National Integration, New Delhi, 1963
Kothari, Rajni,	Politics in India, New Delhi 1947.
Kumaramangalam, S. Mohan,	India's Language Crisis, Madras, 1965.
Masani, Jarir	Indira Gandhi – A Biography, London, 1975.
Menon, V. P.	Integration of the Indian States, Madras 1985.
Omvedit, G.	Dalits and Democratic Revolution, New Delhi,
	1994.
Potter, David,	India's Political Administrators, 1918-1983,
	Oxford, 1968.

Prasad, Bimal	Gandhi, Nehru and J. P.: Studies of Leadership,
Parshad, Gopal	Value-Based Politics of BJP, Sanjay Prakashan, New Delhi, 2020.
Raj, K. N.	Indian Economic Growth: Performance and Prospects, New Delhi, 1965.
Roy, Trithankar	<i>The Economic History of India</i> , 1857-1947, Delhi, 2000.
Singh, Amrik, ed.	Punjab in Indian Politics, Delhi, 1985.
Singh, B. B.	<i>Economic History of India</i> , 1857-1956, Bombay, 1965
Singh, Amarjit	Divided Punjab: Politics of the Muslim League and Partition, 1935-1947, New Delhi, 2001.
	Jinnah and Punjab: Shamsul Hasan Collection and Other Documents, (ed.), New Delhi, 2007.
	Gandhi and Muslims of India: Selections from the Collected Works of Mahatma Gandhi, (ed), New Delhi 2015
	<i>Partition of India: Rethinking</i> , (ed), New Delhi, 2017.
Shiv Rao, R,	<i>The Framing of India's Constitution: A Study</i> , New Delhi, 1968.
Singh, Yogendra	Social Change in India, New Delhi, 1993.
Tharur, Shashi	India From Midnight to the Millennium, New Delhi, 1997.

Table I: CO-PO Matrix for the course DSE History-A 502 (Option –I)												
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
DSE	3	3	3	3	3	2	3	2	3	3	3	2
History-A												
502 (I).1												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
502(I).2												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
502 (I).3												
DSE	3	3	3	3	2	3	3	3	3	3	3	3
History-A												
502 (I).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

Mapping Matrix of Course	e DSE History- A 502(Option –I)
ble I [.] CO-PO Matrix for the c	course DSE History-A 502 (Option -

СО	PSO 1	PSO 2	PSO 3	PSO 4
DSE	3	3	3	3
History-A 502				
(I).1				
DSE	3	3	3	3
History-A 502				
(I).2				
DSE	3	3	3	3
History-A 502				
(I).3				
DSE	3	3	2	2
History-A 502				
(I).4				
Average	3	3	2.75	2.75

Table II: CO-PSO Matrix for the course DSE History-A 502 (Option –I)

# Subject Code : DSE History-A Paper No. : 501 (Option – II)

# World History: Social and Economic Trends (From Ancient to 17th Century)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of World History: Social and Economic Trends (From Ancient to 17th Century). It intends to present and overview of Social, Economic and religious changes in historical context. A few introductory lectures on Ancient Civilizations of Mesopotamia, Egypt, Greek and Rome, Feudalism in Europe, growth of trade and Commerce, Arabia before Islam, Hazrat Mohammad and Islam, Islamic Society, Economy and Literature, Transition from Feudalism to Capitalism, Renaissance and Reformation, Mercantile Revolution etc. would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the main features of Mesopotamia Civilization.
- Describe social, economic and cultural life of the people of Egypt Civilization.
- Explain the main features of Greek Civilization.
- Describe the political, social, economic and religious life of the people of Roman Civilization.
- Throw light on Feudalism in Europe with special reference to Manorial System.
- Describe the development of trade and commerce with special reference to the growth of towns.
- Describe early life and teachings of Hazrat Mohammad.
- Describe the evolution of Islam Society and Economy.
- Throw light on the transition of Feudalism to Capitalism.
- Describe the main causes and impacts of Renaissance and Reformation.
- Write an essay on Mercantile Revolution.

- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

# Unit – I

Mesopotamia Civilization: Economy, Society and Religion Egypt Civilization: Society, Religion, Art, Science and Technology Ancient Greek: Society, Economy and Decline Ancient Rome: Society, Economy and Religion

# Unit-II

Feudal Europe: Manorial System, Position of Peasants and Position of Artisans Trade, Commerce and Growth of Towns Arabia Before Islam: Society and Economy Hazrat Muhammad and the Rise of Islam Islamic World: Society, Economy, Literature, Art and Architecture

## Unit – III

Transition from Feudalism to Capitalism in Europe Renaissance: Origin, Nature and Impacts Reformation: Origin, Nature and Impacts Mercantile Revolution: Origin and Impacts

## Unit – IV

# Maps (World and Europe)

Extent and Important Places of Egypt Civilization Major Urban Centers in Medieval World Important Centers of Renaissance Important Mercantile Centers

## **Suggested Readings:**

Adams, R. M. Alfody, G. Andrewes, A. Finley, M. I. The Evolution of Urban Society, London, 1966. The Social History of Rome, London 1988. The Greek Society, London 1971. Ancient Slavery and Modern Ideology, London, 1980.

Garnsey, P.D.A and Whittaker, C. R.	Imperialism in Ancient World, Cambridge, 1978.
Garnsey, P.D.A and Saller, R	The Roman Empire: Economy, Society and Culture,
	London, 1987.
Hansen, M. H.	The Athenian Democracy, Oxford, 1991
Hasebroeck, J.	Trade and Politics in Ancient Greece, New York,
	1965.
Hitti, P. K	History of the Arabs,
Hodgson, M.G.S.	The Venture of Islam
Jones, A.H.M.	The Roman Economy, Oxford, 1974.
Lee, R. B. and I de Vore	Man The Hunter, Chicago, 1968.
Parshad, Gopal	Pracheen Evam Madhyakaleen Vishva, Luxmi
-	Publishing House, Rohtak, 2015.
Panday, Vonod Chandra and Singh, I	K. Vishva Ki Pracheen Sabhyatayen, Lucknow, nd.
Panday, V. K.	Pracheen Vishva Ki Sabhyatayan, Allahabad, 2011.
Postage, J. N,	Early Mesopotamia, New York, 1992.
Reed, C.	Origins of Agriculture, The Hague, 1977.
Sahlins, M.	Stone Age Economics, London, 1974.
Sahu, Kishori Prasad	Islam: Udhbhav aur Vikas, Patna, 2008, reprint.
Simith, B. D.	The Emergence of Agriculture, New York, 1995.
Sunil Madhav,	Vishva Ki Pracheen Sabhyatao ka Itihas, Patna,
	2000, Reprint.
Thomas, P. K.	Understanding the Neolithic, New York, 1999.

Mapping Matrix of Course DSE History- A 501(Option –II) Table I: CO-PO Matrix for the course DSE History-A 501 (Option –II)

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
DSE	3	3	3	3	3	2	3	2	3	3	3	2
History-A												
501 (II).1												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
501(II).2												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
501 (II).3												
DSE	3	3	3	3	2	3	3	3	3	3	3	3
History-A												
501 (II).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

СО	PSO 1	PSO 2	PSO 3	PSO 4
DSE	3	3	3	3
History-A 501				
(II).1				
DSE	3	3	3	3
History-A 501				
(II).2				
DSE	3	3	3	3
History-A 501				
(II).3				
DSE	3	3	3	3
History-A 501				
(II).4				
Average	3	3	3	3

Table II: CO-PSO Matrix for the course DSE History-A 501 (Option -II)

Subject Code : DSE History-A Paper No. : 502 (Option – II)

# Social and Economic History of Contemporary India (1947-1966)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of Social and Economic History of Contemporary India (1947-1966). It intends to present and overview of Social and Economic change in historical context. A few introductory lectures on Social and Economic consequences of Partition of India, social and economic bases of reorganization of Indian states, making of economic policy, five year plans, land reforms, social legislations, position of women etc. would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the social and economic consequences of Partition.
- Describe social and economic basis of reorganization of states.
- Explain social and economic basis of Kashmir Problem.
- Describe making of economic policies.
- Throw light on the five year plans with special reference to industrial and agrarian development.
- Write an essay on Social Legislations.
- Critically examine social and economic change in contemporary India.
- Throw light on the position of women.
- Describe the development of education.

- **Note:** 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

Partition of India: Social and economic Consequences Reorganization of States: Social and Economic Basis Social and Economic Basis of Kashmir Problem

Unit – II

Making of Economic Policy Five Year Plans and Industrial Development Five Year Plans and Agrarian Development Land Reforms and Abolition of Zamindari System

Unit – III

Social Legislations: Hindu Code Bill and its Correlate Acts Social and Economic Changes Position of Women Development of Education

## Unit - IV

Maps (India) Partition and Rehabilitation Camps Major Industrial Centers of Industrial Development Under Five Year Plans Areas of Land Reforms Centers of Higher Education

Bayly, C. A.	Indian Society and the Making of British Empire,
	Cambridge, 1987.
Bhambri C. P.	The Janata Party: A Profile, New Delhi, 1980.
Chandra Bipan, Mirdula Mukherjee,	
and Aditiya Mukheree	Azadi Ke Baad Bharat, New Delhi, 2009.
Desai, A. R.	Peasant Struggle in India, Delhi, 1979.
Dutt, R. P.	India Today, Bombay 1949.
Dutt, V. P.	India and the World, New Delhi, 1990.
	India's Foreign Policy, New Delhi, 1984.
Gandhi, Rajmohan	Patel: A Life, Ahemdabad, 1990.
Gopal, S.	<i>Jawaharlal Nehru</i> – <i>A Biography</i> , Vol. 2 and 3,
	London and Delhi, 1979, 1984.
Guha Ram Chandra	Bharat: Gandhi Ke Baad, Penguin, New Delhi,
	2006.
Kaul, Jolly Mohan	Problems of National Integration, New Delhi, 1963

Kothari, Rajni,	Politics in India, New Delhi 1947.
Kumaramangalam, S. Mohan,	India's Language Crisis, Madras, 1965.
Masani. Jarir	Indira Gandhi – A Biography, London, 1975.
Menon, V. P.	Integration of the Indian States, Madras 1985.
Omvedit, G.	Dalits and Democratic Revolution, New Delhi,
,	1994.
Potter, David.	India's Political Administrators. 1918-1983.
	Oxford, 1968.
Prasad, Bimal	Gandhi, Nehru and J. P.: Studies of Leadership,
,	Delhi, 1985.
Raj, K. N.	Indian Economic Growth: Performance and
<b>.</b>	Prospects, New Delhi, 1965.
Roy, Trithankar	The Economic History of India, 1857-1947, Delhi,
	2000.
Singh, Amrik, ed.	Punjab in Indian Politics, Delhi, 1985.
Singh, B. B.	Economic History of India, 1857-1956, Bombay,
-	1965
Singh, Amarjit	Divided Punjab: Politics of the Muslim League and
2 2	Partition, 1935-1947, New Delhi, 2001.
	Jinnah and Punjab: Shamsul Hasan Collection and
	Other Documents, (ed.), New Delhi, 2007.
	Gandhi and Muslims of India: Selections from the
	Collected Works of Mahatma Gandhi, (ed), New
	Delhi, 2015.
	Partition of India: Rethinking, (ed), New Delhi,
	2017.
Shiv Rao, R,	The Framing of India's Constitution: A Study, New
	Delhi, 1968.
Singh, Yogendra	Social Change in India, New Delhi, 1993.
Tharur,Shashi	India From Midnight to the Millennium, New
	Delhi,1997.

	1 able 1: CO-PO Matrix for the course DSE History-A 502 (Option – II)											
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
DSE	3	3	3	3	3	2	3	2	3	3	3	2
History-A												
502 (II).1												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
502(II).2												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-A												
502 (II).3												
DSE	3	3	3	3	2	3	3	3	3	3	3	3
History-A												
502 (II).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

Mapping Matrix of Course DSE History- A 502(Option –II) Table I: CO-PO Matrix for the course DSE History-A 502 (Option –II)

Tuote II		of the course Doll	1115tol j 11502 (opt	<i>,</i> 1011 11)
СО	PSO 1	PSO 2	PSO 3	PSO 4
DSE	3	3	3	3
History-A 502				
(II).1				
DSE	3	3	3	3
History-A 502				
(II).2				
DSE	3	3	3	3
History-A 502				
(II).3				
DSE	3	3	3	3
History-A 502				
(II).4				
Average	3	3	3	3

Table II: CO-PSO Matrix for the course DSE History-A 502 (Option –II)

# DEPARTMENT OF HISTORY KURUKSHETRA UNIVRSITY KURUKSHETRA B.A. (GENERAL), HISTORY (SEMESTER SYSTEM) UNDER THE CHOICE BASED CREDIT SYSTEM (CBCS) /LEARNING OUTCOMES CURRICULUM FRAMEWORK (LOCF) (W.E.F. 2022-23)

**Note:** There shall be two Optional Papers in each Semester  $1^{st}$ ,  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ . The Candidate shall take any one of the two Optional Papers in each Semester. The Candidate who may select Option-I in Semester-I will continue to select the Option-I in the Semester  $2^{nd}$ ,  $3^{rd}$ ,  $4^{th}$ ,  $5^{th}$  and  $6^{th}$ . The Candidate who may select Option-II in the Semester-I will continue to select the Option-II in the Semester-I will

		LIST OF PA	PERS			
Subject	Paper	Nomenclature	Internal	Theory	Total	Time
Code	No.		Assessment	Paper	Marks	
				Marks		
DSE	601	Modern World	30	120	150	3 Hrs.
History	Option-I					
В						
		OR				
DSE	602	Social and Economic	30	120	150	3 Hrs.
History	Option-I	History of Contemporary				
В		India				
		(1947 – 1966)				

## **B. A. (General) Part-III, History, Semester – 6th** Course – DSE History - B

DSE	601	Modern Europe (1789-	30	120	150	3 Hrs.
History	Option-II	1919)				
В						
		OR				
DSE	602	Contemporary India: State	30	120	150	3 Hrs.
History	Option-	and Politics				
В	II					

# Syllabus and Course Reading Under the Choice Based Credit System (CBCS)/ Learning Outcomes Curriculum Framework (LOCF)

# Subject Code : DSE History-B Paper No. : 601 (Option – I)

# **Modern World**

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of Modern World. It intends to present and overview of Political change in historical context. A few introductory lectures on Scientific Revolution, Agrarian Revolution, American Revolution, Industrial Revolution, French Revolution, Parliamentary Reforms, Imperialism, Formation of Triple alliance and Triple Entente, First World War, Bolshevik Revolution Nazism and Fascism, Second World War etc. would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Throw light on Scientific Revolution.
- Describe the causes, development and impacts of Agrarian Revolution.
- Explain the main causes and development of American war of independence.
- Describe the main causes, development and impacts of Industrial Revolution.
- Throw light on causes and consequences of French Revolution.
- Write an essay on Parliamentary Reforms in England.
- Critically examine imperialism in Africa.
- Throw light on the formation of Triple Alliance and Triple Entente.
- Describe the main causes and consequences of World War-I.
- Describe the main causes and consequences of Bolshevik Revolution in Russia.
- Write an essay on Nazism and Fascism.
- Describe the main causes and consequences of World War-II.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be

earmarked for internal assessment. Each question will, therefore, carry 24 marks.

- 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
- 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

# Unit – I

Scientific Revolution Agrarian Revolution American War of Independence Industrial Revolution French Revolution: Causes and Consequences

#### Unit – II

Parliamentary Reforms in England European Imperialism in Africa and its Partition Formation of Triple Alliance and Triple Entente First Word War: Causes and Consequences

## Unit – III

Treaty of Versailles and its Consequences Bolshevik Revolution in Russia: Causes and Consequences Nazism and Fascism: Nature and Consequences World War – II: Causes and Consequences

## Unit - IV

Maps (World and Europe)

- --

- -

Major Centers of Industrial Revolution Political Condition of Europe on the Eve of French Revolution in 1789 Partition of Africa Polarization of European Powers in Second World War

Suggested Readings:	
Barraclough, G	An Introduction to Contemporary History, London,
	1964.
Beasley, W. E	Japanese Imperialism, 1894-1945, Oxford, 1987.
Benns, F. L.	European History Since 1870, New York, 1955.
Brower, Daniel R	The World in the Twentieth Centry: From Empires
	to Nations, Delhi, 2002. Reprint.
Carr, E. H.	International Relations Between Two World Wars
	(1919-1939), London, 1965.
Dattar, Kiran	America Ka Itihas, New Delhi, 2012.
Despande Anirudh or Anay	Beesvi Shatabadi Me Itihas Ke Mudde, New
	Delhi, 2013.
Gupta Parthsarthi	Europe Ka Itihas, New Delhi, 2012
Hayes, C. J. H	Contemporary Europe Since 1870, New York,
	1965.
Langsam, W. C and O. C. Mitchell,	The World Since 1919, Reprint, New Delhi, 1997.

Mahajan Sreh	Bisvi Shatabdi Ka Visv Itihas: Ek Jhalak, New
, i i i i i i i i i i i i i i i i i i i	Delhi, 2015.
Phukan, Meenakshi,	Rise of the Modern West: Social and Economic
	History of Early Modern Europe, New Delhi, 1998.
Robert, J. M	Europe 1880-1945, Delhi, 1989.
Taylor, A. J. P.	The First World War: An Illustrated History, New
	Delhi, 2002.
Verma Lal Bahadur	Adhunik Itihas Ki Jhalak, Delhi, 2013.

# Mapping Matrix of Course DSE History- B 601(Option –I) Table I: CO-PO Matrix for the course DSE History-B 601 (Option –I)

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
DSE	3	3	3	3	3	2	3	2	3	3	3	2
History-B												
601 (I).1												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-B												
601(I).2												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-B												
601 (I).3												
DSE	3	3	3	3	2	3	3	3	3	3	3	3
History-B												
601 (I).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

# Table II: CO-PSO Matrix for the course DSE History-B 601 (Option –I)

СО	PSO 1	PSO 2	PSO 3	PSO 4
DSE	3	3	3	3
History-B				
601(I).1				
DSE	3	3	3	3
History-B				
601 (I).2				
DSE	3	3	3	3
History-B				
601 (I).3				
DSE	3	3	2	3
History-B				
601 (I).4				
Average	3	3	2.75	3

# Subject Code : DSE History-B Paper No. : 602 (Option – I)

# Social and Economic History of Contemporary India (1947-1966)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of Social and Economic History of Contemporary India (1947-1966). It intends to present and overview of Social and Economic change in historical context. A few introductory lectures on Social and Economic consequences of Partition of India, social and economic bases of reorganization of Indian states, making of economic policy, five year plans, land reforms, social legislations, position of women etc. would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the social and economic consequences of Partition.
- Describe social and economic basis of reorganization of states.
- Explain social and economic basis of Kashmir Problem.
- Describe making of economic policies.
- Throw light on the five year plans with special reference to industrial and agrarian development.
- Write an essay on Social Legislations.
- Critically examine social and economic change in contemporary India.
- Throw light on the position of women.
- Describe the development of education.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24

marks.

- 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
- 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

Unit - I

Partition of India: Social and economic Consequences Reorganization of States: Social and Economic Basis Social and Economic Basis of Kashmir Problem

Unit – II

Making of Economic Policy Five Years Plans and Industrial Development Five Year Plans and Agrarian Development Land Reforms and Abolition of Zamindari System Unit – III Social Legislations: Hindu Code Bill and its Correlate Acts Social and Economic Changes Position of Women Development of Education

Development of Education

## Unit – IV

Partition and Rehabilitation Camps Major Industrial Centers of Industrial Development Under Five Year Plans Areas of Land Reforms Centers of Higher Education

# **Suggested Readings:**

Maps (India)

Indian Society and the Making of British Empire, Bayly, C. A. Cambridge, 1987. Bhambri C. P. The Janata Party: A Profile, New Delhi, 1980. Chandra Bipan, Mirdula Mukherjee, and Aditiya Mukheree Azadi Ke Baad Bharat, New Delhi, 2009. Desai, A. R. Peasant Struggle in India, Delhi, 1979. Dutt, R. P. India Today, Bombay 1949. Dutt, V. P. India and the World, New Delhi, 1990. _____ India's Foreign Policy, New Delhi, 1984. Gandhi, Rajmohan Patel: A Life, Ahemdabad, 1990. Gopal, S. Jawaharlal Nehru – A Biography, Vol. 2 and 3, London and Delhi, 1979, 1984. Problems of National Integration, New Delhi, 1963 Kaul, Jolly Mohan Kothari, Rajni, Politics in India, New Delhi 1947. Kumaramangalam, S. Mohan, India's Language Crisis, Madras, 1965. Indira Gandhi – A Biography, London, 1975. Masani, Jarir Menon, V. P. Integration of the Indian States, Madras 1985. Omvedit, G. Dalits and Democratic Revolution, New Delhi, 1994. Potter, David, India's Political Administrators, 1918-1983, Oxford, 1968. Prasad, Bimal Gandhi, Nehru and J. P.: Studies of Leadership, Delhi, 1985. Raj, K. N. Indian Economic Growth: Performance and Prospects, New Delhi, 1965. The Economic History of India, 1857-1947, Delhi, Roy, Trithankar 2000. Singh, Amrik, ed. Punjab in Indian Politics, Delhi, 1985. Singh, B. B. Economic History of India, 1857-1956, Bombay, 1965 Singh, Amarjit Divided Punjab: Politics of the Muslim League and Partition, 1935-1947, New Delhi, 2001. Jinnah and Punjab: Shamsul Hasan Collection and _____ Other Documents, (ed.), New Delhi, 2007.

	Gandhi and Muslims of India: Selections from the
	Collected Works of Mahatma Gandhi, (ed), New
	Delhi, 2015.
	Partition of India: Rethinking, (ed), New Delhi,
	2017.
Shiv Rao, R,	The Framing of India's Constitution: A Study, New
	Delhi, 1968.
Singh, Yogendra	Social Change in India, New Delhi, 1993.
Tharur,Shashi	India From Midnight to the Millennium, New
	Delhi,1997.

	Table I: CO-PO Matrix for the course DSE History-B 602 (Option –I)											
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Outcomes												
DSE	3	3	3	3	3	2	3	2	3	3	3	2
History-B												
602 (I).1												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-B												
602(I).2												
DSE	3	3	3	3	2	2	3	2	3	3	3	2
History-B												
602 (I).3												
DSE	3	3	3	3	2	3	3	3	3	3	3	3
History-B												
602 (I).4												
Average	3	3	3	3	2.25	2.25	3	2.25	3	3	3	2.25

## Mapping Matrix of Course DSE History- B 602(Option –I) ole I: CO-PO Matrix for the course DSE History-B 602 (Option -

# Table II: CO-PSO Matrix for the course DSE History-B 602 (Option –I)

СО	PSO 1	PSO 2	PSO 3	PSO 4
DSE	3	3	3	3
History-B				
602(I).1				
DSE	3	3	3	3
History-B				
601 (I).2				
DSE	3	3	3	3
History-B				
602 (I).3				
DSE	3	3	2	3
History-B				
602 (I).4				
Average	3	3	2.75	3

# Subject Code : DSE History-B Paper No. : 601 (Option – II)

# Modern Europe (1789-1919)

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of Modern Europe (1789-1919). It intends to present and overview of Political change in historical context. A few introductory lectures on French Revolution, Napoleon Bonaparte, Congress of Vienna, Concert of Europe Metternich System, Unification of Italy and Germany, Foreign policy of Bismarck, Formation of Triple Entente, Partition of Africa, First World War, Bolshevik Revolution, Treaty of Versailles would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Throw light on causes and consequences of French Revolution.
- Describe the emergence and decline of Napoleon Bonaparte.
- Explain the main conditions and significance of Congress of Vienna.
- Describe the nature and impacts of the concert of Europe.
- Discuss the nature and growth of Metternich system
- Write an essay on unification of Italy and Germany.
- Critically examine foreign policy of Bismarck.
- Throw light on the formation of Triple Entente.
- Describe the circumstances of partition of Africa.
- Describe the main causes and consequences of World War-I.
- Describe the main causes and consequences of Bolshevik Revolution in Russia.
- Write an essay on the treaty of Versailles and its consequences.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24

marks.

- 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
- 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

Unit-I

French Revolution: Causes and Consequences Napoleon Bonaparte: Emergence and Decline Congress of Vienna: Conditions and Significance Concert of Europe: Nature and Impacts Metternich System: Nature and Growth Unification of Italy and Unification of Germany Bismarck: Foreign Policy and Formation of Triple Alliances Formation of Triple Entente

## Unit – III

European Imperialism in Africa and its Partition World War – I: Causes and Consequences Bolshevik Revolution in Russia: Causes and Consequences Treaty of Versailles and its Consequences

# Unit – IV

Maps (Europe)

Political Condition of Europe on the Eve of French Revolution in 1789 Unification of Italy Unification of Germany Polarization of European Powers in World War – I

Barraclough, G	<i>An Introduction to Contemporary History</i> , London, 1964.
Beasley, W. E	Japanese Imperialism, 1894-1945, Oxford, 1987.
Benns, F. L.	European History Since 1870, New York, 1955.
Brower, Daniel R	The World in the Twentieth Centry: From Empires
	to Nations, Delhi, 2002. Reprint.
Carr, E. H.	International Relations Between Two World Wars
	(1919-1939), London, 1965.
Dattar, Kiran	America Ka Itihas, New Delhi, 2012.
Despande Anirudh aur Anay	Beesvi Shatabadi Me Itihas Ke Mudde, New
	Delhi, 2013.
Gupta Parthsarthi	Europe Ka Itihas, New Delhi, 2012
Hayes, C. J. H	Contemporary Europe Since 1870, New York,
	1965.
Langsam, W. C and O. C. Mitchell,	The World Since 1919, Reprint, New Delhi, 1997.
Mahajan Sreh	Bisvi Shatabdi Ka Visv Itihas: Ek Jhalak, New
	Delhi, 2015.
Phukan, Meenakshi,	Rise of the Modern West: Social and Economic
	History of Early Modern Europe, New Delhi, 1998.
Robert, J. M	Europe 1880-1945, Delhi, 1989.
Taylor, A. J. P.	The First World War: An Illustrated History, New
	Delhi, 2002.
Verma Lal Bahadur	Adhunik Itihas Ki Jhalak, Delhi, 2013.

PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 Course Outcomes 3 DSE 3 3 3 3 2 3 2 3 3 3 2 History-B 601 (II).1 DSE 3 3 3 3 2 2 3 2 3 3 3 2 History-B 601(II).2 DSE 3 3 3 3 2 2 3 2 3 3 3 2 History-B 601 (II).3 3 3 3 3 2 3 3 3 3 DSE 3 3 3 History-B 601 (II).4 3 3 3 3 2.25 2.25 3 2.25 3 3 3 2.25 Average

Mapping Matrix of Course DSE History- B 601(Option –II) Table I: CO-PO Matrix for the course DSE History-B 601 (Option –II)

Table II: CO-PSO Matrix for the course DSE History-B 601 (Option -II)

CO	PSO 1	PSO 2	PSO 3	PSO 4	
DSE	3	3	3	3	
History-B					
601(II).1					
DSE	3	3	3	3	
History-B					
601 (II).2					
DSE	3	3	3	3	
History-B					
601 (II).3					
DSE	3	3	2	3	
History-B					
601 (II).4					
Average	3	3	2.75	3	

Subject Code : DSE History-B Paper No. : 602 (Option – II)

# **Contemporary India: State and Politics**

Marks: 120 Internal Assessment: 30 Time Allowed: 3 Hours Credit : 06

**Programme Specific Outcomes:** To introduce the students to the major elements of Contemporary India: State and Politics. It intends to present and overview of State and Politics in historical context. A few introductory lectures on Partition of India and rehabilitation, Making of Indian Constitution, problem of Kashmir, Foreign Policy, Indo-Pak relation, India's relation with USA and USSR, reorganization of states, nature of political parties, electoral politics etc. would be required to commence the paper.

**Course Outcomes:** After completing the course the students will be able to:

- Discuss the circumstances of Partition and Rehabilitation.
- Describe main features of Indian Constitution.
- Explain problem of Kashmir.
- Describe the integration of princely states.
- Throw light on foreign policy of India up to 1966.
- Describe the role of India in Non-Alignment Movement.
- Critically examine Indo-Pak Relations.
- Discuss Sino-India Relation.
- Describe foreign policy of India with special reference to India's relation with USA and USSR.
- Throw light on reorganization of States since 1950.
- Describe the nature of Centre-State relations.
- Write an essay on nature of political parties and electoral politics.
- Note: 1. The question paper will consist of *nine* questions. The candidate shall attempt five questions in all. The Question No. 1 will be *compulsory*. The Candidate shall attempt *four* more questions selecting at least *one* from each unit. The paper will carry 150 marks out of which 30 marks will be earmarked for internal assessment. Each question will, therefore, carry 24 marks.
  - 2. The **Compulsory Question No. 1** will be multiple choice type consisting *eight* questions of equal marks (i.e. 3 marks each) spread over the whole syllabus.
  - 3. The Map Question will be carrying 24 marks (14 for map work and 10 for explanatory note). For visually disabled candidates, the part relating to the explanatory note will carry full marks.

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	Unit – I	
Partition and Rehabilitation		
Making of Indian Constitution and its Characteristics		
Problem of Kashmir		
Integration of Princely States		
c ,	Unit II	
Foreign Policy up to 1966:		
India and Non- Alignment Movement		
Indo-Pak Relation		
Sino-India Relation		
India's Relation with USA and USSR		
	Unit III	
Reorganization of States Since 1950		
Nature of Centre – State Relation		
Nature of Political Parties		
Electoral Politics at National Level		
	Unit IV	
Maps (India)		
Partition and Rehabilitation Camps		

Integration of Princely States Countries of Non-Alignment Movement Reorganization of States Since 1950

Bayly, C. A.	Indian Society and the Making of British Empire,
	Cambridge, 1987.
Bhambri C. P.	The Janata Party: A Profile, New Delhi, 1980.
Chandra Bipan, Mirdula Mukherjee,	
and Aditiya Mukheree	Azadi Ke Baad Bharat, New Delhi, 2009.
Desai, A. R.	Peasant Struggle in India, Delhi, 1979.
Dutt, R. P.	India Today, Bombay 1949.
Dutt, V. P.	India and the World, New Delhi, 1990.
	India's Foreign Policy, New Delhi, 1984.
Gandhi, Rajmohan	Patel: A Life, Ahemdabad, 1990.
Gopal, S.	Jawaharlal Nehru – A Biography, Vol. 2 and 3,
	London and Delhi, 1979, 1984.
Kaul, Jolly Mohan	Problems of National Integration, New Delhi, 1963
Kothari, Rajni,	Politics in India, New Delhi 1947.
Kumaramangalam, S. Mohan,	India's Language Crisis, Madras, 1965.
Masani, Jarir	Indira Gandhi – A Biography, London, 1975.
Menon, V. P.	Integration of the Indian States, Madras 1985.
Omvedit, G.	Dalits and Democratic Revolution, New Delhi,
	1994.
Potter, David,	India's Political Administrators, 1918-1983,
	Oxford, 1968.
Prasad, Bimal	Gandhi, Nehru and J. P.: Studies of Leadership,
	Delhi, 1985.
Raj, K. N.	Indian Economic Growth: Performance and
	Prospects, New Delhi, 1965.
Roy, Trithankar	The Economic History of India, 1857-1947, Delhi,
	2000.
Singh, Amrik, ed.	Punjab in Indian Politics, Delhi, 1985.
Singh, B. B.	<i>Economic History of India, 1857-1956</i> , Bombay, 1965
Singh, Amariit	Divided Puniab: Politics of the Muslim League and
~8,3	Partition, 1935-1947. New Delhi, 2001.
	Jinnah and Punjab: Shamsul Hasan Collection and
	Other Documents, (ed.), New Delhi, 2007.
	Gandhi and Muslims of India: Selections from the
	Collected Works of Mahatma Gandhi, (ed), New
	Delhi, 2015.
	Partition of India: Rethinking, (ed), New Delhi, 2017.
Shiv Rao, R,	The Framing of India's Constitution: A Study, New
Circle Versulat	Deini, 1968.
Singn, Yogendra	Social Change in India, New Delhi, 1993.
i narur, Snasni	Delhi, 1997.

Course PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 Outcomes DSE History-B 602 (II).1 DSE History-B 602(II).2 DSE History-B 602 (II).3 DSE History-B 602 (II).4 Average 2.25 2.25 2.25 2.25

Mapping Matrix of Course DSE History- B 602 (Option –II) Table I: CO-PO Matrix for the course DSE History-B 602 (Option –II)

Table II: CO-PSO Matrix for the course DSE History-B 602 (Option –II)

СО	PSO 1	PSO 2	PSO 3	PSO 4	
DSE	3	3	3	3	
History-B					
602(II).1					
DSE	3	3	3	3	
History-B					
602 (II).2					
DSE	3	3	3	3	
History-B					
602 (II).3					
DSE	3	3	2	3	
History-B					
602 (II).4					
Average	3	3	2.75	3	

SCHEME OF EXAMINATIONS						
MASTER OF COMPUTER APPLICATIONS						
(THROUGH DIRECTORATE OF DISTANCE EDUCATION, KURUKSHETRA UNIVERSITY,						
KURUKSHETRA)						
	W. E. F. ACADEMIC SESSION 2021-22	IN PHASED	MANNER			
Paper No.	Nomenclature of Paper	External	Internal	Total	Duration	
		Marks	Marks	Marks	of Exam	
MCA FIRST YEAR						
MCA-DE-21-11	Programming in Java	80	20	100	3 Hours	
MCA-DE-21-12	Object-Oriented Analysis and Design	80	20	100	3 Hours	
	USING UML and C++			4.0.0		
MCA-DE-21-13	Artificial Intelligence	80	20	100	3 Hours	
MCA-DE-21-14	Advances in Data Bases	80	20	100	3 Hours	
MCA-DE-21-15	Elective-I	80	20	100	3 Hours	
MCA-DE-21-16	S/W Lab – I Based on MCA-DE-21-11	100	-	100	3 Hours	
MCA-DE-21-17	S/W Lab – II Based on MCA-DE-21-12	100	-	100	3 Hours	
Elective – I						
MCA-DE-21-15 (i)	Software Engineering					
MCA-DE-21-15 (ii)	Computer Graphics					
MCA-DE-21-15 (iii)	Security in Computing					
MCA-DE-21-15 (iv)	Design and Analysis of Algorithms					
MCA-DE-21-15 (v)	Cloud Computing & IoT					
MCA-DE-21-15 (vi)	Cyber Security					
	MCA SECOND YEA	R				
MCA-DE-21-21	Programming with Python	80	20	100	3 Hours	
MCA-DE-21-22	Web Technologies	80	20	100	3 Hours	
MCA-DE-21-23	Data Communication and Networking	80	20	100	3 Hours	
	Technologies					
MCA-DE-21-24	Linux and Shell Programming	80	20	100	3 Hours	
MCA-DE-21-25	Elective-I	80	20	100	3 Hours	
MCA-DE-21-26	S/W Lab – III Based on MCA-DE-21-21	100	-	100	3 Hours	
MCA-DE-21-27	S/W Lab – IV Based on MCA-DE-21-24	100	-	100	3 Hours	
Elective – I						
MCA-DE-21-25 (i)	Principles of Programming Languages					
MCA-DE-21-25 (ii)	Advanced Computer Architecture					
MCA-DE-21-25 (iii)	Theory of Computation					
MCA-DE-21-25 (iv)	Mobile Application Development					
MCA-DE-21-25 (v)	Machine Learning					
MCA-DE-21-25 (vi)	Data Warehousing and Mining					

## MCA-DE-21-11 PROGRAMMING IN JAVA

## Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

# UNIT – I

Introduction to Java: Importance and features of Java, Java virtual machine, Bytecode, JDK, Keywords, constants, variables and Data Types, Operators and Expressions, Decision Making, Branching and Looping, jump statements: break, continue, return. Introducing classes, objects and methods: defining a class, adding variables and methods, creating objects, constructors, class inheritance. Arrays and String: Creating an array, one and two dimensional arrays, string array and methods.

## UNIT – II

Packages and interfaces, Exception Handling: Fundamentals exception types, uncaught exceptions, throw exception, built in exception, creating your own exceptions, Multithreaded Programming: Fundamentals, Java thread model: synchronization, messaging, thread classes, Runnable interface, inter thread Communication, suspending, resuming and stopping threads.

## UNIT – III

I/O Streams: String and String Buffer classes, Wrapper classes: Basics types, using super, Multilevel hierarchy abstract and final classes. Input/Output Programming: Basics, Streams, Byte and Character Stream, predefined streams, Reading and writing from console and files.

## UNIT –IV

Event Handling: Different Mechanism, the Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter and Inner Classes, Working with windows, Graphics and Text, using AWT controls, Layout managers and menus, handling Image, animation, sound and video, Java Applet. Beans: Introduction to Java Beans and Swings.

## Text Book:

1. Patrick Naughton and Herbertz Schildt, Java-2 The complete Reference by TMH, 2011.

## Reference books:

1. E Balaguruswamy, "Programming with java", Tata McGraw-Hill.

2. Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley.

#### Time: 3 hours

## MCA-DE-21-12 OBJECT ORIENTED ANALYSIS & DESIGN USING UML AND C++

## Max. Marks: 100 (External: 80, Internal: 20)

#### Time: 3 hours

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

## Unit I

Introduction to UML: History of UML, Principles of Modeling, Overviews of UML Views, Things – Structural, Behavioral, Grouping and Annotational Things, Relationships in UML, Adornments, Stereotypes, Tagged Values, Constraints, Overviews of UML Diagrams,

Class Modelling using UML: Object, Class, Link, Association, generalization & Inheritance, Association Ends, N-ary associations, Aggregation vs Composition, Abstract Classes, Metadata, Reification, Constraints, Derived Data, Drawing Class Diagrams.

#### Unit II

State Modeling with UML: Events, States, Transitions, Conditions, Action, Activity, State Diagrams, Nested States, Signal Generalization, Concurrency, Relationships between Class and State Models.

Interaction Modeling: Use Case Models – Actors, Use Cases, Include & Extend Relationships, Use Case Diagrams; Sequence Models – Scenarios, Sequence Diagrams; Activity Models – Activities, Branches, Concurrent Activities, Swim Lanes, Activity Diagrams.

System Design: Estimating System Performance, Making a Reuse Plan, Breaking a System into Subsystems, Identify Concurrency, Allocate Subsystems to Hardware, Managing Data Stores, Handling Global Resources, Choosing a Software Control Strategy, Handling Boundary Conditions, Setting Trade-Off Priorities, Selecting an Architectural Style.

## Unit III

Introduction to C++: Class and Objects, Inline functions, Static data members and members functions, Dynamic memory allocation and de-allocation, constructors and destructors, unformatted and formatted I/O operations.

Compile-time Polymorphism in C++: unary and binary; arithmetic and relational operators; Friend Function and its need, Friend Class, Function overloading, overloading operators through friend function.

#### Unit IV

Inheritance in C++: Derivation Rules, Single Inheritance, Multiple Inheritance, Hierarchical Inheritance, Multilevel Inheritance, Roles of constructors and destructors in inheritance.

Run-time Polymorphism in C++: Virtual functions and their needs, Pure virtual function, virtual derivation and its need, abstract class.

Generic programming & Exception Handling in C++: Template function, Template class, Exception handling features of C++.

## Text Books:

- 1. M. Blaha, J. Rumbaugh, Object-Oriented Modeling and Design with UML, pearson Education-2007
- 2. Herbert Schildt, C++, the complete Reference, Tata McGraw-Hill

## Reference Books:

- 1. Bjarne Stroustrup, The C++ Programming Language, pearson
- 2. Satzinger, Jackson, Burd, Object-Oriented Analysis & Design with the Unified Process, Thomson-2007
- 3. Lippman, C++ Primer, 3/e, Pearson Education
- 4. Balaguruswami, E., Object Oriented Programming In C++, Tata McGraw-Hill

## MCA-DE-21-13 ARTIFICIAL INTELLIGENCE

## Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

## UNIT – I

Introduction: Background and history, Overview of AI applications areas.

Predicate calculus: Syntax and semantic for propositional logic and First Order Predicate Logic (FOPL), Clausal form, inference rules, resolution and unification. Knowledge representation: Network representation-Associative network & conceptual graphs, Structured representation- Frames & Scripts.

## UNIT – II

Search strategies: Strategies for state space search, data driven and goal driven search; Search algorithms- uninformed search (depth first, breadth first, depth first with iterative deepening) and informed search (Hill climbing, best first, A* algorithm, mini-max etc.), computational complexity, Properties of search algorithms-Admissibility, Monotonicity, Optimality, Dominance, etc.

## UNIT – III

Production system: Types of production system-commutative and non-commutative production systems, Decomposable and non-decomposable production systems, Control of search in production system.

Expert systems: Architecture, development, managing uncertainty in expert systems - Bayesian probability theory, Stanford certainty factor algebra, Nonmonotonic logic and reasoning with beliefs, Fuzzy logic, Dempster / Shaffer and other approaches to uncertainty.

# UNIT – IV

Knowledge acquisition: Types of learning, learning automata, genetic algorithms, intelligent editors, learning by induction.

AI Programming Language: PROLOG: Introduction, Clauses: Facts, goals and rules. PROLOG unification mechanism, arithmetic operator, list manipulations, Fail and Cut predicates.

# Text Books:

- 1. George F. Luger, Artificial Intelligence, 5th edition, Pearson Education, 2008.
- 2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert system PHI.

## **Reference Books:**

- 1. Ben Coppin, Artificial Intelligence Illuminated, Narosa Publishing House 2005.
- 2. Nils J. Nilsson Principles of Artificial Intelligence Narosa publishing house.

#### Time: 3 hours
#### MCA-DE-21-14 ADVANCES IN DATABASES

#### Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – I

Database System Concepts and Architecture: Three - Schema Architecture and Data Independence, ER Diagrams, Naming conventions and Design Issues. Relational Model Constraints and Relational Database Schemas, EER model: Subclasses, Superclasses, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization.

#### UNIT – II

Object Model: Overview of Object-Oriented concepts, Object identity, Object structure, Type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Complex objects. Query Processing and Optimization: Using Heuristics in Query Optimization, Semantic Query Optimization, Database Tuning in Relational Systems.

#### UNIT – III

Databases for Advance Applications: Architecture for parallel database; Distributed database concepts, Data fragmentation, Replication, and allocation techniques, Overview of Client-Server Architecture, Active Database Concept and Triggers, Temporal Databases Concepts, Spatial and Multimedia Databases, Deductive Databases, XML Schema, Documents and Databases.

#### UNIT – IV

Principles of Big Data: Ontologies and Semantics: Classifications, The Simplest of Ontologies, Ontologies, Classes with Multiple Parents, Choosing a Class Model. Data Integration and Software Interoperability Versioning and Compliance Issues, Stepwise Approach to Big Data Analysis, Failures and Legalities.

#### Text Books:

1. Elmasri and Navathe, "Fundamentals of Database Systems", Pearson Education.

2. Jules J. Berman, "Principles of Big Data", Elsevier India.

#### **Reference Books:**

1. Date C.J., "An Introduction to Database Systems", Pearson Education.

- 2. Hector G.M., Ullman J.D., Widom J., "Database Systems: The Complete Book", Pearson Education.
- 3. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", Tata McGraw Hill.

#### MCA-DE-21-15 (i) SOFTWARE ENGINEERING

#### Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### Unit-I

Introduction: Software Crisis-problem & causes, Software Processes, Development models: Waterfall, Prototype, Evolutionary & Spiral models, Quality Standards like ISO 9001, SEI-CMM.

Requirement Analysis: Structured Analysis, Behavioural & non-behavioural requirements, Software requirement specification: components & characteristics, Function point metric.

#### Unit-II

Software Project Planning: Cost estimation, static, Single & multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management, project scheduling, personnel planning, team structure, Software configuration management, quality assurance, project monitoring.

#### Unit-III

Software Design: Fundamentals, problem partitioning & abstraction, design methodology, Function Oriented Design, Cohesion, Coupling & their classification, User Interface Design, Detailed design, Information flow metric, Cyclomatic complexity.

Coding: Style, structured programming, Metrics: LOC, Knot count, live variable, Halstead's measures.

#### **Unit-IV**

Testing: Static & dynamic testing, Functional testing: Boundary Value Analysis, Equivalence class testing, Decision table testing, Cause effect graphing; Structural testing: Control-flow & data-flow based testing, loop testing, mutation testing; performance testing; testing strategies: unit & integration testing, System testing, Alpha & Beta testing, debugging.

Maintenance: Types & characteristics of maintenance, Reverse Engineering & Re-engineering.

#### Text Books:

- 1. Pressman R. S., "Software Engineering A Practitioner's Approach", Tata McGraw Hill.
- 2. Jalote P., "An Integrated approach to Software Engineering", Narosa.

#### **Reference Books:**

- 1. Sommerville, "Software Engineering", Pearson Education.
- 2. Fairley R., "Software Engineering Concepts", Tata McGraw Hill.
- 3. James Peter, W Pedrycz, "Software Engineering", John Wiley & Sons.

#### MCA-DE-21-15 (ii) COMPUTER GRAPHICS

#### Max. Marks: 100 (External: 80, Internal: 20)

#### Time: 3 hours

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – I

Introduction to Computer Graphics and its applications; Components and Working of Interactive Graphics; Display Processors; Look-up table; Popular Graphics Software; Coordinate Systems;

Graphics Devices: Raster scan and Random Scan systems, Resolution, Aspect Ratio, Refresh CRT, Color CRT monitors, Plasma Panel and LCD monitors, Interlacing; Grey shades; Interactive Input Devices: Pointing Devices, Image and Video Input Devices; Hard Copy Devices: Printers, Plotters;

#### UNIT – II

Drawing Geometry: Points and Lines; Output Primitives: Symmetrical and Simple DDA line drawing algorithms, Bresenham's line drawing; loading frame buffer; symmetrical DDA for drawing circle; DDA approach for drawing a Circular Arc; Polynomial method for Circle drawing; Circle drawing using Polar coordinates, Bresenham's circle drawing; generation of ellipse;

Line Styles; Generation of Bar Charts, Pie-Charts; Parametric representation of Cubic Curves; Bezier curves; Anti-Aliasing;

#### UNIT – III

2-D Transformations: Geometric Transformations, Coordinate Transformations, Translation, Rotation, Scaling; Matrix representations and Homogeneous Coordinates; Composite transformations; general pivot point rotation; general fixed point scaling; Shearing; Reflection about X- Axis and Y- Axis; Reflection through an Arbitrary Line; General Concatenation Properties;

2-D Viewing: WIndow, Viewport; Window-to-Viewport coordinate transformation, Zooming, Panning; Clipping operations: Point and Line clipping, Cohen-Sutherland line clipping, Mid-point Subdivision line clipping, Liang-Barsky line clipping, Sutherland-Hodgman polygon clipping;

#### UNIT – IV

Graphical User Interface; Input of Graphical Data: Logical Classification of Input Devices; Interactive Picture Construction Techniques; Positioning Constraints; Grids; Gravity Field; Rubber-Band technique; Dragging;

Polygon Area Filling: Flood Fill ; Scan-line fill algorithm; Boundary Fill;

3-D Graphics: 3-D modeling of objects, 3D Geometric transformation; Parallel projection; Perspective projection; Hidden surface removal: Back Face removal, Z-buffer, Scan line, Depth-Sorting, Area subdivision, Ray-Tracing, BSP Tree;

Colours and Shading: Modelling light intensities, Gouraud shading, Phong shading; Introduction to animation; Tweening;

#### Text book:

1. Donald Hearn, M. Pauline Baker, Computer Graphics, PHI.

#### Reference books:

- 1. Apurva A.Desai, Computer Graphics, PHI.
- 2. D.P.Mukherjee, Debasish Jana, Computer Graphics: Algorithms and Implementations, PHI.
- 3. D.P. Mukherjee, Fundamentals of Computer Graphics and Multimedia, PHI.
- 4. Newmann & Sproull, Principles of Interactive Computer Graphics, McGraw Hill.
- 5. Foley etc., Computer Graphics Principles & Practice, Addison Wesley.
- 6. Rogers, Procedural Elements of Computer Graphics, McGraw Hill.
- 7. Anirban Mukhopadhyay, Arup Chattopadhyay, Introduction to Computer Graphics and Multimedia, Vikas.
- 8. Zhigang Xiang, Roy Plastock, Computer Graphics, Tata McGraw Hill.
- 9. Malay K. Pakhira, Computer Graphics, Multimedia and Animation, PHI.

#### MCA-DE-20-15 (iii) SECURITY IN COMPUTING

#### Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### Unit – 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.

#### Unit – 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, Firewall- Need for firewall, Characteristics, Types of firewall, Firewall Basing, Intrusion Detection System- Types, Goals of IDS, IDS strengths and Limitations.

#### Unit – 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.

#### Unit – 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.

#### Text Books:

1. Charles. P. Pfleeger & Shari Lawrence Pfleeger, Security in Computing, Pearson Education.

#### **Reference Books:**

- 1. William Stalling, Lawrie Brown, Computer Security Principles and Practice, Pearson Education.
- 2. Atul Kahate, Cryptography and Network Security, Tata McGraw-Hill Education

#### MCA-DE-21-15 (iv) DESIGN AND ANALYSIS OF ALGORITHMS

#### Max. Marks: 100 (External: 80, Internal: 20)

#### Time: 3 hours

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – I

Introduction: Algorithms, Role of algorithms in computing, Complexity of algorithms, Analyzing algorithms, designing algorithms, asymptotic notations.

Divide and Conquer: Complexity of iterative programs and recursive programs, solving recurrence equations: back substitution method, recursion tree method, master's theorem.

Analysis of heap sort and quick sort; Counting sort, Radix sort, Bucket sort, Lower bounds for sorting.

#### UNIT – II

Hash Tables, Hash functions, Collision handling in hashing, analyzing various operations on Binary search tree. Introduction to Red-black trees.

Dynamic Programming (DP): Elements of DP, Matrix chain multiplication, Longest common subsequence, optimal binary search trees.

#### UNIT – III

Greedy Techniques (GT): Elements of GT, Activity selection problem, Huffman codes, Knapsack Problem. Graph Algorithms: 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.

#### UNIT – IV

Strings: Storage of strings, naive string-matching algorithm, Rabin-Karp string matching algorithm. 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. Introduction to approximation algorithms.

#### Text Books:

- 1. Cormen, Leiserson, Rivest, Introduction to Algorithms, PHI India.
- 2. Neapolitan R., Foundations of Algorithms, Jones and Bartlett Learning

#### Reference Books:

1. Cooper A., "Computability Theory", Chapman and Hall/ CRC Press.

- 2. Robert Sedgewick, "Algorithms in C", Pearson Education India.
- 3. Steven Skiena, "The Algorithm Design Manual", Springer India.
- 4. Reiter, Johnson, "Limits of Computation", Chapman and Hall/ CRC Press.

#### MCA-DE-21-15 (v) CLOUD COMPUTING & IoT

#### Max. Marks: 100 (External: 80, Internal: 20)

#### Time: 3 hours

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT–I

Cloud Computing: Definition, roots of cloud computing, characteristics, cloud architecture, deployment models, service models.

Virtualization: benefits& drawbacks of virtualization, server virtualization, virtualization of – operating system, platform, CPU, network, application, memory and I/O devices etc.

#### UNIT-II

Cloud Computing Service Platforms – compute services, storage services, database services, application 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.

Security in cloud computing: issues, threats, data security and information security

#### UNIT-III

Internet of Thing (IoT): overview, conceptual framework, architecture, major components, common applications

Design principles for connected devices: Modified OSI Model for IoT/M2M systems, ETSI M2M Domains and High-level capabilities, wireless communication technologies - NFC, RFID, Bluetooth BR/EDR and Bluetooth low energy, ZigBee, WiFi, RF transceiver and RF modules. Data enrichment, data consolidation & device management at gateway.

#### UNIT-IV

Design principles for web connectivity: web communication protocols for connected devices: constrained application protocol, CoAP Client web connectivity, client authentication, lightweight M2M communication protocol. Message communication protocols for connected devices - CoAP-SMS, CoAP-MQ, MQTT, XMPP. IoT privacy, security and vulnerabilities and their solutions.

#### Text Books:

- 1. ArshdeepBahga, Vijay Madisetti, Cloud Computing A Hands-on Approach, University Press.
- 2. RajkumarBuyya, James Broberg, AndrzejGoscinski, Cloud Computing Principles and Paradigms, Wiley India Pvt. Ltd.
- 3. Raj Kamal, Internet of Things Architecture and Design Principles, McGraw Hills

#### Reference Books:

- 1. Kai Hwang, Geoffrey C.Fox, and Jack J. Dongarra, Distributed and Cloud Computing, Elsevier India Private Limited
- 2. Saurabh Kumar, Cloud Computing, Wiley India Pvt. Ltd.
- 3. Shailendra Singh, Cloud Computing, Oxford
- 4. Coulouris, Dollimore and Kindber, Distributed System: Concept and Design, Addison Wesley
- 5. Michael Miller, Cloud Computing, Dorling Kindersley India
- 6. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud computing: A practical Approach, McGraw Hill
- 7. Dimitrios Serpnos, Marilyn Wolf, Internet of Things (IoT) Systems, Architecture, Algorithms, Methodologies, Springer
- 8. Vijay Madisetti and ArshdeepBahga, Internet of Things (A Hands-on Approach), VPT
- 9. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications

#### MCA-DE-21-15 (vi) CYBER SECURITY

#### Max. Marks: 100 (External: 80, Internal: 20)

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### Unit- I

Introduction to Cyber Security: Overview of Cyber Security, Internet Governance: Challenges and Constraints, Cyber Threats, Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, International convention on Cyberspace.

Unit – II

Introduction to Cybercrime and Laws: Origins of Cybercrime, Classifications of Cyber crimes, information Security, Cyber criminals, Criminals Plan for Attacks, Cybercafe, Botnets, Attack Vector, The Indian IT ACT 2000 and amendments.

**Tools and Methods used in Cybercrime:** Introduction, Proxy Server and Anonymizers, Password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, DOS and DDOS attack, SQL injection.

#### Unit – III

**Phishing and Identity Theft:** Introduction to Phishing, Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft: PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle.

Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool Kit- Para -Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law –types of intellectual property rights.

#### Unit – IV

**Network Defence tools:** Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, Virtual Private Networks, Linux Firewall, Windows Firewall, Snort Detection System, Introduction to block chain technology and its applications.

#### Text Books:

- 1. Mike Shema, Anti-Hacker Tool Kit (Indian Edition), Publication McGraw Hill.
- 2. Nina Godbole and SunitBelpure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Publication Wiley.

#### Reference Books:

- 1. Marjie T. Britz, Computer Forensics and Cyber Crime: An Introduction, Pearson Education
- 2. Chwan-Hwa (John) Wu,J. David Irwin, Introduction to Computer Networks and Cyber security, CRC Press
- 3. Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Cengage Learning
- 4. Debirag E.Bouchoux, Intellectual Property, Cengage Learning.

#### MCA-DE-21-21 PROGRAMMING WITH PYTHON

#### Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – I

Python: Introduction, Installation, Data types: Numbers, Lists, Tuples, Sets, Dictionaries, Files; Operators, Input/Output Statements, Control Flow statements.

Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

#### UNIT – II

Text files: manipulating files and directories, os and sys modules, reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).

String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa.

Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions.

#### UNIT – III

Graphics and Image Processing: "turtle" module; simple 2d drawing- colors, shapes; digital images, image file formats.

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects, inheritance, polymorphism, operator overloading (_eq_,_str_, etc); abstract classes; exception handling, try block

#### UNIT – IV

Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames Multithreading, Networks, and Client/Server Programming; interacting with remote HTML server, running HTML-based queries, downloading pages; CGI programming, programming a simple CGI form, Regular expressions.

#### Text Books:

1. Kenneth Lambert, "Fundamentals of Python: First Programs", Course Technology, Cengage Learning, 2012

2. T. Budd, "Exploring Python", Tata Mcgraw Hill, New Delhi.

#### Reference Books:

1. Zed A. Shaw, "Learn Python The Hard Way", 3rd Edition, Pearson Education.

2. Mark Lutz, "Learning Python", O'Reilly Publishers.

#### MCA-DE-21-22 WEB TECHNOLOGIES

#### Max. Marks: 100 (External: 80, Internal: 20)

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – I

Introduction: Internet basics; WWW and DNS, Web Server, Proxy Server, Web Crawler, Web Browsers; functions and working principle of web browsers, conceptual architecture of common web browsers: Google Chrome, Internet Explorer. Internet services: HTTPS,FTP, Telnet, SMTP, POP, MIME, IMAP, Web site attacks; Introduction to HTML; History of HTML and SGML; HTML Command Tags, Creating Links, Creating Tables, Form and Frames.

#### UNIT – II

Web page designing: Designing web pages with HTML, DHTML and its events; Working with web site templates. Use of Cascading Style Sheet in web pages: Adding CSS, Selectors, Pseudo Classes and Elements, Extensible Markup Language (XML): Introduction, Prolog; displaying XML contents; Using DTDs in XML document; XML with CSS and XSL,XML Parser.

#### UNIT – III

Client and Server Side Programming: Introduction to CGI, JavaScript: JavaScript overview; constants, variables, operators, expressions & statements; user-defined & built-in functions; Arrays; client-side form validation; using properties and methods of built-in objects, DOM. Java Server pages(JSP), JSP application design, tomcat server, JSP objects, declaring variables and methods, debugging, sharing data between JSP pages, Session Tracking.

#### UNIT – IV

Web Security: Web Security; Firewalls- definition and uses, network layer firewalls and application layer firewalls; Injection attacks, Local privacy attacks, browser attacks, Security from Hacker and Crackers.

#### Text Books:

1. Uttam K. Roy, "Web Technologies", OXFORD, University Press.

2. Xavier, C, "Web Technology and Design", New Age International

#### **Reference Books:**

- 1. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
- 2. Jackson, "Web Technologies" Pearson Education
- 3. Dafydd Stuttard, "The Web Application Hacker's Handbook", Wiley India Pvt.Ltd.

#### MCA-DE-21-23 DATA COMMUNICATIONS AND NETWORKING TECHNOLOGIES

#### Max. Marks: 100 (External: 80, Internal: 20)

#### Time: 3 hours

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – I

Data Communication Components and Data Representation; Computer Networks and its types, Network Software: Protocols, Services, network architecture, design issues, OSI Reference model, TCP/IP Reference model, Comparison of OSI and TCP/IP Models; TCP, UDP, IP; IPv4 and IPv6;

Networking models: decentralized, centralized, distributed, client/server, peer-to-peer, web-based, file sharing model; Introduction to example Networks: the Internet, ISDN, Frame Relay and ATM;

#### UNIT – II

Digital and Analog data and signals, Asynchronous and Synchronous transmission; bit rate, baud, bandwidth, Transmission impairment; Channel Capacity; Manchester and Differential Manchester encoding; Pulse Code Modulation and Delta Modulation; Amplitude, Frequency and Phase Shift Keying; Switching: Circuit Switching and Packet Switching; Multiplexing: FDM, TDM, WDM; Spread Spectrum; local loop; Modems and ADSL; Internet over Cable; ADSL Versus Cable;

#### UNIT – III

Data Link Layer Design issues; Framing, Error Detection and Correction; Flow Control: Sliding Window Protocols; Medium Access Control: Aloha, CSMA protocols, Collision free protocols; Wireless LAN Protocol: MACA; Introduction to IEEE LAN standards; Ethernet, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, VLAN, Introduction to Wireless LANs: IEEE 802.11; Bluetooth; Introduction to WiMax and Cellular Networks;

#### UNIT – IV

Network Layer Design issues, Virtual Circuit and Datagram Subnet, Routing Algorithms: Shortest path Routing, Flooding, Distance Vector Routing, Link State Routing, Multi Cast Routing; Internet Structure; Introduction to RIP, OSPF and BGP protocols; Congestion Control Algorithms: General Principals, Traffic Shaping, Leaky bucket, token bucket, choke packets, Load Shedding.

Internet Security issues: Threats and Attacks; Security Services; Firewalls; Encryption; Authentication; Digital Signature; Message Digest; Virtual Private Networks;

#### Text Books

1. Michael A. Gallo, William M. Hancock, Computer Communications and Networking Technologies – CENGAGE learning.

2. Behrouz A Forouzan, Introduction to Data communications and Networking5E - Mc-Graw Hill.

#### **Reference Books:**

**1.** William Stallings, Data and Computer Communications, 5th Edition – PHI.

2. Andrew S. Tanenbaum, Computer Networks – PHI.

#### MCA-DE-21-24 LINUX AND SHELL PROGRAMMING

#### Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – I

Introduction to Unix/Linux: Evolution of Unix/Linux, Unix/Linux distributions, Linux/Unix operating system, Linux/Unix architecture, Features of Linux/Unix, Interfacing with Unix/Linux system.

Commands in Unix/Linux: General-Purpose commands, File oriented commands, directory oriented commands, Communication-oriented commands, process oriented commands and other commonly used commands.

#### UNIT – II

Regular expressions & Filters in Linux: Regular expressions and their use, Simple filters viz. more, wc, diff, sort, uniq, grep, sed, etc.

Linux/Unix file system: Linux/Unix files, inodes and structure and file system, files system components, standard file system, file system types, file system mounting and unmounting.

#### UNIT – III

Processes in Linux: starting and stopping processes, initialization Processes, mechanism of process creation, job control - at, batch, cron, time, Signal handling.

System Calls: create, open, close, read, write, iseek, link, unlink, stat, fstat, umask, chmod, exec, fork, wait, system.

#### UNIT – IV

Basic system administration in Linux / Unix.

Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, command line programming, creating shell scripts.

#### Text Books:

1. Sumitabha Das, Your Unix - The Ultimate Guide, Tata McGraw-Hill. 3/e

2. Mark G.Sobell, A Practical Guide to Linux Commands, Editors, and Shell Programming, Pearson, 3/e

#### **Reference Books:**

- 1. Yashwant Kanetkar, Unix & Shell programming BPB.
- 2. Richard Petersen, The Complete Reference Linux, McGraw-Hill.
- 3. M.G. Venkateshmurthy, Introduction to Unix & Shell Programming, Pearson Education.
- 4. Stephen Prata, Advanced UNIX-A programmer's Guide, SAMS.

#### MCA-DE-21-25 (i) PRINCIPLES OF PROGRAMMING LANGUAGES

#### Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – 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.

#### UNIT – 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.

#### UNIT – 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.

#### UNIT – IV

Miscellaneous topics: Parameter passing techniques, Static & Dynamic Scoping, Storage of variables, Static storage, Heap Storage management, Distributed Processing, Exceptions and Exception handlers, Coroutines, Scheduled subprograms, Parallel programming, Processor design, Hardware and Software architectures, Network Programming, Evolution of scripting languages, Applets, XML.

#### Text 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.

#### **Reference Books:**

1. Appleby Doris & Vande Kopple J. Julius, "Programming languages- Paradigm and practice", McGraw Hill.

- 2. Sethi Ravi, "Programming languages", Pearson Education
- 3. Scott M., "Programming Language Pragmatics", Elsevier India.

#### MCA-DE-21-25 (ii) ADVANCED COMPUTER ARCHITECTURE

#### Max. Marks: 100 (External: 80, Internal: 20)

#### Time: 3 hours

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – I

Computational Model: Basic computational models, evolution and interpretation of computer architecture, concept of computer architecture as a multilevel hierarchical framework. 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 of integer, Boolean, load and store instructions, VLIW architecture, Code Scheduling for ILP-Processors -Basic block scheduling, loop scheduling, global scheduling.

#### UNIT – II

Superscalar Processors: Emergence of superscalar processors, Tasks of super scalar processing – parallel decoding, superscalar instruction issue, shelving, 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, guarded execution.

#### UNIT – III

MIMD Architectures: Concepts of distributed and shared memory MIMD architectures, UMA, NUMA, CC-NUMA & COMA models, problems of scalable computers.

Direct Interconnection Networks: Linear array, ring, chordal rings, star, tree, 2Dmesh, barrel shifter, hypercubes.

#### UNIT – IV

Dynamic interconnection networks: single shared buses, comparison of bandwidths of locked, pended & split transaction buses, arbiter logics, crossbar, multistage networks– omega, butterfly Cache coherence problem, hardware based protocols – snoopy cache protocol, directory schemes, hierarchical cache coherence protocols, software based protocols.

#### Text Books:

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.

#### MCA-DE-21-25 (iii) THEORY OF COMPUTATION

#### Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### Unit – I

Computability and Non-computability and examples of non-computable problems, Russel's paradox, Finite State System, Extended Transition Function, Designing of DFA and NDFA, Finite Automata with E-Transitions, Equivalence of DFA and NFA with proof, Regular Expression, 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, Application of Pumping Lemma, Myhill-Nerode Theorem, Minimization of FA.

#### Unit – II

Grammar: Definition, Chomsky Classification of Grammars, Construction of 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.

Push down Automaton: Introduction, Types of PDA, Designing of PDA's, Conversion from PDA to CFG and vice-versa, Applications, Parsing: Early's, Cook-Kasami-Young, Tomito's, top-down and bottom-up methods.

#### Unit – III

Linear Bounded Automata (LBA), Turing machines, variants of TMs, Restricted TMs, TMs and Computers. Recursive and recursively- enumerable languages and Properties.

Decidability: Post's correspondence problem, Rice's theorem, decidability of membership, emptiness and equivalence problems of languages. Random Access Machines, Decidable languages, decidable problems, The halting problem, Diagonalization method, Undecidable problems for Regular expressions, Turing machines and other undecidable problems.

#### Unit – IV

Reducibility: The Set NP and Polynomial Verifiability, Polynomial-Time Reductions and NP Completeness, The Cook-Levin Theorem, Some Other NP-Complete Problems, Reduction, mapping reducibility. Computational Complexity: Primitive recursive functions, computable functions, examples, Recursion

#### Text Books:

1. John C. Martin, "Introduction To Languages and Theory of Computation", McGraw Hill.

2. Peter Linz, An introduction to formal language & automata, Jones & Bartlete publications.

#### Reference Books:

1. Hopcroft, J.E. & Ullman, J.D. Formal languages and their relation to Automata, Pear son Education.

2. Lewis, H.R. & Papadimitrious, C.H. Elements of the theory of computation. PHI

theorem. Tractable and Intractable problems, Theory of Optimization.

3. Krithivasan K. & Rama R., "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education, 2009.

4. Michael Sipser, "Introduction to the Theory of Computation", Cengage Learning.

#### MCA-DE-21-25 (iv) MOBILE APPLICATION DEVELOPMENT

#### Max. Marks: 100 (External: 80, Internal: 20)

questions selecting one question from each Unit.

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more

#### UNIT – I

Introduction: Mobile Applications, Characteristics and Benefits, Application Models, Mobile devices Profiles. Basics of Android, Importance and scope, 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

Application Design: Memory Management, Design patterns for limited memory, Work flow for Application Development, Techniques for composing Applications, Dynamic Linking, Plug-ins and rules of thumb for using DLLs, Concurrency and Resource Management.

#### UNIT-II

Google Android: Activities, Intents, Tasks, Services; Callbacks and Override in application, Concurrency, Serialization, Application Signing, API keys for Google Maps.

Android Framework: Fragments and Multi-platform development, Creating Widgets: Layouts, Canvas Drawing, Shadows, Gradients; Applications with multiple screens; Handling database in Android: Android Database class, Using the Database API, Working with Data Storage: Shared preferences, Preferences activity, Files access, SQLite database

#### UNIT-III

Android Applications: Various life cycles for applications, Building a User Interface: Blank UI, Folding and Unfolding a scalable UI, Making Activity, Fragment, Multiple layouts; Content Provider, 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.

#### UNIT-IV

Preparing for publishing, Signing and preparing the graphics, Publishing to the Android Market Other Platforms: Apple iPhone Platform, Introduction to iPhone OS and iOS, UI tool kit interfaces, Event handling and Graphics services, Layer Animation. Overview of Cross-platform application development.

#### Text Books:

- 1. Zigurd Mednieks, Laird Dornin, G,Blake Meike and Masumi Nakamura "Programming Android", O'Reilly Publications.
- 2. Wei-Meng Lee, "Beginning iPhone SDK Programming with Objective-C", Wiley India Ltd.

#### Reference Books:

- 1. Pradeep Kothari, "Android Application Development: Black Book", Wiley India Ltd.
- 2. James C.S. "Android Application development", CENGAGE Learning.
- 3. Gargenta M., Nakamura M., "Learning Android", O'Reilly Publications.

#### MCA-DE-21-25 (v) MACHINE LEARNING

#### Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### Unit – I

Machine Learning: Introduction to Machine Learning, Overview of Machine Learning, Key Terminology and task of ML, Applications of ML;

Supervised Learning: Classification, Decision Tree Representation- Appropriate problem for Decision Learning, Decision Tree Algorithm, Hyperspace Search in Decision Tree;

#### Unit – II

Naive Bayes- Bayes Theorem, Classifying with Bayes Decision Theory, Conditional Probability, Bayesian Belief Network;

Regression: Linear Regression- Predicting numerical value, Finding best fit line with linear regression, Regression Tree- Using CART for regression.

#### Unit – III

Logistic Regression - Classification with Logistic Regression and the Sigmoid Function; Clustering: Learning from unclassified data –Introduction to clustering, K-Mean Clustering, Expectation-Maximization Algorithm(EM algorithm), Hierarchical Clustering, Supervised Learning after clustering.

#### Unit – IV

Dimensionality reduction- Dimensionality reduction techniques, Principal component analysis, Anomaly Detection, Recommender Systems;

SVM, Reinforcement Learning.

#### Text Books:

1. Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited.

2. EthemAlpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press.

#### Reference Books:

- 1. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press.
- 2. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press.
- 3. Peter Harrington, Machine Learning in Action, Manning
- 4. ShaiShalev-Shwartz and Shai Ben David, Understanding Machine Learning From Theory to Algorithms, Cambridge University Press

#### MCA-21-25 (vi) DATA WAREHOUSING AND MINING

#### Max. Marks: 100 (External: 80, Internal: 20)

# **Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. All questions will carry equal marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, students will have to attempt four more questions selecting one question from each Unit.

#### UNIT – I

Data Warehouse: Basic concepts, The Data Warehouse - A Brief History, Characteristics, Difference between Operational Database Systems and Data Warehouse, Architecture for a Data Warehouse, Fact and Dimension Tables, Data Warehouse Schemas, Data Cube : A Multidimensional Data Model, Data Cube Computation Methods, Typical OLAP Operations, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute Oriented Induction.

#### UNIT – II

Data Mining: Introduction: Motivation, Importance, Knowledge Discovery Process, Data Mining Functionalities, Interesting Patterns, Classification of Data Mining Systems, Major issues, Data Objects and Attribute Types. Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization. Data Mining Models: Directed Data Mining Models, Directed Data Mining Models, Directed Data Mining Models, Directed Data Mining Methodology. Data Visualization. Outliers, Types of Outliers and Challenges of Outlier Detection.

#### UNIT – III

Data Mining Classical Techniques: Statistics – Similarity Models, Steps for Designing Similarity Models, Table Lookup Model. Clustering- Requirement for Cluster Analysis, Clustering Methods- Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering. Nearest Neighborhood- Memory Based Reasoning, Challenges of Memory Based Reasoning,

#### UNIT – IV

Data Mining Next Generation Techniques: Decision Tree- Decision Tree Induction, Attribute Selection Measures, Tree Pruning. Association Rule Mining- Market Basket Analysis, Frequent Itemset Mining using Apriori Algorithm, Improving the Efficiency of Apriori, Neural Network- Bayesian Belief Networks, Classification by Back propagation. Data Mining Applications, Data Mining Trends and Tools.

#### Reference Books:

1. J Hanes, M. Kamber, "Data Mining Concepts and Techniques", Elsevier India.

2. G.S. Linoff, M.J.A. Berry, "Data Mining Techniques", Wiley India Pvt. Ltd.

3. A. Berson, S.J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw-Hill.

KURUKSHETRA UNIVERSITY KURUKSHETRA

(Established by the State Legislature Act XII of 1956)



# SCHEME, SYLLABUS AND COURSES OF READING FOR

## M. A. SANSKRIT (PREVIOUS) SEMESTERS : I & II under CBCS-LOCF

(Modified w.e.f. the Academic Session : 2020-2021)

Semester – I	Examination : December,	2020
Semester – II	Examination : May,	2021

Published by: REGISTRAR KURUKSHETRA UNIVERSITY KURUKSHETRA

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### KURUKSHETRA UNIVERSITY, KURUKSHETRA (Established by the State Legislature Act XII of 1956)

### **DEPARTMENT OF SANSKRIT, PALI & PRAKRIT**

Semesters	Hard Core (HC)	Soft Core (SC)	Interdisciplinary/ Open Elective as per course curriculum	Viva Voce	Total
I	20	-	-	-	20
II	20	-	2	2	24
III	4	16	2	-	22
IV	4	16	-	2	22
Total	48	32	4	4	88

### Credit Matrix for M.A. Sanskrit

### **Instructions for the Students:**

### **Course Type**

**Hard Core (HC):** There are hard core courses in every semester. These courses are to be compulsorily studied by a student as a core course to complete the requirement of a programme in a said discipline of study.

**Soft Core (SC):** Soft Core is a course which can be chosen from a pool of papers in Semester III and IV. It will be supportive to the discipline of study and mandatory as per course curriculum.

**Open Elective (OE):** Open Elective Course may be from an unrelated discipline. It is interdisciplinary/open elective as per course curriculum.

However, a student who fails to get admission to open elective/interdisciplinary course in other Department within the Faculty, will opt a paper in the department itself.

### KURUKSHETRA UNIVERSITY, KURUKSHETRA (Established by the State Legislature Act XII of 1956)

# SCHEME OF EXAMINATION FOR M.A. SANSKRIT UNDER CBCS-LOCF W.E.F THE SESSION 2020-21 CHOICE BASED CREDIT SYSTEM

#### Course Code Title of Paper Туре L Marks Credits Duration of Exam. Int. Ass. Theory (Hrs) **SKT-HC-101** Samhita Upanisat Cha HC 80 20 4 4 3 HC 20 4 3 SKT-HC-102 Vyakaranam 4 80 Bhasavijnanam Cha (1) Bharatiyadarshanam (1) **SKT-HC-103** HC 4 80 20 4 3 Kavyam Natakam Cha SKT-HC-104 HC 4 80 20 4 3 SKT-HC-105 Dharmatantragamah (1) HC 80 20 3 4 4 Total 20 400 100 20 Grand Total 500

### Semester-I

#### Semester-II

Course Code	Title of Paper	Туре	L	Ма	arks	Credits	Duratio
				Theory	Int.		n
				5	Ass.		of
SKT-HC-201	Brahmanam Vedangani Cha	HC	4	80	20	4	3
SKT-HC-202	Vyakaranam Bhasavijnanam Cha (2)	HC	4	80	20	4	3
SKT-HC-203	Bharatiyadarshanam (2)	HC	4	80	20	4	3
SKT-HC-204	Kavyam Kavyashastram Cha	HC	4	80	20	4	3
SKT-HC-205	Dharmatantragamah (2)	HC	4	80	20	4	3
SKT-HC-206	Viva-Voce	HC	-	50	-	2	
Total			20	450	100	22	
Grand Total				5	50		
SKT-OE-207	Prācīnabhāratīyasamskṛtiḥ, Darśanaṁ Bhāṣāvijñānaṁ	OE	4	40	10	2	3
	Ca (1)						
Grand Total			4	ļ	50		

# एम० ए० संस्कृतम् (प्रथमं वर्षम्), प्रथमद्वितीयसत्रात्मकम्

M. A. Sanskrit (Previous)

Semesters : I & II

# योजना, पाठ्यक्रमः, पाठचर्या च (2020-2021 शैक्षिकसत्रतः संशोधितम् )

# SCHEME, SYLLABUS AND COURSES OF READING

(Modified w.e.f. the Academic Session : 2020-2021)

एम०ए० (संस्कृत)-कक्ष्यायाः प्रथमवर्षीयपाठ्यक्रमः सत्रद्वये (प्रथमसत्रे द्वितीयसत्रे च) विभक्तः वर्तते। तत्र प्रतिसत्रम् अध्ययनार्थं **पञ्च** पत्राणि निर्धारितानि सन्ति। एम०ए० (संस्कृतम्)–द्वितीयसत्रस्य पाठ्यक्रमसमाप्तेः अनन्तरं प्रथमद्वितीयसत्रयोः अधीतं पाठ्यक्रमम् आश्रित्य छात्राणां संस्कृतमाध्यमेन मौखिकी परीक्षा आयोजयिष्यते। एतदर्थं 50 अङ्काः निर्धारिताः सन्ति।

द्वितीयसत्रे चयनाधारितश्रेयोदानपद्धत्यनुसारेण संस्कृतेतरछात्रेभ्यः एकम् वैकल्पिकं पत्रं वर्तते। एतदर्थं 40 अङ्काः, आन्तरिकमूल्याङ्कनाय च 10 अङ्काः निर्धारिताः सन्ति।

लिखितपत्राणां परीक्षासमयः प्रतिपत्रं 3 होराः भविष्यति। प्रत्येकं लिखितपत्राय अशीतिः (80) अङ्काः विद्यन्ते। एतदतिरिक्तं प्रतिपत्रं विंशतिः (20) अङ्काः आन्तरिकमूल्याङ्कनाय अधोनिर्दिष्टरूपेण निर्धारिताः –

(i)	प्रतिपत्रम् एका परीक्षा संगोष्ठी वा	:	50% = 10 अङ्काः
(ii)	एका कक्ष्यापरीक्षा	:	25% = 05 अङ्काः
(iii)	कक्ष्यायाम् उपस्थिति:	:	25% = 05 अङ्काः
	कक्ष्यायाम् उपस्थितेः अधोलिखितरीत्या अङ्काः प्रदास्यन्ते-		
	(1) 91% तोऽग्रे	:	5 अङ्काः
	(2) 81% त:  90% पर्यन्तम्~	:	4 अङ्काः
	(3) 75% त: 80% पर्यन्तम्~	:	3 अङ्काः
	(4) 70% त:   74% पर्यन्तम्~	:	2 अङ्काः
	(5) 65% त:   69% पर्यन्तम् <mark>∼</mark>	:	1 अङ्क:

The syllabus of M. A. Sanskrit (Previous) class is bifurcated into two semesters, namely, Semester-I and Semester-II. Five papers are prescribed for study in each Semester.

Viva-Voce of the students, based on the syllabus covered in their 1st and 2nd Semester courses, will be conducted through Sanskrit medium after the completion of the syllabus of M.A. Sanskrit, Second Semester. Viva-Voce carries 50 marks.

One Open Elective (Interdisciplinary) paper, carrying 40 marks + 10 marks for Internal Assessment, has been prescribed in the 2nd Semester under Choice Based Credit System.

The time for examination in each theory paper will be 3 (three) hours. Each theory paper in the 1st & the 2nd semester carries 80 (Eighty) marks. Besides, each paper has been assigned 20 (Twenty) marks for Internal Assessment as per the following scheme:

(i)	One Test/Seminar for each paper	:	50% = 10 Marks
(ii)	One Class Test (one period duration)	:	25% = 05 Marks
(iii)	Attendance	:	25% = 05 Marks
	Marks for Attendance will be given as under:		
	(1) 91% onwards	:	5 Marks
	(2) 81% to 90%	:	4 Marks
	(3) 75% to 80%	:	3 Marks
	(4) 70% to 74%	:	2 Marks
	(5) 65% to 69%	:	1 Mark

**E** 

## ,eñ,ñiblÑre~(çHeao'Hē)-]çHeal ≠e~

M. A. SANSKRIT (PREVIOUS), FIRST SEMESTER

COURSE CODE : SKT-HC-101

### çHei =le~%l fgrk mifu'lr ~p

Paper-I : Samhita Upanisat Cha

L	Credits
4	4

i v**HÄ I%**80 v HJfjde**M** HÄüHÄI%20 Ie; %3 **disi**% (3 Hours)

Co. 101. I : v fleu~34/d so; a½/dsh i tr sj %v f/u8i for l€fo". lejdulifnmer kula Lo: i a Kil; le%Arsi i g6 o6kd / elZelt i aÑr jfi clá isHofr A

Co. 101. II : , rfleu~ 34d s of. 121 th lula elè; es 1 i 14 126; k 16, i aki th lula #fpdji 14R k i Ấr sửr Údula Klua Hofr A

Co. 101. III : ; t qill) f' loi al Yi i từ l; elè; esi Nick% eui % Lo: i eoxFNfU] ek Hitel từ si p Lo ek Hiteai fr Lod Ùil? eocá; USA

Co. 101. IV : b2HoH; b5fu'In% vè; ; us Nick% i jeHeu% Lo: i locks% foj kev foj k k p Kluai II; r A

**31.kle&**û% fullidy f[kl Brkula i lj:EfjD) kv k/ fµD) kv ly lpulled i 1/4R kp xgue~

vè;;ue~(IbÑrehè;esa)µ

16 VÄR%

Í X618% µv fXf% (1-1) _ l fork (1-35) _ fo". lif (1-54) _ blat% (2-12) _

#a&(2-33) _ cigli fr %(450) _ mill%(5-80) _ o#. k%(7-88) _ Lile%(9-80) A

**34/d e&**@%**fullifyf[k|fb/lulailjEfjD)k vl/fµD)k vlylpulitedi1/47;k p xgue~ve;;ueµ** 16 vÄ1% Í X618%(µi**ff%(10-90)_fgi.;xHEZ(10-121)_ult nh/e~(10-129)_0td ~(10-125)_** i**fjol&no2th(10-95)_;e&;ekt fb/e~(10-10)_ljektif.ktieht%(10-108)_** 

fo' olie=18un161 fbre~(3-33) A

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34/d e&ý%/duliúfyf[kibrkula i ljEfjD) kvl/tipuD) kvlyhpulited i 1/4R/kpxgue--ve;;uepu 16 VÄR%
;tqa1%,ufloid Vibre-{34-1μ6}_vHo2aa%('ledi%,uHadibre-{12-1-1μ30}A
```

**3V.d e&p%d21.oli; isfu'in~(; t qii); %pi&iĝ' l%v è; k; %%io' in©iţ ; ieldeA** 16 v Äl%

fMi . ; %¥

(d) ç'ui=ls i ×p (ý) v fuok, liZcç'ul%Hio'', fUAr=k çFleç'us 34/d pr 4/, xri HBÔØeelk(JR; p Falij% (4) fod Yijfgr 1% (v fuok, lifj) I £(Hr kkijç'ul% çnH; USA v Us ç'ul% Øe' 1% çFle&1)rh, &rrh, &prijE2A/d I E: //R/Hio'', fUA

([)) Qf(; lied ç'ušiq 50% v zł% v by by ulied ç'ušiqp 100% v zł% o 8 fYi d % HosA

(x) çfle 34.dill Jr%/)rh,%ç'u% blÑrelè;esu,olekl,ş%u b/flklobbkv Äöglfu%Hlo";frAv b/sç'ul% IblÑr@gbbl@dÄXbhbbleb;ekuled soli,dsu elè;esulekl krejbDbbA

#### ç'ui #fuelZhfof/%

- 1. ç'ui #; fueižiai #Ñrelè; eu HosA
- 2. ç'ui =16 i ×p (5) v fuok iZç'uk/Hio'', fUA
- g' ulule~v Älulep foHit ue~v / liyf[ k: i sk Hio"; frµ
  - I. çile%ç'u%µ v; a(çile% ç'u%3Vd pr qV; xr i HBÔØeekU R; HosA v fLeu~ç'usp iblj%(p) fod Yi jfgr k%(v fuok lijs i f(ilr kij; c'uk%;ril; UA) (4×4%46v ÄK%)
  - II. f)rh,%ç'u%(çfle3ktil/Jr%)µ i j;l£fjD,k vk/ fµD,k vlylpuliedi%Rk pebB; al liÑrelè; eu Oli; k qçfle3ktil/Dibyl%ebb; açnil; rå. (2×8%/6vÄl%)
  - III. rìh %¢' u%(f)rh 341 EJ r%µ
    - (d) i **j;E (j;)** k v **k (qi)** k v **ky ipulite**di ¼7; k p e**Li)**; a **Ģi(; k qi)** r **h, 3ki lib** l **ib** hj % eLid; a çmli; r **f**a
    - ([**i**); Hitufn24 fbri 12:¼a o God mofo'l≰de~, de~v ly lpuliteda ç'uaiek/k q ç'u); a çnil; r\$A (6v ÄK)&
  - IV. prijižę'u%(rrh, 34.0 kJr%) i jį liji) k v k ių k v k ių k v k ių puliedi ¼R k p eliprių/, a Olį; k q

     ; Hitufail ib); k 'N/-elik% çali; UA
     (4×4%/46v Äl%)
  - V. i »pe%ç"u%(pr**ijili**lili'); y eti); l; fo'in**Qi(;** k \$ Hiumilikilik ~etid; açnil; rfa (2×8%/6v ÄK%)

#### vubjelirx##%

- 1. The New Vedic Selection, Part I & II (Revised and Enlarged Edition), Braj Bihari Chaubey, Bharatiya Vidya Prakashan, Delhi-7.
- 2. Vedic Selection, A.A. Macdonell, Motilal Banarsidass, Delhi.
- 3. **1/206 | | k. Hitt; | fgr A**
- 4. **nG/ReghijÑr 'lify;t qillik;A**
- 5. **I qiš HK; %riekji in I koydj] i ljiMA**
- 6. Hymns of the Atharvaveda M. Bloomfield, Motilal Banarsidass, Delhi.
- ziboli, isfu'lo-('liäj Hit;) xhrkçis] xiji it ji Xhrkçis] xiji it ji
- 8. 1/201 bri mgi Ñ".kdepit, o aggi nùk' ilizihi i ligiR HkMji ejaBA
- 9. 1/2XXxxh i Brizej Millósoçalkkmilè;kj vujik çalkluj bylgicinA

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10(132)

COURSE CODE : SKT-HC-102

## f)rhi=le-%@ldj.le-HkHfoKlue-p (1)

Paper-II : Vyakaranam Bhasavijnanam Cha (1)

L	Credits
4	4

i **vHÄR%**80 **v Hyfjd e¥/ HÄüHÄR%**20 **I e; %3 gljsk%** (3 Hours)

Co-HC-102 : I : vfLeu~ 34dis y 34j 1/4Ud 16kjulja i ×Kuizj. kji fUizj. kj v Rifuizj. kr% fol xZfUizj. ki; Dalkský, ki vála pi : ifi f1/4 1/9;; k NdK% i fjfpr k%HofUA

Co-HC-102 : II : V fLeu~ y 34 j 1/4 U d 16 µ 1% n' 1k i qUizij. HU x Za v t U' KOkula L:Hfy Äx&i 6/4y Äx&ui 4 d fy ÄxL; d fri; 'KCHC%, d fri; gy U i 6/4y Äx' KCHk p i HB; U \$A

Co-HC-102 : III : **y 36 ¼Un V, k Holfmx. IL; H£, / ~ / Hôl% I vlidy šli foži k n' lx. lkulafi f¼i £Ø; k i z'; Z& v U PplfLeUto i vlžinU i zlj. lefi O lį; li vlide; li; n** Co-HC-102 : IV : **, r fLeu~ 3 kti s HK Háo Klul; i fj Hk Hij (leija HK Hkkrifj or žja r n Hslč**), HK Hi fj or ill; d lj. lkfuj HK Hka ox Hij. la p bR slu~ Nickt% Kil; U & v U Pp HK Hi fj olj KJ x Za Hijish HK Hi fjolj L; i zijlo S KV, ar n Hslu~plog; U &

**3.** Vid e&û% ojnjit %y 31 % Vid lênh (1 kiñrelè; es)
 16 v Äl%

 v / liy f[ krçdj. k lê% uk kel kiñrelè; es l keji. keØl[; k çeişit uk/ş ji mila
 16 v Äl%

 : i fl f%çfØ; k pµ
 (d) 1 xłűçdj. le~([§ 1 fUçdj. le~(v pl·fUçdj. kr%fol xdZfUçdj. k; be)-A

 **3.** Vid e&ű% ojnjit %y 31 % Vid lênh
 16 v Äl%

 v / liy f[ krçdj. k le% uk kel keji. le@l[; k çeişit uk/ş ji mila: i fl f%çfØ; k pµ
 16 v Äl%

 v / liy f[ krçdj. k le% uk kel keji. le@l[; k çeişit uk/ş ji mila: i fl f%çfØ; k pµ
 16 v Äl%

 (d) vt Ui f%y Äğdj. leµ jel] 1 of gj] 1 f[ k xkA
 16 v Äl%

 (l] vt UL: liy Äğdj. leµ jel] 1 of gj] 1 f[ k xkA
 16 v Äl%

 (x) vt Uu i hdfy Äğdj. leµ jel] 1 of gi] n/] e/ 4
 17 vi uk hdi olij] n/] e/ 4

 (3) gy Ui f%y Äğdj. leµ fo' oolg]- e3ou]- jit u]-i ffku]- fo) I]-rn]-; ten]- v LenA

**31/d e&%% oj nj it %y 34j 1/4bd l&p**h

v/ Klyf[krçdj.kr Kc¼/ukrkal kalgj.kaQK[;k]çe‡qktulkkyşki wallar ifi f%çf@;kpµ

(d) frÄldsHilfinçdj. le&  $\sqrt{H}$   $\sqrt{J}$  A

([)) i **ulấnti**çdj. leA

**3Vd e8**p% **HkilioKue**µ

16 VÄK%

HIKNIKO Klul; i fjHKN: (MapAHKN: K/i fjHKN: oSK\Ĉiu pAHKN:ri fjorila rnHuk pAHKN: fjorill; dlj. NuAHKN: fjoljk%(: i j\$Nelde)-AHljish i fjoljl; HKN:rçejjk N; N%rk: laoSK\Ĉiu p (: i j\$Nelde)-Ab Nistjilu; u&HKN:rçejjk N; N% rk: laoSK\Ĉiu p (: i j\$Nelde)-AHKN: Naoxinij. le~(i fjoljeyud e~v IÑireyud ap) A

f**Mi . ; %**#

(d) ç'ui=ls i xp (ý) v fuok, MZ; ç'ul%Hlo"; fulAr=k çHeç'us 34/d pr ü/; xri HBÔØeelk(JR; p Bolij%

(4) fod Yijfgr 1% (v fuok, H) i I f(Hr kij c' uk% cnil; UsA v Us c' uk% Øe' 1% cHest) rh sr h sprijezuti i i/1%/Ho''; fUA

([) OI; lied ç'ušiq 50% v zł%v ly ipulied ç'ušiqp 100% v zł%o 8 fYi d % Hos A

(x) çFle 314d KJr%{)rh, %ç'u%d blÑrelè; ena ,oiek/ ş%/ ÿFlikioblik v Äögliu%Hio"; frAv ÿsç'u% IbÑr@gulf@kÄXHHidle); ekuled alfi ,d ar elè; ena iek/ krej KD, W5A

ç'ui #fuelZhof/%

1. ç'ui **=11; fuelZiei ±Ñrelè; eu HosA** 

2. ç'ui = s i > p (5) v fuok li%; fuA

3. **ç'ulule~v Älulep foHit ue~v / liy f[ k: i sk Hio"; frµ** 

 cFle%ç'u%μv; a(çFle% ç'u%3Vd pr φ/; xr i HBÔØeek/J R HosA v fLeu~ç'us p Folj%(þ) fod Yi jfgr K/(v fuok, lijb, l f(llr kijç'uK/çrll; UA) (4×44/46v ÄK/b)

Ⅲ. **f)rh %ç' ư%(çfle3td lí J r%**μ

(d) çfle?Ndib?çdj.lti2:¼alub);albiÑrelè;eu ibakgi.la.Qk[;krq;flibuín24kblikr~ibpröµ/;a çmli;r£a (2×4%9vÄl?ja

 ([); çHe3Atili5;çdj.lt 12:1/1; in); L; çeţijt uli4yişit uil.a: ifi f%çfØ; lai biÑrelè; eu fyf[kq;

 ; Hitum2.ktilik ~i npr Q/; açnil; r& (2×4%) Älç;

III. rìh %ç' u%(f)rh 348 EJ r %µ

(d) f}rh 31.d Brçdj. It 121/al wij; al kalgj. kaQil(; k.e; Hituín23.kblik - Iwprü)/; açnil; rf. (2×49-0/ÄK)/

([**1**) f)rh; 3M:llD;cdj.ltlic:¼L; in); L; çe**jşt dib**ýştitudia: ifl f¼çfØ; lafyf[k:q; Hitufri2M:dilk ~ inprů/; açnil; rá. (2×4%/9×ÄR)6

IV. pr**üzç' u%(rì h 3\ti Ľ) r%**µ

(d) rìh 34d lið çdj. It lē ¼al við; al lalgj. la Ģlí;; kra; Hitufn24dilik -l vip růl/; açnil; rá. (2×4%9/ÄlQ)6

16 VÄK%

([**i**) rìh 34d H3 çdj. It H2:14; in); L; çe**ht diby şit wil**a: ifi f1/çf0/; lafy f[kq; H1/ufr2/kb/Hk~

inpr**ü/; açnil; r A** 

**(2×4³/8× ÄK)** 

V. i »pe%ç"u%(prijiku iUr%µ prijiku iuxii iBÔðel ic%el ek(iited aç"u); al ek kraç"uprij/; açnil; r& (2)

**(2×8%46) ÄK**b

#### vuq**lei**rx**utik**%

- 1. **y 36; ¼łud légi; Of; ; lő J lí j kul ' lít.:h (30M/ ly] elsiy iy culji hik ] friVy k**A
- 2. y 34, ¼ Ud 164), ojnjik ] ĢK; jã Hiel u ' IL:H, HShçal kiuj friVy KA
- 3. y 34 ¼ Ud 184 ) OK; 16 v k kzin fej v (k oV çal kiu) bylgicinA
- 4. HKakvijshičidih, nehlelj () cehl gji; kiki ligiR v dinehl p. Max<A
- 5. i ni ni Hill Zel(ili, cy no fi gi) d ((kk fo' ofo) ky; ) d ((kk A
- 6. I leitj Hitlißiokiuj cicjile I D skA
- 7. Introduction to Comparative Philology, P.D. Gune, Pune.
- 8. Transformational Grammar, Ratford, A., Cambridge Univ. Press, 1988.
- 9. Introduction to Linguistics, Ratford, A. et. al., Cambridge Univ. Press, 1999.
- 10. Introduction to Theoretical Linguistics, Lyons, John, 1968.
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- 14. Principles and Parameters, Culicover, P.W., Oxford Univ. Press, 1997.
- 15. An Introduction to Language, Fromkin, V. and R. Rodman, New York etc. Harcourt, Brace Jovenovich College Publishers, 1988, 1992.
- 16. Linguistics, An Introduction to Language and Communication-Akmaijan, A.R. Demers and R. Hamish, Cambridge Mass, MIT Press, 1979.

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COURSE CODE : SKT-HC-103

### rìhi **te~%Hijrh n' kie~**(1)

Paper-III : Bharatiyadarshanam (1)

i **vHÄ1%**80 **v Holfj d eM/ HÄüHÄ1%**20 **I e; % glji%** (3 Hours)

CO-SKT-HC-103 - 1 rd Zktk & fuc U Hed i żu%

Ųk, n'hall; izlj. bablik‰d skofeJizbirk, rol 2004 kikų ųk, n'halsizo skaiblir qafojfpr% mbŘ"Vablik% v fLrA v L; izek biblas of. bi21 fu izek blfu v f/ÑR; fucU by \$kua Nadak bla fo"k, ibjk, leiz'hi21 fr]y \$kui£r Holep foo/Z1 frA

CO-SKT-HC-103 - 2 rd 2kk & i £ QK; k

r d Zikik, R/xx i žr hulei i z z Qil(; k fo'k, L; i felè; ; ulfici elfo'\/A CO-SKT-HC-103 - 3 i lip; d líjdk & fuc V lied i zu%

bZojÑ". Kojfprķiaik; dkjdķiaik; rikt; i ožfi¼kuk% fu: firkAr=k Nicik kay şkui frHişk% fodik kHzfucUked%i zu%i filefyr%A

CO-SKT-HC-103 - 4 I k; d k k d k d k d k k k

i£şslad kljd k, k%l tµeke;;ukHeto Lrtµu"Brkai£riknukHetp lizad kljd kQ k[;k vi\$(krkA

 34.d e&û%d Stofe J %r d Hitik %r ljilik %çlek; oki ; De~&fuc V liled %ç' u%( I hÑr elè; es) A 16 v Äi%

 34.d e&û%r d Hitik %r ljilik %çlek; oki ; De~&i f/ Oli ; lA
 16 v Äi%

 34.d e&û%r d Hitik %r ljilik %çlek; oki ; De~&i f/ Oli ; lA
 16 v Äi%

 34.d e&ú%r d Hitik %r ljilik %çlek; oki ; De~&i f/ Oli ; lA
 16 v Äi%

 34.d e&ú%r d Hitik %r ljilik %r l

(d) ç'ui=ls i ×p (ý) v fuok, il‰ç'ul%Hio"; fulAr=k çFleç'us 34/d pr44/; xri IBÔØeelfJR; p Rolj% (4) fod Yijfgrk% (v fuok, kljb. I £(krkkijç'ul% çnkl; UsA v Us ç'ul% Øe'k% çFle&?)rh, &rrh, &pr641234/d1 12:14%Hio"; fulA

(x) çFle3AdlıKJr%f}rh,%ç'u%latÑrelè;esu,olekk ş%v ÜHkloBkvÄöğfu%Hio";frAv Üsç'uk% IbÑr@juh@käXiHklelè;ekuladshi ,dsu elè;esu lek/krq'iD)UA

L	Credits	
4	4	

ç'ui #fuelZhof/%

- 1. ç'ui =11; fueliziai ±Ñrelè; eu HosA
- 2. ç'ui = s i > p (5) v fuok likç'ul%Hio"; fuA
- 3. ¢ ulule~v Äiulep follit ue~v / liyf[ lr: i sk Hio"; frµ
  - cHe%c'u%μv; a(cHe% c'u%3Vd pr 4/; xri HBÔðeekU R HosA v fleu~c'us p Holj%(p) fod Yi jfgr k%(v fuok Hjs I ffilr klic'uk%cnli; UA
     (4×44/46v ÄK%)
  - II. f)rh,%ç'u%(çfle3klikJr%μ; Hituín&klikle~vkJR; i kÑrelè; es, dafucUafyf[kafucU}; a çnil; r& (16vÄK%
  - III. rì h %ç' u%(1) rh 34d KJ r %µ 🛛 çi Äếi (f ); a여k ; k ę; Hituín&kilik ~i (f ‡, açnil; r A 👘

(2×8°/46v ÄR)

IV. pr**ijiž**ç'u%(rìḥ 3\dill'ı'); a çnil; râ (16ν Äl%)

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V. i »pe%ç'u%(prijil\dil]r%μ i çi Äãdijdi}; a Ģij; k ę; Hitufn2ktilik ~ difjdid; a çnii; rA
(2×8%/6vÄl%)
```

#### vulpeirxiiik%

- 1. rd Elktit, Ģiti; kā Jikuolt, 'kil:kā i kigi?; Hk.Nij;]ejsBA
- 2. rd Ektik Ģil(; kā crijkulik 'liķy] eksiyiy cuļķi lnik ] frīvykA
- 3. rd Ektik (Ģli; kāxt ku 'El:hehyxipdj] pijsielij olijkit ka
- 4. Tarkabhāṣā, Eng. Tr. S.R. Iyer, Varanasi.
- 5. Tarkabhāṣā, Eng. Tr. A.B. Gajendragadkar.
- 6. **I lip; rùð diligi şi lif lif lif lif köli; i lif vi kir kir fej] v (koV çal klaj bylgicin**A
- 7. I 🛱; dlijdlit i Elärfik (Çit; iäxt ku/ IL:helyxipdj) pi\$Hcit ojkit ka
- 8. Sāmkhyakārikā, Eng. Tr. Wilson, Delhi.

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COURSE CODE : SKT-HC-104

### **pr<b>47:1**e~%d **I**Øe~u**i\/**d e~p

Paper-IV : Kavyam Natakam Cha

L	Credits
4	4

i villä 18%30 v liulifj d ett/ lä üllä 18%20 l e; %3 **dist**% (3 Hours)

CO-HC-104 : I : 344 sfLeu~ fjek3si fU = k is xqk% bi? su i g egiHijrL; i UHizk f'k kiply o/L; egid k9 Rai fjph r & r mulja' y ki 9 kj; kjfHk h r &

CO-HC-104 : II : jlek. K.; kljx##Roa I K ± uNd L; kljd kveqUa f K; r & I U; Äxkljfi OK; HHasi E Di Ho-UA

CO-HC-104 : III : d fol EC1/2k v Fk p x1/9k EC1/2k i ely ipulÄfLeu~ 3kd s fo/ h r sk v iy ipulited k i zul%LFikul-lit %t k U/sk

CO-HC-104 : IV : I lekt/s d lítynik L; i fjp;s i esa esknul; [k NtilQ Roa;}k xkird lQ Roa' lki;qs d Fikud s Q lí;;kp i Ei k rsi biÑrelè;es A

<b>31/d e&amp;û%ek86% f k iqiy o/ e~(çFie%i x\$</b> 6%i çi Ä <b>ğNulişy Äljfurlik wil</b> a' y ki Ģiţ ; kA	16 VÄK%
<b>31.d e&amp;ü%HoHiz%nùjjlepijre~%i çi Äãd lĢi 158:dunili: uil a'y ld Ģiţ ; l</b> A	16 VÄK%
<b>3Vd e&amp;ý%nìjj lepfj r e~%a ly ipulièd i%ç' uKA</b>	16 VÄK%
<b>31.d e&amp;p%d liynit %e\$kmeµ</b> i <b>u29%,' yki k%iµ33 % yki Ģiţ</b> ;k (I <b>i</b> Ñrelè; e <b>s)</b> A	16 VÄK%

f**Mi .** ; %¥

(d) ç'ui=ks i ×p (ý) v fuok, HZ ç'uk% Hão"; fUA r=k çHeç'us 34.61 prüµ/, xri HBÔØeeHUR; pRohj% fod Vijfgrk% (v fuok, Hjs I K(Hrkkj; ç'uk% çnH; UAA v Ļ!s ç'uk% Øe'k% çHe&R) rh, &rrh, &preµZ34.61 Hz %4% Hão"; fUA

([) OI; lied c' usiq 50% v al% v by builed c' usiqp 100% v al% o 8 f Yi d % Hos A

(x) pr**ejekti k**Ur%i ×pe%ç'u%i **t**iÑirelè; esu ,o i ek/ş%v iÇiHik i olek v Äğiku%iHio"; frAv iÇisç'uk% I tiÑir @juh@käXiHikilelè; ekuladisti ,d su elè; esu i ek/irq'iD) USA

#### ç'ui #fuekZkfof/%

- 1. ç'ui **:::; fueiziai ±Ñreiè; eu HosA**
- 2. ç'ui =ls i xp (5) v fuok liZç'ul%Hio"; fUA
- 3. ¢'ulule~v Äiulap foHit ue~v / liyf[ lr: i sk Hio'; frµ
  - cife%c'u%μv; a(cife% c'u%3Vd pri4/; xri HBÔðeekU R; HosA v fLeu~c'us piblj%(þ) fod ¥ijfgrk%(v fuok lijs I f(Irikijc'u%cifil; UA) (4×4%/46v Äl%)
  - II. f)rh%ç'u%(çHe3klitJr%μ | ç| Äē NulgyÄijfuniti uila'ykl); a Ϙiţ; kq; Hium2klitk~ 'ykl ±, açnit; rA (2×8%46/ÄK).

- III. rì h, %ç' u%(f) rh, 34.d iL/r %μ l çi Äãd iQi iSbofunili: wila'yid); a Qiţ; kq; Hitufn24.dilk ~ 'yid ±, açnil; rá. (2×8%46/Äl%)
- IV. pr**HZ c,' u%(rìh, 34 di ĽJr%) μ; Hituín 24 k di a u k di dija p v ľĽ R, da c,' ua lek k q~** v ky ky ukła dac,' u}; ac nil; r A. (16 v ÄK%)
- V. i >pe%ç'u%(prijikuli jr%µ
   i çi Äã diĢi išboiuni kuita'yid); a i kÑrelè; eu Ģiţ; k q

   ; Fituri kilik -'yid =; açni; râ
   (2×8%/6v Äl%)

vubjeli rx1114%

- 1. f kipyo/] Ģiţ; iñ v ipķ Z lijk 'leiZoljki kiA
- 2. nìţjepfjr] Ģlį; ki objilioj olijkit ki
- 3. f kliply o/ (i Ele | x)Z] ĢK; kā Nikl/ Kuok ' KL:H, i KgR; H: Nj;] ejBA
- 4. Uttararāmacarita of Bhavabhūti, M.R. Kale.
- 5. nijjepfjr] i Elsrij. Ek>lA
- 6. I blÑr I lígi?; dk bírgit], ñ chñ d Hil; v uājeny no 'litzliji, elshy ky culji hiti] friVy lj</mark> 1978
- 7. I bíŇir i lígiŘ, dkhárgik j cyne milie, k j 'líjnk fud suj olýk ik lij 1978
- 8. I blýr uklad jaj diluvid' ljs Hjár; já çal k lu ' li til i puk foHlaj núj çatsij 1959
- 9. I blvr uluti i ek(ili çli blatelyfi g 'blatej i ligi? fud suj d ku jaj 1960

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**COURSE CODE : SKT-HC-105** 

## i xpei te~%/ eZUkke%(1)

Paper-V : Dharmatantragamah (1)

L	Credits
4	4

i **viiä i?%**80 **v iufij d eM/ i**Äü**iÄ i?%**20 **i e; %3 giji?%** (3 Hours)

CO-SKT-HC-105 - 1 euleir %(i fiele; k % &

eubjer ‰i£lesvè;ksl "V,-4R RSb, projetuk)a cbge.k&(kf=k,Ⓢ&/km&o.kkak)a rSkadr 29 kuka p folrirao.käteflrA,rmk/JR; lahÑrekè;esi fucVy \$kusi fo"k,l; ifriknu&ikeF;ali Ig Hk%Hk&kuefi o/Z&A.eubjer %-dokywtHkAñ?rO;k[;kibphurek,oa ibekf.kdrek or 22 \$vr,o vl;k%vkykalsivè;;ualial fyreA

CO-SKT-HC-105 - 2 euleir%(f)rh leç k % &

v fLeUnie; k s o Bind &o. Hitle/ e ZC O o LFHk, 1% o. Hitle r Sha ozp; h721% i zhd ijk Hap i zri knual zhd ijfof/l fgrafo| r SLv L; v e; uz Nicht%o Bind / e Z; i fjp; ai zhuqfUA CO-SKT-HC-105 - 3 pk ID, i vilić. k pk ID, I vilić. k d IBM; L; v FIZHL=ls i fjf" KV£ i slit el fyr lifu I fUA r Slqekuo/e36 j it ulfr%, n. Nulfr%, I R; L; efgelij, 'kifq=iHar%, 'Hy L; egùðja /eHZHZ lekula egùðlímfo'lk, I%, I fair KA r Slieè; ; usi Ø logilij d aKluao/Z50.

CO-SKT-HC-105 - 4 **pk ID** I **viii. k** 

pk HD, Iwik Halitza (GH;; k Iyielè;; uHH±oLr (u'BitrikuuHhäp vit)(k hA

 31.dl e&û%eutpir%i Helge, k%(1 hÑrelè; es) (d ŵy diflañreléfizip lo¥, kv ly ld s) A
 16 v Äi%

 31.dl e&û%eutpir%i)rh lge, k%(d ŵy diflañreléfizip lo¥, kv ly ld s) A
 16 v Äi%

 31.dl e&û%eutpir%i)rh lge, k%(d ŵy diflañreléfizip lo¥, kv ly ld s) A
 16 v Äi%

 31.dl e&ú%pkiD)l df. lj. 1–273
 16 v Äi%

 31.dl e&p%pkiD)l df. lj. 274–571
 16 v Äi%

fMi . ; %¥

(d) ç'ui=ls i ×p (ý) v fuok, HZoç'ul%-Hio''; fulAr=k çFleç'us 34/d pr 4/; xri HBÔðeeh/JR; p Rohj% (4) fod Yijfgr 1% (v fuok, 14)5 l £(Hr kkijç'ul% çnil;; lust v Us ç'ul% Øe' 1% çFlest}rh, sprij1234/dl 12:1/11%-Hio''; fulA

([)) Qf(; lied c' ušiq 50% v 50% v by ipulied c' ušiqp 100% v 50% o 6 f Y d % Hos A

(x) çHe3Adlık Jr%a`}rh, %ç'u%lah Telè; esa, oleklış %v ÇHaklondak v Äğıtu%Hio"; frAv Çısç'uk% I h Tragunkazki Xihikilelè; ekuladın tili, dısı elè; esal eklarafil) USA

ç'ui #fuekZkfof/%

1- ç'ui =ll; fueizlai tiÑrelè; eta HosA

2- ç'ui = s i > p (5) v fuok liZç'ul?/Hio"; fUA

3- ç'ulule~v Äliulep foHit ue~v / lilyf[kr:isk Hio"; frµ

- cfle%c, u%μv; a(cfle%) c, u%3Vd pr ψ; xr i HôôžeekJ R HosA v fLeu~c, usp iðlj%(þ) fod ¥i jfgr k%(v fuok lijs i f(ir kijc, uk/cnii; UA) (4×44/46/Äk/s)
- II. f)rh,%ç'u%(çHe3AdikUr%µ; Hikum&/iBÔðee~vkUR, daç'uaibiÑrelè; esi lek/krq ç'u}; açnik; r& (16v ÄK);
- III. rìh %ç' u%(f)rh 3kti LJr%μ ; Hituín2/ Hôôðee~v LJR i Hitai); al çi Äã Ģlį; k qi Hitaid; a çni; rā.
- IV. pr**φiž**ç'u%(rìh) **3**4d **i**Ur%μ ; **Hitum**24 **BÖ**ðee~v **i**UR, fuc V **iie**d aç'u}; al ek kręç'uprφ4, a çnil; r**A** (16ν Äl%)
- V. i×pe%ç'u%(pr#jä%dikUr%μ; Hikufm24 lBÖðee~vkUR; ikaka); alçiÄã (91); kajikBkak, a çmil; rA.

vubjelirx11116%

1. eutpir %eldfizi) loy h fgr (; l ñ ok ap 'leizd k hd j%fu i/z) hij i k] eliçti/2 1909

- 2. eutpir%estirfiReutfik; & est; | ElőxÄlütik>l; i fjey i f@d\u00ediv0] fm\yf; 1998
- 3. diligyh, v Rezil: 🕴 v učji na; obji ' lit.: Hjegjpluk y Neurit ] fn VykA
- 4. Kauțilya's Arthaśāstra, Tr. R. Shamasastry, Wesleyan Mission Press, Mysore

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# ,eñ,ñi bÑre~(çFleao"kē)-]f}rh,ai ≠le~

M. A. SANSKRIT (PREVIOUS), SECOND SEMESTER COURSE CODE : SKT-HC-201

## **'KBi ±e~%clã. le~oslÄliu p**

Paper-VI : Brahmanam Vedangani Cha

i viitä ik⁄60

v Həfj d ety HÄülÄR%20

le; %3 gisk (3 Hours)

Co. 201. I:, sjşchā. H.; 'kq%'ksk[; kma iqhL; egùb)a irriz Rt'hyrk, f%f'k[k]; jit i yv, KL; fo'k, 'p Kk, rSA

Co. 201. II : fu#Dr' HL:HL; e[i; i z k ue]- fu?k VISI d fy r' Kolule FHZ i Äfri R;; k% n'V;-k fuojiue~bR ss fo'k K%l fUA v fLeu~ ?Nd s Nick%e[i;: i sk fuojiufi %kUku~ KH; fUA

Co. 201. III : , r fleu~ 34d snor ķ 1% i fj HKH ½plaHak nor klav klij% i eģiklul la Klue~bR s S fo'k S Nick% i fj fpr 1% Hio"; fU A

Co. 201. IV : OBid Hittik 1% v ocić Hite oBid Qidj. H.; lo'; drk Hofr A, rfLeu~ 34d s oBid Qidj. H.; cić is NidS: 107; r A

<b>31/d e8û%, sjşclã. le~%/ è; k %33 (' kq%isi( ; kue)-µ</b>	
<b>i biÑrelè; es: Ģiļ;; k v ly ipulitèd %ç' u%p</b> Å	16 VÄ₩%
3Nde&ü%fu#DeµçHe%vè,k%µQK[;k]v hyhpulied%ç'u%tuojāuliu pA	16 VÄ₩%
<b>31/d e&amp;ý%fu#Deµ f)rh, %/e ķ %(185 i ld%_l lre%/e ķ %(187 i ld%/µ</b>	
<b>Ģiį; ji</b> v <b>iyipulied %ę' u% iuojiuli</b> u pA	16 VÄK%
<b>3Vd e&amp;p%oBd aQdj. lep</b>	
o Gold Hittly, K%Loc: i e_ o Gold y KBid Hittly, K%a/ Uje_l fU/% i ni KB%_ o Gold Loj%_	
y#,∼ydlj%y¥-ydlj%AçR;k%,µ'kr]'kkup}Doljadkup}r <b>qHit RA</b>	16 VÄK%

L	Credits
4	4

f**\li . ; %**\$\$

(d) ç'ui=ls i xp (ý) v fuok, MZ-ç'ul%-Hio'', fu/Ar=k çHeç'us 34/d prü//, xri HBÔØeell/JR, p Bolj%

(þ) fod Yijfgrk% (vfuok, kljba i £(klrkki)jç'uk% çnkl; UsA vijs ç'uk% Øe'k% çfle&f)rh,&rrh,&pr**ijiE3N**dii 12:1/18/Hio''; 1UA

([)) Qi(; lied ç'usiq 50% v ta% v iy ipulied ç'usiqp 100% v ta% o 8 fYi d % HosA

(x) çHe3Ad KUr%a')rh, %ç'u%d biÑrelè;esa, oleklış%v ÇHkulonEkv Äğdfu%Hio";frAv Çısç'uk% IbiÑr@guh@käXH-Kibelè;ekulad sifi,dsa elè;esal ek/krafiD)U4A

ç'ui #fuekZkfof/%

- 1. ç'ui=li; fueliziel añrelè; ea HosA
- 2. ç'ui = s i > p (5) v fuok lizç'ui%Hio'', fuA
- g' ulule~v Äliulep follit ue~v / liy f[ k: i sk Hio", frµ

  - II. f)rh %ç' u%(çfle3\ti lL)r%µ
    - (d) i Hellah); al bhÑrelè, eu Qil; ; k q; Hitufn2kblik ~i Hellak, açnil; rA (2×4%), Äk% ([l); ; Hitufn2kblik 12% ~, d e ~v ly joulited aç' ual bÑrelè, eu | ek/k qç' u}; a
  - **çnii; rā (8**/ Ä**k%**
  - III. rì**h %ç' u%(í)rh 3ki ii**Jr**%**µ
    - (d) i HBkl;  $a Oli; k \in Hium Addik ~ i HBkld; açnil; r A (2×4% AK) <math>i$ 
      - **([i); Hitufrižkilit ic**‰~, de~v ly ipulited aç' ual ek'k açç' u); açnil; r& (8v Äl\$%)
  - IV. pr**ülkç' u%(rìh 3uli il) r%**µ
    - **(d) i lEki}; aQi(; k e; Rituín2/kilik ~i lEkik; açnil; r \$ (2×4%) ÄK%**
    - **([); ; HituínZkilit, lɛˈ**¼e~, d e <v **ly ipuliè**d aç' ual ek k **eç**' u); açııl**ı; r s**. (8/ Äl%)

(2×8%/46v ÅR%)

- V. **i »pe%ç" u%(pr<b>ijiku i l/ r%**µ
  - **pr<b>ējākli līd**ri libôdel līc‰c;'u); al ek krep;'usk açnil; r£

vulqifi rx11114%

- 1. ,sjs&clã.k(f)rh, Hax)]|k.HaX;|fgr]|E.lad, oe-vuqlad MBM/qldjelyoh]rljk çVk oD)Zoljk It KA
- 2. fu#D] fgluih v uqhad i ã f louijk,.k' IL:Hà b.Nijikt dy cq gluli ] fmVykA
- 3. fu#D (Hix 1-2)] Ld lukegsoj & fu#D Hik; Val Ki fgr] y (e. k.Lo: i] çd kî i K. Kuj ubZin/ly KA
- 4. fu#D] majjāk Zīvīr of Uki fgr] v kululide] i ulA
- 5. fu#D1 E¹ E¹ E² E² cã cấu i fjot d] oBd ; UBy; ] vt cộA
- 6. fgluh fu#D (vè, k, 1, 2, 7)] Ģli; kīd fi yne 'lil.:lij | ligi?; H.Nij] ejBA
- 7. otlici (Oldj.k (Hinc 1822)] jlexilisty] uškuy i f@y*hoc glÅl ] fmVyHA
- 8. A Vedic Grammar for Students, A.A. Macdonell, Motilal Banarsidass, Delhi.

***

COURSE CODE : SKT-HC-202

## I Irei **te~%Qldj. le~HkilioKlue~p** (2)

Paper-VII : Vyakaranam Bhasavijnanam Cha (2)

**i vHÄR%**0 **v Hyfjd eM/HÄüHÄR%**20 **I e; %3 gHjr%**(3 Hours)

Co. 201. II : , sj schä. H.; 'lef%'lisit, ; kusi i ett; egits i i rriz R'livrk, R%f'l (Hi jit i w, KL; fo'k, 'p Kk, r& Co. 201. III : fu#D'liL-H.; etj; i zit ue} fu'& VISI difyr'l Kokule FHZ6 i Älfri R;; i K6 n'V-k fuojaue~bR ss fo'k, R%l fUA v fLeu~ 3kti s NiciK%etj; : i sk fuojaufi 1/4kulu~ KiL; fUA Co. 201. III : , r fLeu~3kti smork, R%i fj HKHi, 1/2 plaHak/5, morkulav ki ji% i etjiNuli la Kue~bR s%fo'k, %NiciK%i fifpr K%Hio''; fUA

Co. 201. IV : oBid Hitlik 1% v ociá Hit: oBid Qidj. H.; lo'; d r k Hofr A, ríleu~ 34d s oBid Qidj. H.; clá la NidSátØ; r A

16 VÄK% **3Vd e&:%oj njit %y 34 1/4Ud lêch** v/ Kyf[k;cdj.k.Kc¼ vkkel kkcj.keQK;;K] cetek vkkyški vila: i fl f%cfQ; kpu (d) fräusvnincdj. le~ $\frac{1}{\sqrt{\sqrt{1}}}$ ([A ule/kgdj.leA(x) v RuisnefØ; IA(3) i j LeBnefØ; IA 16 VÄK% **3Vd e&1% ojnjit %y 31 1/4Ud lêch** v/ Kayfik çdj. K. Kayla kakal kakaj. kaQKi; K. çeşkik viliyişki vallar ifi f%çf@; k.pu (d) | elt çdj.leA ([]) rf¼rçdj.le~(pkjfHili; De)-A **31/d e&/% Hi/lit nii(k % fi ¼1/d lên/n (i ui/Z2)- %d lịd çd j. le~(l liÑr elè; esi)** 08 VÄR/6 (d) I kaloj. kal vlOli ; kA 08 VÄR% ([) I willy six will ad lijd StoHiD & cfri knueA **3Vd e8p% HklioKueµ** 16 VÄK% I LIÑT HIKIK (o Bedhvieldhp) Av Hieb Kjuest v Hiztoriel: dit. Klu frik pA èofufoKlueµ nipi;. Ilo; ol%r slaçd k IZk p_ èouhlaèol; lifed aoxhil j. leA : i foKlueµ' Kofueizle_' Kokukar Ühliu_ / kr (kçR; ' pAolD), foKlueµ i nØe%A

L	Credits
4	4

f**\li . ; %¥** 

(d) ç'ui=ls i xp (y) v fuok MZzç'ul%Hio"; fulAr=k çHeç'us 34/d pr 4/; xri HBÔØeelkUR; p Polij%

(þ) fod Yijfgrk% (vfuok, kljb. I £(klrkäljç'uk% çnkl; blst. vb/s ç'uk% Øe'k% çfie&()rh, &rrh, &pr**iji23u**li 12:1/4%/Hio''; fb/A

(x) rìh, 30.41 KJr% proježç'u% JaÑrelè; esa ,ol ek/ ş%v UHk lobbk v Äögifu% Hio"; frAv Usç'uk% IbŇr@gubl@ ÄXKH Kblelè; ekuled shii ,dsa elè; esa lek/ krejib) USA

#### ç'ui #fuekZkfof/ %

- 1. ç'ui =li; fueiziai ±Ñrelè; eu HosA
- 2. ç'ui = s i xp (5) v fuok iZç'uk%Hio"; fUA
- 3. ¢ ulule~v Äliulap follit ue~v / liyf[ k: i sk Hio"; frµ
  - cite%c'u%μv; a(cite% c'u%3Vd pr ψ/; xr i HBÔðeek/J R HosA v fLeu~c'us p iðlj%(þ) fod ¥i jfgr k%(v fuok lijs i f(itr kijc'u%citi; UA) (4×4%/6v Äk%)
  - II. f)rh %ç'u%(çFle3Adill/y %μ
     (d) çFle3Adill\$/çdj.lt lic%al u\$; al lalgj.la Øl(; kq; Flitufn2Adillk~I upr q4; a çrill; rfl
     (2×4%θ/Äl%)
    - ([])  $\varphi$  (He 34.4 HD  $\varphi$  dj. kt He 1/4; in); L;  $\varphi$  ( $\varphi$  div) is kin a : if if 1/4 $\varphi$  div); he fy f k q ; Hitu in 24.4 Hitu - i npr i (4, a  $\varphi$  div); r f (2×4.4 A); r f (
  - III. rìh %ç' u%(f)rh 3kti KJr%µ
    - (d) f)rh;34/dH37çdj.btH2%al 44);al kakgj.ha (91);krq;H164/H164/dH11k~l 44pr4//;açmlt;r54 (2×45%ev/Ä13%a
    - ([l) f)rh 34.d B)çdj. It E:¼; in);L; çehnt wildyşli willa:ifi f¼çf@;lafyf[kre;Hitufn24.dbHk~ inproμ/;açmll;rsA (2×4%-94/ÄR)%
  - IV. pr**üli**ç' u%(rì h 3ki li Jr%)
    - (d) rừ h 31 di 167 çdj. là 167 ¼al vh); al 14Ñ relè; esa lindgi. la (91);; k q; Hilu m21 kilink ~i vh r φ); a çmil; r fa (2×4849/Äk);
    - ([)) rìh 34.4 HĐ çdj. Huhpijsk in); L; luhby şiinila lahvrelè; ena dijd 860 HD 8çfri huk ; Hhufn24.4 Hk ~p Folfj v/jşi HÄrifu inifu çnil; UA. (2×4%-9×ÄK);
  - V. i×pe%ç'u%(pr#jä%dikJr%µ pr#jä%dik/xžiBÖ2/eliz:%a lek(kineda ç'u);a lek/kra ç'uprü/;açmil;r& (2×8%/46vÄK%)

vubjelirx11116%

- 1. y 34 ¼Nd liện ți ojnjik ] Oli; în Hitel a ' lik tiệ Hiếh çai k lai fmVy KA
- 2. y 34 j¥kuld lēdīj Ģkļ; lāv ķik ka fej] v (ķoVinikka) bylgicinA
- 3. **y 31 ¼lud lõgi () (; i**ñ J li jluli ' IL:h (3(M) ly] elsiyly cuiji hit ] fnYykA
- 4. oŞidj. Ili ¼ilud lisiqh (i uliz)z] HilAlik nii(k] elsiyiy culji hik] fnYyiA
- 5. oŞidj. III 1/41/dilSiqh (1-2 Hini)] Qilî; ki xisiynik i kMş] pilşilicik i jilijin i ili kini olik ki kA
6. dījdāidj.k(fi ¼ludiēglufa)] i ElārfikĢit; jā Jikuoti 'lil:tāji līgŖ HkNjā] ejBA

7. HK1kvijSHK1diji nehldji) osih gji;kiki ligiR volinelji p. Mx<A

8. i ni niHZel(ili; cyno fi gi d #(lekfo' ofo) ly; ] d #(leka)

#### 9. I leitj Hitligiokiaj cicjile i D skA

10. Introduction to Comparative Philology, P.D. Gune, Pune.

- 11. Transformational Grammar, Ratford, A., Cambridge Univ. Press, 1988.
- 12. Introduction to Linguistics, Ratford, A. et. al., Cambridge Univ. Press, 1999.
- 13. (a) Introduction to Theoretical Linguistics, Lyons, John, 1968.
- (b) Linguistic Semantics, Lyons, John, Cambridge Univ. Press, 1995
- 14. General Linguistics, An Introductory Survey-Robins, R. H., Indiana Press, Bloomington, 1964.
- 15. An Introduction to the Science of Meaning, Oxford Blackwell, Semantics, 1962.
- 16. Sanskrit Syntax, J.S. Speijer, Motilal Banarasidass, Delhi.
- 17. An Introduction to Language, Fromkin, V. and R. Rodman, New York etc. Harcourt, Brace Jovenovich College Publishers, 1988, 1992.
- 18. The Principles of Semantics, Blackwell, Ullmann, Stephen, 1957.
- 19. Semantic Analysis, Ithaca, N.Y.-Ziff, Paul, Comell University Press, 1960.
- Linguistics, An Introduction to Language and Communication-Akmaijan, A.R. Demers and R. Hamish, Cambridge Mass, MIT Press, 1979.

 $\Phi$ 

COURSE CODE : SKT-HC-203



Paper-VIII : Bharatiyadarshanam (2)

L	Credits
4	4

i villä 18%30 v Holfj d ett/ käükä 18%20 I e; %3 gljik% (3 Hours)

CO-SKT-HC-203 - 1 V HZ ag%& fucU Hed i zu%

i voižkelka lnť kill; i zlj. kk 191% y 1934 (11-184 dji zkr% v FHZ azg% i voižkelka lnť kils i zošla dljf; r q fojfpr% mlÑ" (14:191% v fLrA v =k of. killula fof/fu"16: knhu~ v f/ÑR fuc U y \$kua Nicik klaekelka kríkilso sook), fKlitu: i fo"k, i ljk, lai z'kilf" j \$kui fr Hkap foo/ZfrA

CO-SKT-HC-203 - 2 V HZag%& i fD Q [; k

V HZ azyl; x i ar hulai i z aqui; k fo'k l; i telè; ; uHtel elfo'MA CO-SKT-HC-203 - 3 osilui i;%& fucui Hedi zu%

Inkult; kakulaj fpr & oskul ij % oskul rikel; , d % i £1 ½% i zij. katek% v fLr A v fLeu~ ' kai ji} Soskul L; i zejti ¼kul % v è; ij is i oknuj k; su fu: fir KA. Nicik ka y \$ kui fr Hk; K% fod it kHz fuc U kied % i zu% i filefyr % A

### CO-SKT-HC-203 - 4 OSIUI Ij%& x i fDr G I ; k

# 'kkelji}Sosakull; l(neke;;ukHetoLrtµ"Brkai£riknukHetplizax|i£DrOjk[;k vi\${krkA

<b>31/d e&amp;</b> û%y <b>lili( Hildj%</b> v HZÄxg%%  <b>i</b> Ñr elè; en fuc <b>v lied k</b> ⁄ç'uRA	16 VÄK%
<b>3Nd e&amp;::%// HZÄxg%%i f/ Ģlį</b> ; lA	16 VÄK%
<b>3Vd e&amp;</b> ý% i niulu; isidžjaosiluli ij%%iucVilled i%ç'ultA	16 VÄK%
<b>3.ki e&amp;</b> þ% <b>onlyi lj%%i íf Ģlį ; lA</b>	16 VÄ₭%

fMi . ; %¥

(d) ç'ui=ls i ×p (ý) v fuok, HZoç'ul% HIo''; fUAr=k çFleç'us 34/d pr Q/; xri HBÔ2/eeH/J P; p Polj% (þ) fod Yijfgr K% (v fuok, HZ)s l £(Hr Kàjç'ul% çnH; USA v Us ç'ul% 2/e'K% çFle&f)rh, &pr 6/HZ34/dl E://#//HIo''; fUA

([)) QI(; lied c' usiq 50% v zł% v by by ulied c' usiąp 100% v zł% o 8 (Y d % Hos A

(x) çHe 31Udi KUr%f}rh, %ç'u%i tiÑrelè; esu ,o i ek/ş%v (JHk i oblik v Äğifu%Hio"; frA v (Jsç'ul% I tiÑr @juh@läXih-ktlelè; ekuled sifi ,d sı elè; esu i ek/krefil) USA

### ç'ui #fuekZkfof/ %

- 1. ç'ui =li; fuelžiei biÑrelè; eu HosA
- 2. ç'ui =ls i xp (5) v fuok iZç'uk/Hio'', fUA
- 3. **ç'ulule~v Älulep foHit ue~v / liyf[ k: i sk Hio"; frµ** 
  - c, File%c, u%μv; a(c, File% c, u%3Vd pr ψ/; xr i HBÔðeekU R, HosA v fleu~c, usp Folj%(p) fod Yijfgr k%(v fuok Fils I f(Tr kijc, uk@ril; UA) (4×4%6v Äk%)
  - II. f)rh,%ç'u%(çHe3AdiKJr%μ; Hitufn2Adike~vKJR; I kiÑrelè; esu, dafucUafyf[k qfucU}; a çnik; rA (16vÄK%)
  - III. rìh %;'u%(f)rh 3kH KJr%µ I çi Ääiff ); aQil ; ke; Hitufn2kkilk ~i (f ‡ açril; r&

(2×8°/46v ÄR%

IV. pr**ifiZç'u%(rìḥ 3ki li Jr%μ; HiluínZkille~v li JŖ, d aíucU aíy f[k efucU}; açnil; r fl (16v Äl%)** 

V. i »pe%ç'u%(priji ki li jr%µ l çi Ääi ff); aĢi(; k e; Hiun ki ki ki i ff ≠ açni; r k (2×8%/6v ÄK)

#### vulqilli rx11111%

- 1. v Hizangi i Eliñ r Hik Ofi; hñ olp li frini lê; kji pliske kvilj; . Vily; kA
- 2. v HZng%, Ql(; kin; kl/áj ' ll. li) d ki jA
- 3. **v Hizay%, Oli; i fi i Rçalikk' leifzi ligi? HkNi; ejBA**
- 4. Arthasangraha, Eng. Tr. A.B. Gajendragadkar and R.D. Karmarkar, Motilal Banarsidass, Delhi.
- 5. Arthasangraha, Eng. Tr. G. Thibaut, Delhi.
- 6. oslul (j.) Of ; lá crj hikk' (j.) ojski kA
- 7. oslul iji i Eliar Fik Qit; in jleetizz letzfnYy kA
- 8. osibi jį Ģlį; jūxt ku 'li:helyxipdj] olįkit kA

#### 9. osibi iji i Eiñrfik Ģit; iñ Niliú it içzin fej] v (k oV çei kiej by igicinA

10. Vedāntasāra, Eng. Tr. M. Hiriyanna.

11. Vedāntasāra, Eng. Tr. Swami Nikhilananda.

**

COURSE CODE : SKT-HC-204

## **uoei =te~%d k@e~d k@' lkL=te~p**

Paper-IX : Kavyam Kavyashastram Cha

L	Credits
4	4

i **vHäR%**80 **v Hylfjd eM/HÄüHÄR%**20 **I e; %3 gljik%** (3 Hours)

Co-HC-204 : I : if#hrx|dljL; cklL; llelUjifjp;sulg x|egidlO/s^dlnEjh* bR;fHX segikpsk;k% o`Ua^o`UxUlsT>rax|e*;}k ^vks%lelk H#LF0esn~x|L; thore*bfriz*libu O/4RÜ;k;f\$

Co-HC-204 : II : i lijflihid i luhizik i luiskolgd s nifel ezik Hisisisyd Roa elwilliniku» p QRÙk Qli; k r A i ozso unhihk p foj kifizi% i fjfprk% HofUA elè; ee=k i biÑra HofrA

Co-HC-204 : III : diQ' HL:ladiQL; i k Hine A r s6 p diQy (k laxqinkifoopu»p i fri k r fA i ni fjp; si l q diQLekiHK k kD jox E r sfo) k HH-RA

Co-HC-204 : IV : y{k ll&Q ×t ulfu: i.lar R E:14Sp foopulfed Si zuSifo'k i fri hua fo/ h r A, r s fo| lfH2; %d lQ' llL:L; Kluai zh r A

<b>3Vd e&amp;î%ck HIV%d inE</b> jh %eg <b>t osloùIU%</b> v / <b>iiuin2/</b> ⁄// aR/µ	
个Ppiouka/ang)rLrr%bRljH ^d Rad RitefrrefrfpjaQykal;e≭bfri;bbeA	
μx <b>i leis:Ģii</b> ; <b>i</b> A	16 VÄK%
<b>34d e&amp;</b> ü% <b>d líynit %e\$me~ i uZ\$%' y ld k%</b> 34 <b>r%i elűri ; lie</b> µ	
<b>' y ki Ģiţ ; k (l kiÑr elè; es) A</b>	16 VÄK%
<b>3Ud e&amp;ý%fo' oulfk¦sl lígRni 21%µd líjd lĢlí ; lí foopulied %ç' u%pA</b>	
µçRe%ifjRNa%A()rh,%ifjRNa%µvfHXbbc:i.ke}-dbjdk6iþa;k4i;bbeA	16 VÄK%
344de&p%liligiRni21%µdilijdiQil(;)[{foopulited%ç'u%pA	
µf}rh,%ifjFNar%,y{k blin:i.leÇ×tullu:i.lep (dbijdb%o-µ₂o)A	16 VÄK%

fMi . ; %¥

(d) ç'ui=ls i xp (ý) v fuok, MZ, ç'ul%, HIo"; fulAr=lk çHeç'us 34/d prü/; xri HBÔØeelk(JR; pRelij%

(þ) fod Yijfgrk% (vfuok, kljba l £(klrkki)jç'uk% çnkl; UAA vijs ç'uk% Øe'k% çfle&f}rh,&rrh,&pr**ijkE3U**dike://k%/Hio'',fUA

([)) Qf(; lied ç'ušiq 50% v zł% v by by ulied ç'ušiqp 100% v zł% o 8 fYi d % HosA

(x) f}rh, 31vd KU r%r rh, %ç'u%i biÑrelè;esu ,o iekiş%v ÜHkioblik v Äğıfu%Hlo";frA v Üşç'uk% IbiÑr 09juh@kä Xihikilelè;ekulad sılfı ,dsu elè;esu iekik q'iD)U4A

#### ç'ui #fuekZkfof/ %

- 1. ç'ui =li; fuelžiei tiÑrelè; eta HosA
- 2. ç'ui = s i > (5) v fuok lizç'ul?/Ho"; fuA
- 3. ç^ı ulule~v Äliulep follit ue~v / liyf[ k: i sk Hio", frµ
  - cile%c'u%μv; a(cile% c'u%3Vd pr ψ/; xr i HBÔðeek/J i? HosA v fLeu~c'us p iðlj%(þ) fod ¥i jfgr k%(v fuok ii)s i f(ilr kijc'u%crili; UA
     (4×4%/6v Äk%)s
  - II. f)rh %ç'u%(çfle3klikUr%μ i çi ÄãdiQi KBofurili wilax ki); aQi ; k q; Hium2klikin~ x kikk; açnil; r A (2×846v ÄK)
  - III. rìh %ç'u%(f)rh 31.41 KJr%µ lçi Ää'yki); al kiÑrekè; esi Ģiţ; kre; Hibun24.400k ~'yki =k; a çnil; rfa (2×8%46v ÄK%
  - IV. pr**öllç'u%(rìh 3\till)r%**µ

**l çi Äêd kijd k}; aQki ; k ç; Hitufn&kilik ~d kijd ki; açnil; r \$**.

#### **v Hok**

, d afoopulied aç'ual ek kıçı Hitufrizkilik ic ¼aç'u); açril; r \$. (16v Älýb

V. **i »pe%ç' u%(pr<b>ijiku k**Jr**%**µ

**i çi Äð~, d lad lýd laQlí ; k q; Filtuínž/dilik ~d lý d l} ; açnil ; r f**A

#### **v Hok**

; Hituín&kilit lc¼afoopuliède~, d aç'uai ek k qç'u); açnil; r&

#### **v Hok**

; Flifuín 24 kilik ~içi Äã (O) (;; krq~, d k d líjd krnfod ¥ispiek krq~, d % foo pulited % ç'u% çmli; r£k (16v Älf)s

vulqili rx11114%

- 1. d knižji) egkosloùid%i Elñvipk Zjieulik%ielZjik khielj%iL:hp] i kgRikNjej-ejBurjej-i »pel kdj. lej-2001
- 2. d laičji) egkosloùbj i Elñvipk, Zdfiyne fxij) oljkit kA
- 3. dkalicijh%,d i leŇírd ve;juj Mislóki op'lj.kvxaskyA
- 4. ckiHiW dki lígfiRd vubjivuj vejulitki kN\$A
- 5. I lígi?ni Zi; I E lín i híolín d kli; elshy ly cuiji hili: ] fnWy kA
- 6. I lígRni 24. ØK; kö Ñ". leigu ' lit.:HA

7. I lígi?ni 21; I E lő ' lítyxle ' líL:lő; elsiyly culj: Init ] fnVykA

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**COURSE CODE : SKT-HC-205** 

#### n' lei **:le~%/ ei2l:lke%(**2)

Paper-X : Dharmatantragamah (2)

L	Credits
4	4

i **vHäR%**80 **v Hyfjd eM/ HÄüHÄR%**20 **I e; %3 gljsk%** (3 Hours)

CO-SKT-HC-205 - 1 i RfHQân; e~

(kebbénjípra i 27,11HKkán; e~v)65 kői Eizek, L; fo'kők isk i 27,1HKkn'kölL; ifl %2% xb51% víl.rA víl.eu~xb51s'kők/Herkíu rűðkíuj l *V,-62,1ÜC2; fpr%-Lo:ie} izekr`. ka Lo:ie~b62, kn;% fo'k, k% fu: firk% l fUA vL; vè;;usi Nicki% i22,11HK Eizek, L; izeljkil %4Uku~voxUqilç;fUA

CO-SKT-HC-205 - 2 cgel fyrk (i pelee, k %)

ilpjich&oSlo&iEizek,L; xbM% czycel £grk oSlorUMaxe% vfLrA vfL; fo"k,s eU/rs;r~,"lk l £grk czyce. 1% etgikmo fu%L;hA vL;1% doya ipelegè;k,% iblr%A vfLeUeè;k,sl "V,-QEÙE% o. kebp v Kni¢f"baktoUbL; Ht uap fo|rsA v|Rosl £grSk bLd NJ/bfr l Eizek,L; LrfrxbM% or ZSA vL;1% vè;us Nick% oSlorUL; ifjp;a ibluqfUA

CO-SKT-HC-205 - 3 - **I Ki; 7gh** (1-50)

IHBH;7Jg;HZ‰vè;;usa Nick‰'HEDrrakL; ifjp;a ibluqfUA IblÑrelè;esa 'yksiQH[;kHKHHKGuafoo/ZfrA

<b>3Ad e&amp;</b> û% <b>J Kisjit %çRfHKigir, eA</b>	16 VÄK%
<b>31/d e&amp;ü%cãi ígríl; i &gt;pelge; k; %A</b>	16 VÄK%
<b>31/d e&amp;ý%v lpk, 21Äj%l Hilt, 7_gjh%l &amp;</b> 50 <b>i   Ku</b>	16 VÄK%
<b>34d e&amp;þ%v þpk 32äj%d Hit; 3/gjh%</b> 51&8400 i <b>  Ku (1 kivrele; es)</b>	16 VÄK%

10(149)

fMi . ; %¥

(d) ç'ui=ks i ×p (ý) v fuok, MZ-ç'ul%-Hio'', fUAr=k çfleç'us 34/d pr Q/; xri HBÔØeek/JR; p Polij% (4) fod Yijfgr 1% (v fuok, Kijb I £(Hr kijj ç'ul% çnH; USA v Us ç'ul% Øe' 1% çfle&1) rh, &rih, &pr 6/4234/d 12:1/1%/Hio''; fUA

([) Of; Hed c'usiq 50% v al% v by bulled c'usiqp 100% v al% o 8 f Yi d % Hos A

(x) pr**ijāl**uli KJr% i »pe% ç'u% li klīrelē;esu ,o ieki ş% v b/ Hikioka v Äģiku% Hio";frA v b/ sç'uk% I klī**r @ uk@** klā**xi Hiki**elē;ekuled skli ,dsu elē;esu ieki krejiko) blā.

c'ui #fuekZkfof/ %

- 1. ç'ui **:::; fueiziei ±Ñreiè; eu HosA**
- 2. ¢'ui ±s i ×p (5) v fuok lik¢'ul%Hio"; fulA
- 3. ¢ ulule~v Älulep follit ue~v / liy f[ k: i sk Hio", frµ
  - I. çile%ç'u%(34.41 pri)4, xri lBÖØeliJr%, vfLeu~ç'us pilolj%(4) fod ¥jfgrl%(vfuok, lij6) I f(ilrikijç'uk%) tivr@juh@kä.XiHitlek; ekuladatii, da ek; ea i ek/kraçnii; Us%(4×4%46vÄk%).
  - II. f)rh,%ç'u%(çHe3AdikJr%μ ; Hituín&/ IBÔðee~v kJR, daç'uai kÑr@juh@käXiHklek; ekda dalli, da ek; ea lek/k qç'u); açnil; rA. (16v ÄK%)
  - III. rìh %ç'u%(f)rh 3M:l LJr%μ ; Hium2/ BÔðee~v LJR i Heidi); al çi ÄãĢi(; kqi Heidik; a çnil; rā.
  - IV. pr**HZç'u%(rìh 34.d KJr%μ ; Hiluín24 HBÔð**ee~v KJR; fuc**U He**d aç'u); al ek kr**qç'upr\μ**, a çnil; r**A** (16v ÄK)₆
  - V. i xpe%çⁱ u%(pr**iji**) Li y²μ ; Hitufn2./ HBÔ2ee~ v Li R i HBlai}; a i çi Äã i bÑrelè; eu Oli; k ej HBlakk, açnil; r\$.

#### vubjelirx##%

- 1. çRîHKigh; ej-vuqî (Alik; ilî li Elinît; nə filigi elisiyiy culjil iniki) fmYyi&110 007
- 2. çR(fHK)gàn, e~(^rùo chi/ dhi fgluh Vhikr Fikvuqha Ifgr)]vuq̃f loʻlalj vo LFH)d khA
- 3. Dimitri Semenov, Pratyabhijñāhrdayam of Kşemarāja The Essence of Self-Recognition/Introduction.
- 4. Śrī Brahma-Samhitā (Chapter-5), Tr. & Purport by Bhaktisiddhānta Saraswati Goswami Ṭhākura, Bhaktivedanta Book Trust, Bombay, 1991
- 5. **Jicăi fariț Jin ioxikolie (Îr Vidik foriț enk**.) 1958
- 6. I Nik, Zgjil, Jhläjipk ibjfprit y (eli jiQit; t fgrit pişilizk Ñ". Int. v d inel) oğuktili 2007
- 7. I NH; Zgifi Ģlį; jugigielin fikieliji pilskieki klūri i liji vielėloji olijkit ij 2005
- 8. 'Insykçilnik Mşioşikla vixe %,d ve;uidykçdik kuioşik iki 2011

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# COURSE CODE : SKT-HC-206

i wäik (Maximum Marks): 50

Credits: 2

# fMi. lh %, eñ ñ (l LÍÑre)-86)rh l =11; i LBÔðel ellr‰vubljaçRef}rh l =1, 16%v/la i LBÔðee-vLUR, Nokk Lal LiÑrelè; eu ellipid hijk(lkvk, lisf; ", r£l

**Note:-** Viva-Voce of the students, based on the syllabus covered in their 1st and 2nd Semester courses, will be conducted through Sanskrit medium after the completion of the syllabus of M.A. Sanskrit, Second Semester.

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### CHOICE BASED CREDIT SYSTEM

**Open Elective** 

#### COURSE CODE: SKT-OE-207

# प्राचीनभारतीयसंस्कृतिः, दर्शनं भाषाविज्ञानं च (1)

#### Prācīnabhāratīyasamskrtiņ, Darśanam Bhāṣāvijnānam Ca (1)

L	Credits	अङ्काः 40	
4	2	आन्तरिकमूल्याङ्क	नाङ्काः 10
		योगः 50	
		समयः 3 होराः	
घटव	<b>क्म्-1</b> :	(क) यजुर्वेदः (34. 1-6) - शिवसंकल्पसूक्तम्	4 अङ्काः
		(ख) तैत्तिरीयोपनिषद् - शिक्षावल्ली (अनुशासनोपनिषद्) - व्याख्यामात्रम्।	4 अङ्काः
घटव	<b>क्म्-2:</b>	भारतीयनैतिकशिक्षा -	
		नीतिशतकम् : 1 - 50  श्लोकाः - व्याख्या आलोचनात्मकप्रश्नः च।	8 अङ्काः
घटव	<b>क्म्-</b> 3:	भगवद्गीता, तृतीयाध्यायः, कर्मयोगः : व्याख्या आलोचनात्मकप्रश्नः च।	8 अङ्काः
घटव	<b>क्म्-4</b> :	सामान्यभाषाविज्ञानम् -	8 अङ्काः
		(क) वर्णमाला (संस्कृत-ध्वनयः - स्वराः व्यञ्जनानि च)।	

(ख) वर्णानाम् उच्चारणस्थानानि प्रयत्नाः च।

(ग) भाषाविज्ञानस्य सामान्यपरिचयः, भाषायाः विशेषताः, भाषापरिवर्तनस्य कारणानि,

अर्थपरिवर्तनस्य कारणानि।

### टिप्पण्यः :-

- आन्तरिकमूल्याङ्कनाय सत्रपरीक्षा भविष्यति। तत्र 10 अङ्काः निर्धारिताः।
- परीक्षायाः माध्यमः संस्कृतम् अथवा हिन्दी अथवा आंग्लभाषा भविष्यति।
- 3. प्रश्नपत्रे पञ्च (5) प्रश्नाः प्रदास्यन्ते। प्रथमप्रश्ने चतुर्णां घटकानाम् आधारेण लघूत्तराः चत्वारः (4) विकल्परहिताः (अनिवार्याः) प्रश्नाः प्रक्ष्यन्ते। अस्मिन् प्रश्ने 8 अङ्काः भविष्यन्ति। अन्ये चत्वारः (4) प्रश्नाः क्रमशः प्रथम-द्वितीय-तृतीय-चतुर्थघटकाधारिताः भविष्यन्ति। एषु प्रतिप्रश्नं 8 अङ्काः भविष्यन्ति।

4. व्याख्यात्मकप्रश्नेषु 50% अंशः, आलोचनात्मकप्रश्नेषु च 100% अंशः वैकल्पिको भविष्यति।

### प्रश्नपत्रनिर्माणविधिः

- प्रश्नपत्रस्य निर्माणं सरलसंस्कृतभाषया भविष्यति।
- 2. प्रश्नपत्रे **पञ्च (5)** प्रश्नाः प्रदास्यन्ते।
- प्रश्नानाम् अङ्कानां च विभाजनं निम्नरूपेण भविष्यति :-

I.	प्रथमः प्रश्नः - अस्मिन् प्रश्ने <b>चतुर्णां घटकानां पाठ्यक्रमस्य आधारेण चत्वारः (4)</b>	
	विकल्परहिताः (अनिवार्याः) लघूत्तरप्रश्नाः प्रदास्यन्ते।	८ अङ्काः
II.	द्वितीयः प्रश्नः - <b>(क)</b> प्रथमघटकस्य <b>क</b> -भागे निर्धारितस्य पाठांशस्य मन्त्रद्वयं दत्त्वा एकस्य	
	मन्त्रस्य व्याख्या प्रक्ष्यते।	4 अङ्काः
	<b>(ख)</b> प्रथमघटकस्य <b>ख</b> -भागे निर्धारितस्य ग्रन्थस्य पाठांशद्वयं दत्त्वा एकस्य पाठांशस्य	
	व्याख्या प्रक्ष्यते।	4 अङ्काः
III.	तृतीयः प्रश्नः - <b>(क)</b> द्वितीयघटके निर्धारितस्य ग्रन्थस्य श्लोकद्वयं दत्त्वा एकस्य श्लोकस्य	
	व्याख्या प्रक्ष्यते।	4 अङ्काः
	(ख) द्वितीयघटके निर्धारिताद् ग्रन्थाद् एकस्य श्लोकांशस्य आलोचनां लिखितुं श्लोकांशद्वयं	
	प्रदास्यते।	4 अङ्काः
IV.	चतुर्थः प्रश्नः - <b>(क)</b> तृतीयघटके निर्धारितस्य ग्रन्थस्य श्लोकद्वयं दत्त्वा एकस्य श्लोकस्य	
	व्याख्या प्रक्ष्यते।	4 अङ्काः
	(ख) तृतीयघटके निर्धारिताद् ग्रन्थाद् एकस्य श्लोकांशस्य आलोचनां लिखितुं श्लोकांशद्वयं	
	प्रदास्यते।	4 अङ्काः
V.	पञ्चमः प्रश्नः - चतुर्थघटके निर्धारितविषयाणाम् आधारेण प्रश्नद्वयं दत्त्वा एकस्य प्रश्नस्य उत्तरं	
	प्रक्ष्यते।	8 अङ्काः

#### अनुशंसितग्रन्थाः -

- 1. n@\&egkij]'lEy;tqiiHE;]elshyly cuiji hut]fn\ykA
- 2. Lolehn; kolal i j.Lorf); tqiHK; ] i Előcánůk ft Kit ja jley ky di jv VLV, i kahr (gl); kil) A
- 3. ršija, istulinj- iglulin (Alija, idligu Loleh çi ija, çilikulu i ji Lorija dikilika

4. Hkājījulir'kd] I Eind, oaigluh Ģlį; klijutulnii 'likahi kN\$jelstyly culji hit] mVykA

- 5. ulir' k dej-^uliri Rt (guli Qit; k ku ju soj' litzih ety xipdj) pišiti i oj k k ka
- 6. ulfr'kde]-IELñ, oaQl[; lñ Nilljik soj çi ln feJ] v (koV çdikluj 26 cyjlei ji glnh] bylgiclnA
- 7. **JienHkonduk (fgluih v uqia i fgr)] xi**uk çis**j xiji (i i jA**

#### 8. JIÑ": kf=ki Elj JienHkondrk (f)rh] rìh, oaprijZvè, k) A

- 9. Radhakrishnan, Gītā.
- 10. nəhnük 'leliZHik'id hvijsi bilir Hikit gij; kiki ligi?; v dineli) p. Mac (+ 1990)
- 11. dfi ynə f}osfj Hitlefoldu , oaHitlefill:iţ fo'ofoj ly; çdikluj pi6j oljukit HA
- 12. d. III. gi Hikiliokiuj i ligi? HkNjij ejBA
- 13. Burrow, T. : The Sanskrit Language.
- 14. Gune, P.D. : An Introduction to Comparative Philology, Oriental Book House, Poona, 1958.

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**Programme Outcomes (PO's) of Post Graduate CBCS Programmes/Courses in the Faculty of Indic Studies, Kurukshetra University, Kurukshetra** PO 1. Scientific & Logical knowledge of ancient Indian wisdom.

- PO 2. Enhancing knowledge of Indian art & cultural traditions.
- PO 3. Knowledge of Vedic, medieval & modern Philosophies.
- PO 4. Inculcation of nationalism and other moral values.
- PO 5. Enhancing mental relaxation and peace by adopting prayer, chanting, yoga and meditation.
- PO 6. Preservation of Indian arts & heritage by using modern technology.
- PO 7. To impart knowledge of different sanskaras & philosophies.
- PO 8. Imparting knowledge of folk traditions in different disciplines of the faculty.
- PO 9. Developing aesthetics, creativity & skills like singing, painting, dancing.
- Po 10. Improving the emotional intelligence through Geeta.

## PSOs of M.A. Sanskrit, Pali & Prakrit

- 1- on  $f(x) = \frac{1}{2} \int \frac{1}{2} dr + \frac{1}{2} \int \frac{1}{2}$
- 2- Ladr LkfgR; , oadk0; "kkL= dsv/; ; u kjk Hkkjrh; eskk , oa dk0; dyk dk Kku
- 3- Ladr 0; kdj.k ds v/; ; u kjk Hkk'kk foKku , oa Hkk'kk dk\$ky dk fodkl
- 4- I kfgfR; d vfHk#fp] 0; kogkfjd Kku] "kkL=kDr I adkj , oau\$rd e¥; ka ds vUrfub\$k }kjk 0; fDrRo fodkI
- 5- ; kx , oa vk/; kfRedrk dh i<br/> ifRr }kjk LoLFk thou i)fr , oal nkpkj if"k{k.k

# CO, PO, PSO MATRIX (MAPPING) M.A SANSKRIT SEMESTER I & II

Paper	PO 1	PO 2	PO 3	PO 4	PO	PO	PO	PO	PO 9	PO 10	PSO	PSO2	PSO	PSO	PSO
_					5	6	7	8			1		3	4	5
SKT-HC-	3	3	3	3	3	2.25	3	2.25	2	2.25	2.75	3	3	3	3
101															
SKT-HC- 102	3	2.5	2.75	3	2	2.75	3	2.75	3	1	3	2.75	3	2.75	2.75
SKT-HC-	3	3	3	3	2.5	1	3	1	2	2	2.75	3	2.75	3	2.75
103															
SKT-HC- 104	2	3	1	3	2	1	2.5	1	3	1	3	2.75	3	2.75	3
SKT-HC-	3	3	2	3	3	1	3	1	2	1	2.75	3	2.75	3	2.75
105	2	-	-	-	-	-	-	-			2		~ -	2	2
201	3	2	3	3	2	2	3	2	1	1	3	1	2.5	3	3
SKT-HC- 202	3	1	2	1	1	2.5	2	1	3	1	1	1	3	2	3
SKT-HC- 203	3	2	3	3	2	2	3	2	2	2	3	1	1	3	3
SKT-HC- 204	2.5	3	2	3	2	2	2	3	3	1	1	3	1	3	2
SKT-HC- 205	3	3	3	3	3	1	3	2	2	1	3	1.5	1	3	3

# CO, PO, MAPPING MATRIX SEMESTER I

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
101										
Paper										
CO.101.1	3	3	3	3	3	3	3	2	2	3
CO.101.2	3	3	3	3	3	2	3	2.5	2	2
CO.101.3	3	3	3	3	3	2	3	2.5	2	2
CO.101.4	3	3	3	3	3	2	3	2	2	2
AVG	3	3	3	3	3	2.25	3	2.25	2	2.25

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
102										
Paper										
CO.102.1	3	2.5	2.75	3	2	2.75	3	2.75	3	1
CO.102.2	3	2.5	2.75	3	2	2.75	3	2.75	3	1
CO.102.3	3	2.5	2.75	3	2	2.75	3	2.75	3	1
CO.102.4	3	2.5	2.75	3	2	2.75	3	2.75	3	1
AVG	3	2.5	2.75	3	2	2.75	3	2.75	3	1

# CO, PO, MAPPING MATRIX SEMESTER I

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
103										
Paper										
CO.103.1	3	3	3	3	2.5	1	3	1	2	2
CO.103.2	3	3	3	3	2.5	1	3	1	2	2
CO.103.3	3	3	3	3	2.5	1	3	1	2	2
CO.103.4	3	3	3	3	2.5	1	3	1	2	2
AVG	3	3	3	3	2.5	1	3	1	2	2

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
104										
Paper										
CO.104.1	2	3	1	3	2	1	2.5	1	3	1
CO.104.2	2	3	1	3	2	1	2.5	1	3	1
CO.104.3	2	3	1	3	2	1	2.5	1	3	1
CO.104.4	2	3	1	3	2	1	2.5	1	3	1
AVG	2	3	1	3	2	1	2.5	1	3	1

# CO, PO, MAPPING MATRIX SEMESTER I

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
105										
Paper										
-										
CO.105.1	3	3	2	3	3	1	3	1	2	1
CO.105.2	3	3	2	3	3	1	3	1	2	1
CO.105.3	3	3	2	3	3	1	3	1	2	1
CO.105.4	3	3	2	3	3	1	3	1	2	1
AVG	3	3	2	3	3	1	3	1	2	1

### CO, PSO, MAPPING MATRIX M.A SEMESTER I PAPER-I-SKT-HC-101 SAMHITA UPANSIHAD CHA

SKT-	PSO 1	PSO 2	PSO 3	PSO 4	PSO
HC-					5
101					
CO-1	3	3	3	3	3
CO-2	3	3	3	3	3
CO-3	2	3	3	3	3
C0-4	3	3	3	3	3
AVG	2.75	3	3	3	3

### CO, PSO, MAPPING MATRIX M.A SEMESTER I PAPER-II-SKT-HC-102 VYAKARANAM BHASAVIJNANAM CHA

SKT- HC- 102	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	3	2.5	3	3	2
CO-2	3	3	3	2.5	3
CO-3	3	3	3	3	3
C0-4	3	2.5	3	2.5	3
AVG	3	2.75	3	2.75	2.75

#### PAPER-III-SKT-HC-103 BHARTIYA DARSHAN

SKT-	PSO 1	PSO 2	PSO 3	PSO 4	PSO
HC-					5
103					
CO-1	2.5	3	2	3	3
CO-2	3	3	3	3	3
CO-3	2.5	3	3	3	3
C0-4	3	3	3	3	3
AVG	2.75	3	2.75	3	2.75

### PAPER-IV-SKT-HC-104 KAVYAM NATAKAM CHA

SKT-	PSO 1	PSO 2	PSO 3	PSO 4	PSO
HC-					5
104					
CO-1	3	2	3	2	3
CO-2	3	3	3	3	3
CO-3	3	3	3	3	3
C0-4	3	3	3	3	3
AVG	3	2.75	3	2.75	3

## PAPER-V-SKT-HC-105 DHARMATANTRAGAMAH (1)

SKT- HC- 105	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO-1	2	3	3	3	2
CO-2	3	3	3	3	3
CO-3	3	3	2	3	3
C0-4	3	3	3	3	3
AVG	2.75	3	2.75	3	2.75

# CO, PO, MAPPING MATRIX M.A SANSKRIT II SEMESTER

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
201										
Paper										
CO.201.1	3	2	3	3	2	2	3	2	1	1
CO.201.2	3	2	3	3	2	2	3	2	1	1
CO.201.3	3	2	3	3	2	2	3	2	1	1
CO.201.4	3	2	3	3	2	2	3	2	1	1
AVG	3	2	3	3	2	2	3	2	1	1

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
202										
Paper										
CO.202.1	3	1	2	1	1	2.5	2	1	3	1
CO.202.2	3	1	2	1	1	2.5	2	1	3	1
CO.202.3	3	1	2	1	1	2.5	2	1	3	1
CO.202.4	3	1	2	1	1	2.5	2	1	3	1
AVG	3	1	2	1	1	2.5	2	1	3	1

# CO, PO, MAPPING MATRIX M.A SANSKRIT II SEMESTER

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
203										
Paper										
CO.203.1	3	2	3	3	2	2	3	2	2	2
CO.203.2	3	2	3	3	2	2	3	2	2	2
CO.203.3	3	2	3	3	2	2	3	2	2	2
CO.203.4	3	2	3	3	2	2	3	2	2	2
AVG	3	2	3	3	2	2	3	2	2	2

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
204										
Paper										
CO.204.1	2.5	3	2	3	2	2	2	3	3	1
CO.204.2	2.5	3	2	3	2	2	2	3	3	1
CO.204.3	2.5	3	2	3	2	2	2	3	3	1
CO.204.4	2.5	3	2	3	2	2	2	3	3	1
AVG	2.5	3	2	3	2	2	2	3	3	1

# CO, PO, MAPPING MATRIX M.A SANSKRIT II SEMESTER

SKT-HC- 205	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
Paper										
CO.205.1	3	3	3	3	3	1	3	2	2	1
CO.205.2	3	3	3	3	3	1	3	2	2	1
CO.205.3	3	3	3	3	3	1	3	2	2	1
CO.205.4	3	3	3	3	3	1	3	2	2	1
AVG	3	3	3	3	3	1	3	2	2	1

# CO, PSO, MAPPING MATRIX M.A SANSKRIT SEMESTER II

# PAPER-VI BRAHMANAM VEDANGANI CHASKT-PSO 1PSO 2PSOPSO

HC-201	1501	1502	3	4	5
CO.201.1	3	1	2.5	3	3
CO.201.2	3	1	2.5	3	3
CO.201.3	3	1	2.5	3	3
CO.201.4	3	1	2.5	3	3
AVG	3	1	2.5	3	3

# CO, PSO, MAPPING MATRIX M.A SANSKRIT SEMESTER II

## PAPER-VII VYAKARANAM BHASHAVIJNANAM CHA (2)

SKT-	PSO 1	PSO 2	PSO	PSO	PSO
HC-202			3	4	5
CO.202.1	1	1	3	2	3
CO.202.2	1	1	3	2	3
CO.202.3	1	1	3	2	3
CO.202.4	1	1	3	2	3
AVG	1	1	3	2	3

#### PAPER-VIII BHARTIYA DARSHAN (2)

SKT-	PSO 1	PSO 2	PSO	PSO	PSO
HC-203			3	4	5
CO.203.1	3	1	1	3	3
CO.203.2	3	1	1	3	3
CO.203.3	3	1	1	3	3
CO.203.4	3	1	1	3	3
AVG	3	1	1	3	3

### CO, PSO, MAPPING MATRIX M.A SANSKRIT SEMESTER II PAPER-IX KAVYAM KAVYASHASTRAM CHA

SKT-	PSO 1	PSO 2	PSO	PSO	PSO
HC-204			3	4	5
CO.204.1	1	3	1	3	2
CO.204.2	1	3	1	3	2
CO.204.3	1	3	1	3	2
CO.204.4	1	3	1	3	2
AVG	1	3	1	3	2

## PAPER-X DHARMATANTRAGAMAH (2)

SKT-	PSO 1	PSO 2	PSO	PSO	PSO
HC-205			3	4	5
CO.205.1	3	1.5	1	3	3
CO.205.2	3	1.5	1	3	3
CO.205.3	3	1.5	1	3	3
CO.205.4	3	1.5	1	3	3
AVG	3	1.5	1	3	3

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SCHEME, SYLLABUS AND COURSES OF READING (Modified w.e.f. the Academic Session : 2021-2022)

एम०ए० (संस्कृत)-कक्ष्यायाः द्वितीयवर्षीयपाठ्यक्रमः सत्रद्वये (तृतीयसत्रे चतुर्थसत्रे च) विभक्तः वर्तते। तत्र प्रत्येकं सत्रे पञ्च वैकल्पिकाः वर्गाः [वर्गः (क) वेदः, वर्गः (ख) व्याकरणम्, वर्गः (ग) भारतीयदर्शनम्, वर्गः (घ) संस्कृतसाहित्यम्, वर्गः (ङ) धर्मतन्त्रागमः (2016-2017 शैक्षिकसत्रतः प्रवृत्तः)] सन्ति येषां विद्यार्थी / परीक्षार्थी सत्रद्वयार्थं कमपि एकं वर्गं स्वीकर्तुं शक्नोति। प्रतिसत्रं प्रत्येकं वर्गे अध्ययनार्थं चत्वारि पत्राणि निर्धारितानि सन्ति। एतदतिरिक्तं सर्वेषां पञ्चानां वर्गाणां छात्राणां कृते प्रतिसत्रम् एकम् अनिवार्यपत्रम् – तृतीयसत्रे एकादशं पत्रम् : पालिभाषा साहित्यं च; चतुर्थसत्रे च षोडशं पत्रम् : प्राकृतभाषा साहित्यं च – निर्धारितं वर्तते। इत्थं च तृतीयसत्रे प्रत्येकं वर्गे समुदितानि पञ्च (1+4=5) पत्राणि निर्धारितानि सन्ति। एवमेव चतुर्थसत्रे प्रत्येकं वर्गे पञ्च (1+4=5) पत्राणि निर्धारितानि सन्ति। एम०ए० (संस्कृतम् )–

एवमव चतुथसत्र प्रत्यक वग पञ्च (1+4=5) पत्रााण निधारितानि सान्त। एम०ए० (संस्कृतम् )– चतुर्थसत्रस्य पाठ्यक्रमसमाप्तेः अनन्तरं तृतीयचतुर्थसत्रयोः वैकल्पिकवर्गानुसारेण अधीतं पाठ्यक्रमम् आश्रित्य छात्राणां संस्कृतमाध्यमेन मौखिकी परीक्षा आयोजयिष्यते। एतदर्थं 50 अङ्काः निर्धारिताः सन्ति।

तृतीयसत्रे चयनाधारितश्रेयोदानपद्धत्यनुसारेण संस्कृतेतरछात्रेभ्यः एकम् वैकल्पिकं पत्रं वर्तते। एतदर्थं 40 अङ्काः, आन्तरिकमूल्याङ्कनाय च 10 अङ्काः निर्धारिताः सन्ति।

परीक्षासमय: प्रतिपत्रं 3 होरा: भविष्यति। प्रत्येकं लिखितपत्राय अशीतिः (80) अङ्काः विद्यन्ते। एतदतिरिक्तं प्रतिपत्रं विंशतिः (20) अङ्काः आन्तरिकमूल्याङ्कनाय अधोनिर्दिष्टरूपेण निर्धारिताः –

(i)	प्रतिपत्रम् एक	ग परीक्षा संगोष्ठी वा	:	50% = 10 अङ्काः
(ii)	एका कक्ष्याप	रीक्षा	:	25% = 05 अङ्काः
(iii)	कक्ष्यायाम् उ	गस्थिति:	:	25% = 05 अङ्काः
	कक्ष्यायाम् उप	स्थितेः अधोलिखितरीत्या अङ्काः प्रदास्यन्ते-		
	(1) 91% तो	ऽग्रे	:	5 अङ्काः
	(2) 81% त:	90% पर्यन्तम्~	:	4 अङ्काः
	(3) 75% त:	80% पर्यन्तम्~	:	3 अङ्काः
	(4) 70% त:	74% पर्यन्तम्~	:	2 अङ्काः
	(5) 65% त:	69% पर्यन्तम्~	:	1 अङ्क:

The syllabus of M. A. Sanskrit (Final) class is bifurcated into two semesters, namely, Semester-III and Semester-IV. There are five optional Groups (Group-A: Veda; Group-B: Group-C: Indian Philosophy; Group-D: Sanskrit Literature; Grammar; Group-E: Dharmatantrāgamah) in each Semester out of which the student/examinee can opt any one Group for the both semesters. Four papers are prescribed for study in each Group per Semester. Besides, one compulsory paper is prescribed in each Semester (Paper-XI: Palibhasa Sahityam Cha in the 3rd Semester, and Paper-XVI: Prakritabhasa Sahityam Cha in the 4th Semester) for the students/examinees of all the five Groups. Thus the total number of papers prescribed for the  $3^{rd}$  Semester is five (1+4 = 5). In the same way the total number of papers prescribed for the  $4^{th}$  Semester also is five (1+4 = 5). Viva-Voce of the students, based on the syllabus covered in their Optional Groups of 3rd and 4th Semester courses, will be conducted through Sanskrit medium after the completion of the syllabus of M.A. Sanskrit, Fourth Semester. Viva-Voce carries 50 marks.

One Open Elective (Interdisciplinary) paper, carrying 40 marks + 10 marks for Internal Assessment, has been prescribed in the 3rd Semester for the students belonging to the discipline other than Sanskrit under Choice Based Credit System.

The time for examination in each paper will be 3 (three) hours. Each theory paper in the 3rd & the 4th semester carries 80 (Eighty) marks. Besides, each paper has been assigned 20 (Twenty) marks for Internal Assessment as per scheme noted below:

(i)	One Test/Seminar for each paper	:	50% = 10 Marks
(ii)	One Class Test (one period duration)	:	25% = 05 Marks
(iii)	Attendance	:	25% = 05 Marks
	Marks for Attendance will be given as under:		
	(1) 91% onwards	:	5 Marks
	(2) 81% to 90%	:	4 Marks
	(3) 75% to 80%	:	3 Marks
	(4) 70% to 74%	:	2 Marks
	(5) 65% to 69%	:	1 Mark

# , eo, ol bilir e ~12) r h, o'hz % dd (; k, k% do | kh+z9) k (kk+k2r r h, l = 1s12-15 i = 1s) % pr 44Z=1sp 17-20 i = 1s) % v / Ky f[kr % qd efi, d a ox ± Lokd r q' KDuktr A r r h, l = 1s, d kn' kai = ke]- pr 44Z=1sp 'kk/ ka i = te ~ loftkai > p kukao Xk2 ka/ kdk. Hali i sv fuok, i Z=1sLr % µ

The student/examinee of M.A. Sanskrit (Final) Course can opt any one of the following groups for Paper Nos. 12-15 in the Third Semester and for Paper Nos. 17-20 in the Fourth Semester. Two papers, that is, Paper No. 11 in the Third Semester, and Paper No. 16 in the Fourth Semester are compulsory for the students/examinees of all the five groups.

# ,eññiblÑre~(f)rho'hz)-&iblÔð el; rìhpro#Z=‡,k‰xkazeo dYk%

fodYi%(Option)	0X <b>%</b> (Group)	OX&ULC (Name of Group)
Ι	d / A	0 <b>n</b> %(Veda)
II	[k / B	0; kdj.ke~(Grammar)
III	<b>X</b> / C	₩kj rh; n'kue~(Indian Philosophy)
IV	?k/D	I <b>å</b> ÑrI kfgR; e∼(Sanskrit iterature)
V	Ä/E	/e┟U=ҜҜӾҼ%(Dharmatantrāgamaḥ)

Groups/Options for 3rd & 4th Semesters of M.A. Sanskrit (Final) Course



10(169)

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

### **Outlines of the Syllabus**

# ,eññibÑre-(f}rhao'Hē)-]rìhai‡e~

चयनाधारितश्रेयोदानपद्धत्यनुसारेण M.A. SANSKRIT (Semester System)

#### **CHOICE BASED CREDIT SYSTEM**

(Modified w.e.f. the Academic Session : 2021-2022)

# Semester-III (Session 2021-2022)

- Note: (i) A student of M.A. Sanskrit (Final) can opt any one Group of Specialization, i.e., A/B/C/D/E for Semester III & IV.
  - (ii) Papers under Course Code SKT-HC-301 in Semester-III and SKT-HC-401 in Semester-IVare to be compulsorily studied by the students of all the Options/Groups.
  - (iii) 80 marks of theory paper & 20 marks of internal assessment and 4 credits of Course Code SKT-HC-301 in Semester-III have been added to total marks of theory papers & internal assessment and credits of each Option/Group.

Course Code	Title of Paper	Туре	L	Р	Hrs	Ma	rks	Credits	Duration
						Theory	Int. Ass.		OI Exam. (Hrs)
SKT-HC-301	Palibhasa Sahityam Cha [Common paper for all Options/Groups (A, B, C, D, E)]	HC	4	-	4	80	20	4	3
	Option (I)								
Ŀ	roup-A (Veda)								
SKT- SC-302-A	Riksamhita Yajussamhita Cha	SC	4	-	4	80	20	4	3
SKT- SC-303-A	Brahmanasahityam	SC	4	-	4	80	20	4	3
SKT- SC-304-A	Kalpasahityam	SC	4	-	4	80	20	4	3
SKT- SC-305-A	Rikpratishakhyam Chhandansi Cha	SC	4	-	4	80	20	4	3
Total			16	-	16	320+80=400	80+20=100	16+4=20	
Grand Total						500			
Gro	Option (II) up-B (Grammar)								
SKT- SC-302-B	Vyakaranaparampara (1)	SC	4	-	4	80	20	4	3

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

SKT- SC-303-B	Vyakaranadarshanam (1)	SC	4	-	4	80	20	4	3
SKT- SC-304-B	Vyakaranaprakriya (1)	SC	4	-	4	80	20	4	3
SKT- SC-305-B	Vyakaranaprakriya (2)	SC	4	-	4	80	20	4	3
Total			16	-	16	320+80=400	80+20=100	16+4=20	
Grand Total						50	)0		
	Option (III)								
Group-C	C (Indian Philosophy)								
SKT- SC-302-C	Nyayadarshanam	SC	4	-	4	80	20	4	3
SKT- SC-303-C	Purvamimamsadarshanam	SC	4	-	4	80	20	4	3
SKT- SC-304-C	Charvakadarshanam Jainadarshanam Cha	SC	4	-	4	80	20	4	3
SKT- SC-305-C	Bauddhadarshanam	SC	4	-	4	80	20	4	3
Total			16	-	16	320+80=400	80+20=100	16+4=20	
Grand Total						50	00		
	Option (IV)								
Group-D	) (Sanskrit Literature)								
SKT- SC-302-D	Natyasahityam	SC	4	-	4	80	20	4	3
SKT- SC-303-D	Kavyashastram (1)	SC	4	-	4	80	20	4	3
SKT- SC-304-D	Kavyam Kavyashastrasya Cha Itihasah	SC	4	-	4	80	20	4	3
SKT- SC-305-D	Aitihasikakavyam Khandakavyam Cha	SC	4	-	4	80	20	4	3
Total			16	-	16	320+80=400	80+20=100	16+4=20	
Grand Total						50	)0		
	Option (V)								
Group-E (	(Dharmatantrāgamaḥ)								
SKT- SC-302-E	Dharmaśāstram	SC	4	-	4	80	20	4	3
SKT- SC-303-E	Naigamikāgamaķ	SC	4	-	4	80	20	4	3
SKT- SC-304-E	Bhagavadgītāgamika- bhāṣyam (1)	SC	4	-	4	80	20	4	3
SKT- SC-305-E	Bhagavadgītāgamika- bhāṣyam (2)	SC	4	-	4	80	20	4	3
Total			16	-	16	320+80=400	80+20=100	16+4=20	
Grand Total						50	00		

TY SYLLABUS M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

SKT-OE-306	Prācīnabhāratīyasamskrtiņ,	OE	4	-	4	40	10	2	3
	Darśanaṁ Bhāṣāvijñānaṁ Ca (2)								
Grand Total			4	-	4	Ę	50		

# Semester-IV (Session 2021-2022)

Note: 80 marks of theory paper & 20 marks of internal assessment and 4 credits of Course Code SKT-HC-401 in Semester-IV have been added to total marks of theory papers & internal assessment and credits of each Option/Group.

Course Code Title of Paper		Туре	L	Р	Hrs	Mai	ks	Credits	Duration
						Theory	Int. Ass.	-	of Exam. (Hrs)
SKT-HC-401	Prakritabhasa Sahityam Cha [Common paper for all Options/Groups (A, B, C, D, E)]	HC	4	-	4	80	20	4	3
(	Option (I) Group-A (Veda)								
SKT- SC-402-A	Atharvasamhita Samasamhita Cha	SC	4	-	4	80	20	4	3
SKT- SC-403-A	Aranyakopanisatsahityam	SC	4	-	4	80	20	4	3
SKT- SC-404-A	Vedavyakhyapaddhatayah Vedabhasyakarashcha	SC	4	-	4	80	20	4	3
SKT- SC-405-A	Vaidikavyakaranam	SC	4	-	4	80	20	4	3
SKT- SC-406-A	Viva-Voce	SC	-	-	-	50	-	2	
Total			16	-	16	370+80=450	80+20=100	18+4=22	
Grand Total						550			
Gro	Option (II) oup-B (Grammar)								
SKT- SC-402-B	Vyakaranaparampara (2)	SC	4	-	4	80	20	4	3
SKT- SC-403-B	Vyakaranadarshanam (2)	SC	4	-	4	80	20	4	3
SKT-SC-404-B	Vyakaranaprakriya (3)	SC	4	-	4	80	20	4	3
SKT- SC-405-B	Vyakaranaprakriya (4)	SC	4	-	4	80	20	4	3
SKT- SC-406-B	Viva-Voce	SC	-	-	-	50	-	2	
Total			16	-	16	370+80=450	80+20=100	18+4=22	
Grand Total						550			
Option (III) Group-C (Indian Philosophy)									
SKT- SC-402-C	Yogadarshanam	SC	4	-	4	80	20	4	3

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

SKT- SC-403-C	Advaitavedantadarshanam	SC	4	-	4	80	20	4	3
SKT- SC-404-C	Advaitashaivagamah (Kashmirashaivadarshanam) Purnadvaitadarshanancha	SC	4	-	4	80	20	4	3
SKT- SC-405-C	Darshanikasiddhantah Adhunikavijnanancha	SC	4	-	4	80	20	4	3
SKT- SC-406-C	Viva-Voce	SC	-	-	-	50	-	2	
Total			16	-	16	370+80=450	80+20=100	18+4=22	
Grand Total						55	50		
Group-I	Option (IV) D (Sanskrit Literature)								
SKT- SC-402-D	Natyashastram	SC	4	-	4	80	20	4	3
SKT- SC-403-D	Kavyashastram (2)	SC	4	-	4	80	20	4	3
SKT- SC-404-D	Champukavyam Kavyadarshashcha	SC	4	-	4	80	20	4	3
SKT- SC-405-D	Adhunikakavyam Gitikavyam Cha	SC	4	-	4	80	20	4	3
SKT- SC-406-D	Viva-Voce	SC	-	-	-	50	-	2	
Total			16	-	16	370+80=450	80+20=100	18+4=22	
Grand Total						550			
Group-E	Option (V) ( Dharmatantrāgamaḥ)								
SKT- SC-402-E	Śaivāgamaḥ	SC	4	-	4	80	20	4	3
SKT- SC-403-E	Tantra-spandaśāstram	SC	4	-	4	80	20	4	3
SKT- SC-404-E	Śaivavaiṣṇavatantram	SC	4	-	4	80	20	4	3
SKT- SC-405-E	Śāktastotram	SC	4	-	4	80	20	4	3
SKT- SC-406-E	Viva-Voce	SC	-	-	-	50	-	2	
Total			16	-	16	370+80=450	80+20=100	18+4=22	
Grand Total						550			



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### चयनाधारितश्रेयोदानपद्धत्यनुसारेण

M. A. Sanskrit (Final), Third Semester (Modified w.e.f. Academic Session : 2021-2022)

CHOICE BASED CREDIT SYSTEM

# fyf[kri ‡k klafoLrì%i kBÔðe%

**Detailed Syllabus for written papers** 

COURSE CODE : SKT-HC-301 , d hr hai = te~%i hy Hikik i hgR ap

Paper- XI : Palibhasa Sahityam Cha

L	Credits	
4	4	

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Co-301-I : ikfylægs lædfyrtkrd‰ lýnjhlýk&efT>e ifVink&irhR; & leðjiknkfnikBkuka ek/; esu Nk=k% ck&ik/keL; enyfl)kUr‰ ifjfprk% Hkfo"; fUr A Co-301-II : ikfylægs lædfyrkuka pfj; kfiVd&FkgixkFkk& iCckl q&/kEeinkfnin÷cn/kjpukuka ek/; esu fHk{køfHk{kqkhuka thousu o; a u&rdf'k{kka iklue¢% A Co-301-III : ikfylkfgR; L; , &rg; ek/; esu Nk=ku~ ck&i/kxtUFk‰ lg e/; dkyhukuka lEink; kuka /kkfe2dfln/kkUrka Kkua ck&i/kdkyhulektL; p Kkua dk; irs A Co-301-IV : dL; kfi Hkk"kk; k‰ voxeukFk± 0; kdj.kL; ko'; drk Hkofr A vfLeu~?kVds Nk=ku~ ikfy0; kdj.kL; v/; ; ua dkjf; "; rs A

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

<b>7./je&amp;</b> 1 :	<b>i liyi ligRe~% liyi xqfy</b> ov <b>/listri2R% o i ER%&amp;</b>	
	<b>1-6, 9, 11-13, 17, 18 µ lik a lĩrek; eu x kiệk; là</b>	16 V <b>aR%</b>
<b>7.668</b> 2 :	<b>i liyi lig</b> Re-% <b>i liyi zgf%v/likáriZR%</b> o i l <b>iek%</b> &	
	21-30, 32, 34-36 µ likayd <b>of; k</b> A	16 V <b>aR%</b>
<b>7./1e8</b> 3 :	illyl llgRL; bfrglt %	16 V <b>aR%</b>
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<b>7./de&amp;</b> 4:	<b>i lly Oldj. le~</b>	16 V <b>ar%</b>
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  - IV. rìh %;'u%(f)rh 3441 KJr%µ lik⁻a yki); aộk; ke likátKkik ~'yki≒ a ki; rA

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- VI. i >pe%ç'u% (prijiki ijr%µ i iy Qidj. is i fiki eit &dijdbj%8 valiedi/dod VI fyriki zui% I liki/k qi bj' p 8 valiedi/od VI fyriki zui% zii/ iii (8+8=16 vali%)

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

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**Option** (I)

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Group-A (Veda)

# COURSE CODE : SKT- SC-302-A }hrt kai = he-% di l-fayr k;t kj fayr k p

Paper-XII : Riksamhita Yajussamhita Cha

L	Credits
4	4

i villä 18%30 v kulfj d ell/ käükä 18%20 I e; %3 gljik% (3 Hours)

co-302-A-I:, rfLeu~ ?kVds l adfyrdfri; __Xonh; l Drkuka ek/; esu o; a norkuka Lo: i a KkL; ke% A

Co-302-A-II:_Xonh; &i \ku&okLrksifr&I jLorh& $\sqrt{kknIDrkukaek/;euo;a}$ 

bgyk6ddikjyk6ddKkua ikIL; ke% A

 (w.e.f. Session 2021-2022)

fefyRok Lodůků; a i ky; s  $q pr \sim l ektjk"VKS mUufra d pr% Anokf=a kůkes /; k; s vuclukefHk% cg n poknL; o.ků a fon <math>\dot{\gamma}$  rs A Co-302-A-IV : ; t phL; =; fL=a kůkes /; k; s vfXu&bUn&l w křnn pkuka Lo: iL; k/; ki ua

Co-302-A-IV : ; tphL; =; tL=a kUkes /; k; s vtXu&bUn&I w kInnokuka Lo: iL; k/; ki ukfo'knr; k dk;*I*'s A

<b>7.668</b> 1 :	<b>fuli i i kulai i ji E (j d &amp;i k pit) HK; di jub ji sk xgue/; ; ue-%HVrek/; esf&amp;</b>	
	<b>_X=%&amp; v X(%</b> (1-19), <b>I mil</b> o(1-115), <b>cã. li fr%</b> (2.23), <b>fe=%(</b> 3.59),	
	<b>rf12%(</b> 3.61), it <b>\$7%(</b> 5.83) <b>A</b>	16 <b>V ak</b>
<b>7.668</b> 2 :	<b>fulli lirkini jili ja ka kali i ka </b>	
	<b>_Xefa.</b> i Un~(6.53), olir Hi fr%(7.54), i jlor h (7.95), e. NIP%(7.103),	
	<b>v (R%</b> (10.34), <b>Kue~</b> (10.71) <b>A</b>	16 <b>V ak</b>
<b>7.68</b> 3 :	<b>fulEify1( k l; k; k; ); l; n0\leghijHE; l fgrangue/; ; ue~&amp;</b>	
	; t q2/36/; fulle, oft   u\$ 1/2v/; k %31-32 1/2 1/2	16 <b>V ak</b>
<b>7.11e8</b> 4 :	<b>fulEiyi[kl;k;kl; n0\eg4jHk;l fgraxgue/;;ue~&amp;</b>	
	<b>; t qiľ%kik; fulugot i uš 1/2 v /; k %</b> 33 <b>1/4</b> 50 <b>eti ; lie%</b> A	16 <b>V ak</b> ⁄o

fMi . ; %¥

(d)  $\varphi'$  ui = is i > p (5) v fuok HZ  $\varphi'$  ul% HIo"; ful A r = k  $\varphi$  He  $\varphi'$  us 34 d p r  $\varphi'$ ; xr i HB  $\hat{Q}$   $\hat{Q}$  e HJ R p Rolij % (4) fod Yi j fgr k% (v fuok; k) I 2 (Hr k)  $\varphi'$  uk%  $\varphi$  nH; USA v  $\psi$ s  $\varphi'$  uk%  $\hat{Q}$  e' k%  $\varphi$  He 87) r h, 8 pr HZ 34 d I E 1/4% Hio"; ful A

([) Of ; lied ¢ usiq 50% v at% v ly lpulled ¢ usiqp 100% v at%o6fY d %HosA

(x) çHe3AktikUr%{}rh,%ç'u% laÑrelè;esu,olek/ş%/ţHklobek/vÄngku%Hko";frAvţ/s ç'uk% laÑr@guk@käXkhkklelè;ekuledskii,dsuelè;esulek/kre/kD,U%A

ç'ui #fuekZkfof/%

- 1. ç'ui =li; fuelžiai liÑrelè; eu HosA
- 2. ç'ui = s i > p (5) v fuok lizç'ul?/Hio"; fuA
- 3. ç'ulule-v Äiulep follit ue-v / liy f[ ir: i sk Hio"; frµ
  - cite%c'u%μv; a(cite% c'u%3Vd pr ψ; xr i HBÔðeekU R; HosA v fLeu~c'us p iðlj%(þ) fod ¥i jfgr k%(v fuok lijs i f(itr kijc'u%crili; UA) (4×4%/6v Äk%)
  - II. f)rh%ç'u%(çfle3kill/r% μi jEjd&ikpl)H; djkbjskeb; aØ[; kq; lli.frE/b)%eb; a i ul; rA
  - III. rì h %ç' u%(çflef) r h 31.di LJ r % µi llef) r h 31.di; ll⁄aufril/ lb/l E) aolidmsfo'k de~, de~v ly ipullèda i zul ekikej zu); ai uli; r si (6 v oli%)
  - IV. prijžų: u%(rih 34.d i Ur% µn0\legiji) ikklijskeli); a0i; ką iii únik; k); k eli-; a ili; r3(2x8=16 voi%)

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

V. i >pe%ç'u%(pr@#4411LJr%; undveg@j#;H; kuhjisk eU;; i; fo'ko@i; k; S; iii.in44; k k ~ eU;; a in1; rf.

#### vubi rxiik%

- 1. Ik.IÑre-"XaHit; eA
- 2. "Xa dki qikhiti; ji ã Jinin nielaj i koydiji i ljivita
- 3. oliki Çi(; licopu) Nitijle xisiy) uSky i fQf in gich) ubžirilyki.
- 4. Vedic Reader for Students, A.A. Macdonell.
- 5. Hymns from the **Rgveda**, Peterson, B.O.R.I., Pune, 1938.
- 6. Hymns of the Rgveda, Ralph T.M. Griffith, Chowkhamba, Varanasi, 1963.
- ríðvlegifijívr ' liðy; t qillik; j elstyly culji hik j frivyki.
- 8. ; t qiHit; ] Lolehn, kuti jiloriji i Élőcárilitit Hit þjíeyly di juAD) i kinr 146; kit/2
- 9. **OBBOJE; kdhfri kj. Nilózfegihpiš; di**Rk**u olid i lígR i diklej giš k ji ji i talej** 2006
- 10. **oshik, dijischoshiži 10, k, Nižkjeulikosly dijA**
- 11. official no lite; v upind i prilite/A

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12. ofild mark % with v ij Stocilit 19 1 2 1/2 x; lpj.kf=i Eih Hijrh, foj ki alkkaj frity ka

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#### COURSE CODE : SKT- SC-303-A *** kg kg #e~%ckã. k kgRe~**

Paper- XIII : Brahmanasahityam

i v**HÄR**⁄60

v <b>Udf</b> i	id	٥¥	ЬŻ	لللات	<b>P/</b> 20
					NOLU

le; %3 gisk% (3 Hours)

Co-303-A-I : efgnkl & , rjs fojfpra , rjs ckā.kL; prt[L=å klikekn~  $\vee$ /;k;kn~ ;KL; prtp2.kkuk×pk&i flikaj ;KL; ik=% & LQ;&di ky& $\vee$ fXugks=& go.kh&l ii &Ñ".kkftukfnfHk% Ig  $\vee$ ut[BkuL; fo/k% Kkua ikl;rs A

 $C_{0-303-A-II}$ : , **r** js ckā.kL; i × pf=a kukekn~ V/; k; kn~ Nk=k% jktkfo'orjexoi $\neq$  jke; k% l Eoknu

jkt I w; Ks {kf=; sk I kæi kua dùk0; a u ok bfr I foLrjsk KkL; Urs A , rsu I k/k± U; xkgk&mnlįcjv' oRFkknhuka Hk{k.kL; ykHkk% mfYyf[krk% I fUr A

Co-303-A-III : , rfLeu~ ?kVds pjdlk&ke.kh; KL; Lo: ia ikl; rs A  $\vee$ f' ouhdækjkH; ka lkæfoghuknt; j{k.kdkj.kkn~, rL; uke lk&ke.kh l×tkr% A

 $c_{o-303-A-IV}$ : 'kriFkckā.ks of.krkusdk[;kuškų euęRL;k[;kuel;sda fon $\frac{1}{7}$ rs A , rfLeu~ euk& dFkk vR; Urk ekfeždh IjIk p orrs A eRL; korkjL; chtk% vL; kep dFkk; ka IfUr ; r~

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(w.e.f. Session 2021-2022)

dsuidkjsk vklyokn- euw eRL; L; Igk; su ekuchlf"V% jf{krk A ekuckuka uk'ks Ifr

l forcht H; %; Kek/; esu ekuoL; iqu% i kntHkkb% vfLeu~ Hkrys vHkor~ A

?kVde&1	%	fufnžVxbÉL; ikjEifjdHkk"; ku¢ kjsk ∨/; ; ue~ ¼l ŁÑrek/; eu½µ	
		, <b>r</b> jşckā.ke} ∨/;k;%34	16 V <b>CK</b>
?Wde&2	%	fufnžVxblÉL; i kjEi fjdHkk"; kuq kjsk ∨/; ; ue~ &	
		, <b>r</b> j\$&ckã.ke} ∨/;k;% 35	16 V <b>CK</b>
?kVde&3	%	fufnžVxbEL; i kjEi fjdHkk"; kuq kjsk v/; ; ue~ &	
		'kriFk&ckã.ke} dk.M% 5 ¼pjdlk⊊ke.kh½A	16 V <b>CR</b> /6
?kVde&4	%	fufnžVxbEL; ikjEifjdHkk"; kuq kjsk v/; ; ue~ &	
		'kriFk&ckā.ke} dk.M% 1] ∨/;k;% 8] ckā.ke~ 1&2‰u¢keRL;k[;kue¾A	16 <b>V CR%</b>

fMi . ; %¥

(d) ç'ui = s i > p (5) v fuok, 1826 ç'uk% Hio"; fuAr=k çHeç'us 34/d pr q/; xri HBÔðeelf JR; p Telj% (4) fod Yijfgr k% (v fuok, 1436, l £(Hr kšij ç'uk% çnH; UsA v t/s ç'uk% Øe'k% çHe81) r h, 8 pr quz 34/d l Ec 1/48/d lio"; fuA

([)) QI(; lied ç'usiq 50% v al% v iy ipulied ç'usiqp 100% v al% o 61Yi d % Hos A

(x) çHe3AktikUr%{}rh,%ç'u% laÑrelè;esu,olek/ş%/ţHklobek/vÄgön/%Ho";frAvţ/s ç'ul% laÑr@guh@käX4Hkblelè;ekuledskii,dsuelè;esulek/krefiD)U4A

### ç'ui #fuekZkfof/%

- 1. ç'ui =li; fueiziai laÑrelè; esa HosA
- 2. ç'ui =ls i ×p (5) v fuok liZç'ul%Hio"; fulA
- 3. **ç'ulule~v Älulep foHit ue~v / liy f[ k: i sk Hio"; frµ** 
  - I.
     çHe%ç' u%µv; a(çHe% ç' u%3Ud pr µ/; xr i lBÔðeel/J Ŗ HosAv fleu-ç' usp iðlj %(4)

     fod ¥i jfgr k% (v fuok, lijs l f(ilr kijç' u%çnil; UA)
     (4×4%46v Äk%)
  - II. **()**rh% c'u% (cheRdill y%  $\mu$ ikjEifjD; k jk; k idj.k}; a llNrek/; eu 0; k[; krq fufnlVk/; k; kr~idj.k=; a inkL; rA  $2x8=16\sqrt{d}k\%$
  - III. rrh%c'u%(f)rh 34d KJr%  $\mu(d)$  ikjEifjD;k jk?;k idj.k};a 0;k[;krq fufnŽVk/;k;kr~ idj.k=;a inkL;ra (2x5=10 $\vee$ tdk%/2  $\frac{1}{k^2}$  fufnŽVk/;k;xrfo"k;IEc)e~, de~  $\vee$ kykpukReda it ua lek/kkrq itu};a inkL;ra

- IV. **pripilog'u%(rìh 34d lí Jr% µ**ikjEifjD;k jhR;k izdj.k}; a fo'knu 0;k[;krq fufnŽVkakkr~ izdj.k=; a inkL; rA  $\frac{1}{2x8=16\sqrt{2}}$
- V.  $i \approx pe\% c'u\% (pr filled EJr\% \mu(d) ikjEifjD; k jkR; k idj.k}; a 0; k[; krq fufnZVkakkr~idj.k=; a inkL; ra (2x5=10<math>\vee$ tdk‰

 $⁽⁶ V \mathbf{D} \mathbf{K})$ 

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

½ [½ ; FkkfufnZVikB∻kakfo"k; IEc) e~, de~ ∨kykpukReda izua lek/kkrą izu}; a inkL; rA %6∨xdk%%2

∨ud kfl rxtJFkk%

L

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Credits

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- 1. , **r**js & ckā.ke~¼l k; .kHkk"; , oa ljy fgUnh 0; k[; k½] lEikñ MkW l (kkdj ekyoh;] rkjk fifVax oDl] okjk.kHhA
- 2. Martin Haug, The Aitareya Brāhmaņa of the Rgveda, Bhartiya Publishing House, 1976.
- 3. , **r**jskykpue] I R; or I keJehA
- 4. ,ñ ohñ dhFk] n _Xo\$nd ckā.kktA
- 5. 'kriFk&ckã.k] lEikŒ xxki1kn mik/;k; ¼Hkkx 1 rFkk 3½A
- 6. 'kriFk&ckã.k ¼l k; .kHkk"; ½] ukx idk'ku] fnYyhA
- 7. 'krifk&ckā.ke} Eng. Tr. t& bxfyx 1/4kx 1&51/4
- 8. 'kriFk&ckā.k % , d l kkLÑfrd v/;;u] mfełyk noh 'kekl] egjplin yNeunkl ifCydskUl] ub2 fnYyhA

#### $\star\star\star$

COURSE CODE : SKT- SC-304-A

### **prqZlai ±e~%d Yil lígi**Re~

Paper- XIV : Kalpasahityam

i viiäi?⁄680

**v Həfj d ety HÄülÄR%2**0

le; %3 gisk% (3 Hours)

skt-sc-304-A-1: dkR; k; uJkr I #a 'kpy; tphL; ek/; fUnu'kk [kk; k% egloiwkk xbFkks orrs A

Jk&rl⊯šką ∨XukS IEikn∻ekukuka ;K;kxknutįBkukuka o.kūa fon∻rs A ,rLekn~?kVdkn~Nk=k% n'kūkSk&ekIL; fu;eorku} osinifjxga) Ifengkseik=LFkkiua) gfo"kka IaLdkj%] igiksMk'kkFk±r.Mgykuka išk.ke~bR;knhfHk%, rškka vykolddQyL; Kkua yIL;Urs A

skt-sc-304-A-II : ijk\$/k' kkuka ikdfof/k% o\$nfuekZk} iRuhl Uugu} iLrjkLrj.ke~ bR; \$\$kka fo/khuka

 $I_{v}(er; k \vee /; ; ua dk; rs A$ 

skt-sc-304-A-III : İkjLdjx`g; I #a 'kpy; tphL; eg`loiwk± x`g; I #a fon∻ rs A , rL; iFkedk. Msu o; a vkoLF; kXu‰ vk/kkufof/ka fookgxHkkZkkuid oukfnLbdkjk. kka Kkua ikIL; ke% A

skt-sc-304-A-IV : 'kt/cl #fl;% ofnfuek2ka fofo/konhuka ekuifØ;k] e.Mikuka fuek2kfof/k% bR;r% I k/k± Nk=k% vk/kfudT;kfer% okLrtkkL=L; p Kkua ikIL;fUr A
SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

?kVde&1	%	fuEufyf[krJk&rl ⊯L; ddHkk"; kuq kjsk_fo'kne~ ∨/; ; ue~ ¼l &Ñrek/; e	eu½&
		dkR;k;uJk&rI⊯e~& ∨/;k;%2] df.Mdk 1&4 ¼n'kűkSkèkI%%A	16 <b>Vak</b> ⁄6
?kVde&2	%	fuEufyf[krJkfr ⊯L; ddHkk"; kuq kjsk_fo'kne~ ∨/; ; ue~ &	
		dkR;k;uJk&rl⊯e} ∨/;k;%2] df.Mdk 5&8 ½n'kukSkèk1%/2 A	16 <b>Vak</b> ⁄o
?kVde&3	%	fuEuxál ⊯L; gfjgj&xnk/kjⅆ&HkK"; kuq kjsk ∨/; ; ue~ &	
		ikjLdjxál⊯e} iFke% dk.M%A	16 <b>Vak</b> ⁄o
?kVde&4	%	fuEu'k¥/cl⊯L; fo'kne~ ∨/;;ue~ &	
		dkR;k;u'k¥(cl⊯e} iFke% ∨/;k;%A	16 <b>Va%</b>

- fMi . ; %¥
- (d) ç'ui=ls i xp (y) v fuok MZzç'ul%Hlo"; fulAr=k çHeç'us 34/d pr ü/; xri HBÔØeek(JR; p Relij%

(4) fod ¥ijfgr 1% (v fuok, Hijbo I £(Hr kkijç'u 1% çnil; UA v Us ç'u 1% Øe' 1% çfle&i)rh, &rih, &prijE2AU I E: 1/1%/Hio'', fUA

- ([) Of ; lied c' usiq 50% v to v by ipulied c' usiqp 100% v to of the of
- (x) çfle 34.d LUr %3)r h, %ç'u%d LAÑrelè;esu,olekl ş%u Çfflk lonzik v Äzglfu% Hot";fr Av Çsç'u% ILAÑr 69.uh 62.lÄXH-hitlelè;ekuled shfi, dsu elè;esu lek/krefiD)U4A.

## ç'ui #fuekZkfof/%

- 1. ç'ui =li; fuelžiai laÑrelè; esa HosA
- 2. ç'ui =ls i xp (5) v fuok liZç'ul%Hio"; fUA
- 3. ç'ulule~v Äliulep foHit ue~v / liyf[ k: i sk Hio"; frµ
  - c,He%c,'u%μv; a(c,He% c,'u%3Vd pr ψ/; xr i Hbôðeek/J R, HosA v fLeu~c,'usp iðlj %(þ) fod Vijfgr k%(v fuok lijs i f(Ir kijc,'uk%c,ni; UA
     (4×4%46v Äk%)
  - II. ()rh% ç'u% (çHe3Ad KJr% µddHkk"; kuq kjsk
     I ⊯prqV; a
     I ŁÑrek/; eu
     0; k[; krq

     ; FkkfufnZVk/; k; kr~ "kV~ I ⊯kf.k
     inkL; UrA
     ¼4x4=16∨dk‰
  - III. rrh‰ç'u‰(f)rh **Adikjr%**µddHkk"; kuq kjsk l⊯prqV; a 0; k[; krq ; FkkfufnZVk/; k; kr~ "kV~ l #kf.k inkL; UrA ¼4x4=16∨tdk‰
  - IV. **produce** c'u% (rrh **34d KJr%**  $\mu(d)$  fufnžVHkk"; dkjkuq kjsk  $I \neq prqV$ ; a 0; k[; krq ; FkkfufnžVdk. Mkr~ "kV~  $I \neq kf.k$  inkL; UrA  $\frac{1}{4}x^3 = 12\sqrt{d}k\%$ 
    - ¼[k½ ; FkkfufnžVdk. Mxra lådkje¤dekfJR; fVli. k° fyf[krq lådkj}; a inkL; r& ¼4∨ædk%½
  - V. i >pe%ç' u%(pr@AMIEJr% μI #}; a 0; k[; krq ; FkkfufnžVk/; k; kr~ I #=; a inkL; rA ∨Fkok

 $ifrik | oLrfo"k; de~, da fooj.kkReda it ua | ek/kkrq it u}; a inkL; rf <math>\frac{1}{416}$ 

∨uq kafl rxtJFkk%

- 1. dkR; k; u&Jkfrl ⊯e} fo | k/kj kek&Ñr ljykofÙk] ∨P; r xt/Fkekyk] okjk.kl hA
- 2. dkR; k; uJkGrl⊯e~ ¼Hkkx 1&2½] fuR; kuUn iUr ∨k§ xkiky'kkL=h usu} pk[kEck lkNr lhjht] okjk.klhA

#### SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

- 3. dkR; k; u&Jkfri⊯e} ddHkk"; ] MkME, Œ coj] pk¶kEck i kNr i hjht] okjk.ki h] 1972
- dkR; k; uJkFl⊯e~ ¼ddHkk"; Ifgre½] iFke Hkkx] Jh yky cgkngi ÓkL=h dkinh; I&Ñr fo|kihB] fnYyh] 1982&85
- 5. ikjLdjxál⊯] ∨uopknd MkME l¢(kkdj ekyoh;] rkjk fifVax oDl] okjk.klhA
- 6. ikjLdjxál⊯] [kejkt JhÑ".knkl] ckEcA
- 7. ikjLdjxál⊯ ½gfjgjxnk/kj&Hkk";½] lEikŒ MkŒ txnh'kpUn] pk[kEck l&Ñr lhjht] okjk.klhA
- 8. ikjLdjxál⊯ %gfjgjHkk";Ifgr½; MkME gfjnÙk 'kkL=h] Hkkjrh; fo|k izdk'ku] fnYyhA
- 9. dkrh; 'kt/cl⊯] fo|k/kjxkM&Ñr ljykofùk] ∨P; r xt/Fkekyk] okjk.klhA
- 10. dkrh; 'kYcl⊯] dd&egh/kj&ofÙk&lfgr] pk{[kEck] okjk.klhA
- 11. dkR; k; u'kYcl ⊯e~¼l ki i fÙkda i ; kZykpue½] MkWE ješkpUnz nk'k 'kekZ ukx izdk'ku] fnYyh] 1994
- 12. ikjLdjxál #] 0; k[; kdkj] MkWE oniky] I R; kÉčdkÓu U; kl] d#{k=] 2008

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# COURSE CODE : SKT- SC-305-A i **>pri ki :ke -% d ekr i kj ; aNkiki** p

Paper- XV : Rikpratishakhyam Chhandansi Cha

L	Credits
4	4

#### **i viiäi?⁄**60

**v HJfjd e¥j kÄükÄR%2**0

le; %3 gljk% (3 Hours)

skt-sc-305A-I: vkpk; 2 kkûdu fojfpre~ _ Dikfr'kk[; a ikphur; k ikekf.kdr; k p egùoiwk±

LFkkua Hktrs A dL; kfi xWFkL; vocks/kk; ikfjHkkf"kd'kCnkuka KkueR; Urko'; da Hkofr A

vfLeu~?kVds Nk=H; %vucdfo/kikfjHkkf"kd'kCnkuka & Loj&0; at u&LojHkfDr&jDr&ukfe

bR; knhuka ckg/k% dkjf; "; rs A

skt-sc-305A-II: __Dilfr'kk[;L; nforh;s iVys if'y"V&{ki&mnxlgkfn& LojlU/khuka rrh;s iVys p mnkUk&vunkUk&Lofjr&dEikfnLojk.kka ifjp;% dk;Irs A

skt-sc-305 A -III : VfLeu~ ?kVds o; a 0; at ul fU/kfol tùh; l U/khuka Kkua ikiL; ke% A

skt-sc-305A-IV : oneU=k.kke@pkj.kkFk± NUnkuka Kkua egnko'; da HkofrA NUnKkusu fouk eU=k.kke@pkj.ka ikB'p IE; Dr; k u IEHkofr A , rLekno vfLeu~ ?kVds NUnkuka I (en"V; k

v/;; ua dkjf; "; rs A

 ?kVde&1 % | #k.kka | knkgj.ka fo'kn0; k[; kue~ ¼l ½.Ñrek/; eu½&
 'kkûd½ __dikfr'kk[; e~ μ iVye~ 1
 16 v dl%

 ?kVde&2 % | #k.kka | knkgj.ka fo'kn0; k[; kue&
 'kkûd½ __dikfr'kk[; e~ μ iVye~ 2&3
 16 v dl%

 ?kVde&3 % | #k.kka | knkgj.ka fo'kn0; k[; kue~ &
 16 v dl%

?kVde&4 % o\$ndNUn1 ka Kkue~ & iæ([ko\$ndPNUnka1 ¼_dikfr'kk[;ku(|kjsk%A 16 vdk% fVli.;%%A

(d) ç'ui=ls ixp (ý) v fuok, Micç'ul% Hio''; fulAr=k çReç'us 74/d pr 4/f, xri HBÔðeek(JR; p Rolj%

(4) fod ¥jfgr 1% (v fuok, 14)6 I £(11r 14)jç'u 1% çn1L; USA v Us ç'u 1% Øe' 1% çfle&?)rh,&rrh,&pr6/222401 12:14%/Ho"; fUA

- ([) OI; lied c' usiq 50% v 21% v by ipulied c' usiqp 100% v 21% o 8 f Yi d % Hos A
- (x) çFle 34ul KUr%()rh,%ç'u%U klÑrelè;esu,ol ek/ş%a/U/Flkioblakv Äöglfu%Hlio";frAvU/sç'uk% IklĨr@gulf@lÄXkHkllelè;ekuledskli,dsu elè;esuiek/kq'ID)UKA

## ç'ui #fuekZkfof/%

- 1. ç'ui =11; fueizlei ±Ñreiè; eu HosA
- 2. ç^ıui **s i xp** (5) v fuok likç^ıul%Hio"; fulA
- 3. ç'ulule~v Älulep foHit ue~v / liy f[ k: i sk Hio"; frµ
  - I.
     çHe%ç'u%μv; a(çHe% ç'u%3Vd pr4/; xri HBÔðeekl J R
     HosA v fLeu-ç' usp følj %(p)

     fod Yi jfgr k% (v fuok lijs l f(llr kljç' uk%çnll; UA
     (4x4=16v ÄK%)
  - II. ()rh %ç'u%(çHe¾d LJr% μl #prųV; a l knkgj.ka l ఓÑrek/; eu 0; k[; krq ; FkkfufnžViVykr~

     "kV~ l #kf.k inkL; UrÅ
     ¼4x4=16v ÄK%
  - III. rrh%ç²u%(f)rh 3kti LJr% μl knkgj.ka l⊯prtV; a 0; k[; krq ; FkkfufnžVi VykH; ka "kV~ l ⊯kf.k

     inkL; UrA

     ¼4x4=16v ÄK%
  - IV. pr # C u% (r`r) 3 ul EJr% μl knkgj.ka
     I ⊯ pr ψV; a
     0; k[; krq
     ; FkkfufnžVi Vykr~
     "kV~
     I ⊯ kf.k

     i nkL; Ur\$
     ¼4x4=16v ÄE%
  - V. **i >pe%ç' u%(pr φαλά KJr% μ**}; kš NUn I k‰ I y{k.ka I knkgj.ka 0; k[; kuk; NUn' prtV; a i nkL; rA ½2x8=16**v ÄK%**

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

∨u¢ kfl rxtJFkk%

1- __dikfr'kk[;e] I Ei kñ rFkk vupknd exyno 'kkL=h] pk[kEck] okjk.kI hA

2- __dikfr'kk[;e] ½m0oV&Hkk";Ifgre½ IEikñ] ∨u¢E ohjblndnekj oek], pk{[kEck IbLÑr çfr"Bku] fnYyh] 1992

3- __Xonsikfr'kk[;e~ & MkMi cztfcgkjh pk6cs ¼iVy 1&4½] Hkkjrh; fo|k izdk'ku] fnYyhA

4- _Xonsiktr'kk[; %, d ifjÓhyu] MkWi ohjkinz dekj oek], dkóh fgUnw fo'ofo ky; ] okjk.kl h] 1972

- 5- olind NUnkehekalk] in ; f/kf"Bj ehekald] jkeyky diy VLV] joyh] IkuhirA

 $\star\star\star$ 

Option (II) **oxZ&[ k Ģld j. le~** Group-B (Grammar)

## 

Paper- XII : Vyakaranaparampara (1)

L	Credits
4	4

i villä 18%30 v liufij di ell/ käüllä 18%20 li e; %3 qijil% (3 Hours)

Co. 302 B-I: 2Vds fLeu~ ie(kVoskdj.kkuka 'kkdVk; u&Vkfi'kfy&

 $dk' k \tilde{N} R Lu = 0; k f M \& i k f. k f u \& dk R; k; u \& i r \times t f y % b R; r Skka i f j p; % N k = k u ~ dk; r A$ 

Co. 302 B-II :  $\nabla$ fLeu~ [k.Ms dkf'kdkdkj; k% okeut; kfnR; ; k% U; kl dkjL; ftulinch) u%

ine×tjhdkjL; gjnÙkL;] ifØ;kdk@mhdkjL; jkepUnL;] fl)kUrdk@mhdkj;k%

HkVVkstnhf{krojnjkt;k% ifjp;% inh;rs A

Co. 302 B-III : dL; kfi xWFkL; kockg/kk; rL; ikfjHkkf"kd' kCnkuka Kkuei {krs A vLeknofLeu~?kVds

v''Vk/; k; k% iFkek/; k; L; iFkeiknL; dfri; ieq[kkfHk% | KkfHk%

onf/kxqklakxlo.kixg;?kqkknhfHk%Nk=k%ifjfprk%HkofUrA

Co. 302 B-IV : VfLeu~ Hkkxs o\$ kdj.kfl ) kUrdken; k % vuq kja m.kkfnidj.kL; iFke% ikn%

ikB∻rsA

(w.e.f. Session 2021-2022)

<b>7.//e&amp;</b> 1 :	<b>' Hơ Và ước là ' Hy %dk KÑĐư% QHVỹ ái K. Hước di</b> ệk ướci r °Hy <b>%</b>	16 <b>Va%</b>
<b>7.(1e8</b> 2 :	t ; <b>ing %dif ididij%edeu%dif ididij%et uizen %8/it dij%</b> e	
	<b>ġrìl/ð/ne°ijldij%</b> jlep <b>ld/ð/l0) kliftjdij% Helt rit(k %86) kliftidij%</b>	
	<b>ojrjit %&amp;/; &amp;@ <b>381 ) kdičnij %A</b></b>	16 V <b>ak</b> ⁄o
<b>7.(1082</b> 3 :	i K. Kuffov 'VA; k Kai Hels/; k %ai He% krfA	
	<b>v/liiyi[k  klio/li;d  vkliediť idliri ik  kl\rek;eu   isigj.isiQi[;i&amp;</b>	
	o) %1.1.1), xq%(1.1.2), i alx%(1.1.7), vuqli d%(1.1.8),	
	lo. <b>Z-(</b> 1.1.9), i <b>Xăe-(</b> 1.1.11), <b>3q</b> 1.1.20), <b>3</b> (1.1.22) <b>A</b>	16 V <b>a?%</b>
<b>7.668</b> 4 :	Hit ni(k %o,Sidj. II ) Iddilityh // nijt) 242.	
	<b>ndini dj. lej- i lle% kn%l klg. ld vipi(</b> ; k⁄	16 <b>V ak</b> ⁄o

f**\li .**;%

(d)  $\varphi''$  ui = is i > p (5) v fuok liZ  $\varphi''$  uk/d-lio"; fUAr = k  $\varphi$  fie  $\varphi''$  us 34/d pr  $\varphi'$ ; xr i HBÖØeelkJ IR p felj %(4) fod Yijfgr k% (v fuok lij b | 2(Hr kij  $\varphi''$  uk%  $\varphi$ nH; USA v  $\psi$ s  $\varphi''$  uk% Øe' k% cflest} rh sprig 20/d Hz 2/d ki b'; fUA

([) OI; Hed c' usiq50% v at // by bulked c' usiqp 100% v at // oS / Y i d // hos A

(x) rìḥ?Nd KJr%prk‡KZç'u%d klÑrekè;esa,olek/s%v\;HklokzkvÄzgKu%Hko";frAv\;sç'u% |kŇr@guk@vÄXkHKKekè;ekukadadi,dsaekè;esalek/krafkD)U4A

## ç'ui #fuelZffof/%

- 1. ç'ui =1; fuelZla & Nrek/; eu HosA
- 2. ¢'ui =ls i xp (5) v fuok iZç'uk/Hio'', fUA
- 3. **c' ulule~v Älulep foHit ue~v / liyf[ k: i sk Hio**", frµ
  - I.  $cHe\%c'u\%\mu\nu; a(cHe\%c'u\%\lambda) r the xri HBÔðeek J R Hos Avfleu-c'us pibli (4)$  $fod Yi jfgr k (v fuok Hs I f (1) k jc'uk cril; UA <math>(4x4346 \nu A)$
  - II. f)rh,% ç'u% (çHe3Atli£Jr%, μdl; fpn~, dl; o\$ldj.ll; thouifjp; e} jpu% I £Ňr@ldj.kli£srl; ; kunkap vf/ÑR; fyf[kqo\$ldj.l}; I £:¼So&fYidl6sizu85in41; sA (16vÄK%)
  - III. rừ h‰ çⁱu‰ (f) rh 30 di LJ r‰ μd L; fpn~, d L; o Sidj. LL; thoui fjp; e} jpuk‰ I LÍÑ r Ģidj. k LL: ls r L; ; kunkua p v f/ Ñ R; fy f[k qo Sidj. l}; I E: ¼ So Si Yi di Si zui Si LL; stâ (16 v Ä K‰)
  - IV. pr**ijž**, c'' u% (rrh 34.0 kJr%  $\mu$ ; Hium24 klio/k di upru/ai kligi. kai klivirele; esi Oli; k q'R/-1 vii. ki mi; UA (4x43/46v ÄK%)
  - V.
     i >pe%ç' u%(prijikuli L)r%, μi BÖÖel Ε:¼al uprü/, al kalgi. ka (4x43/4) kulk ~'k/l uf. ki uli; UA

     (4x43/4) for ÄK/kulk

vuble rx1118%

- 1- IbÑr&Gldj.kbL:kdkbfrgbt (Hbx 1822)];b[f1Ej ekebbd]jkeyby dijw\bL\[jeyb]IbbirA
- 2- IblÑr Ģldj.kdkmahlo vijSíodit] IRdle o elįZelskyly cuģi latt] fr¥ykA
- 3- IblÑar Ģlodj. boʻlibli jilel jajak f=bi DBA) jit dey indik boʻl fmVyfi 1972.
- 4. ilí.kuh Ģkdj.k.dkvub;kyu)jke'kelj HAAkpk,)/b.Nkykktdy gkab.]oljik ktfj.1966
- 5- Øldj. klil:#rgit %olñ f=i lEhA
- Belvalkar, Shripada Krishna, An Account of the Different Existing Systems of Sanskrit Grammar, Bharatiya Vidya Prakashan, Varanasi.
- **7** George Cardona, Pāņini : A Survey of Research, Motilal Banarsidass, Delhi.
- Hartmnt Scharfe, Wiesbaden; A History of Grammatical Literature, Otta Marrasowitz, 1977.
- 9- dil'idio TÜk (Ulit&ine×tji&ifgr)] IELiñ,o afgluih Vulidij& Miblut;'ieljy ly f=kiEh,o al úpldjelyo hjirljk if©yd Skojo ljk litka
- **10- dil'idil; fgluii Vidil; & Jhuij; k.** k fe JA
- 11- v"Viè; ķh (HEC;) i Elelo Tùt (i Ele Huc)] iā cā nùt ft Kot ķijkey ly dijv VLV. joyh (Ikahir) A
- 12- v "Vie, k Had H" kd k (i Elele; k %) onei ky foj kHitdj] | kigiR, Ht Nij,] ejelj 1985
- 13- oSidj. III ¼iluid li6ah (nùij:1/4/2] Hillêlik nili(kr] elishy iy cuiji linik ] fn\y kA
- 14- milind NG; Lolehn; kuluij | Eliñ; fij f'Ej e kellad A
- 15- ilí. kuh fiklij (Oli; kolij& Jhuljk, k fel] x kalignit i blŇr xblikelykA
- 15 Pāņinīyaśikṣā, Ed. & Tr. by M.M. Ghosh, Delhi, 1986.

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COURSE CODE : SKT- SC-303-B

# **x** ha' hai **te~%Q**hdj.ht' hile~(1)

Paper-XIII : Vyakaranadarshanam (1)

L	Credits
4	4

i **viiä i?⁄**æ0

**v Həfj d ety HÄüHÄR%**20

le; %3 gist% (3 Hours)

Co. 303 B-I: ?KVds fLeu~ ir×tfyefufojfpregkHkk"; L; iFkekfgæda iLi'kkfgæde/; kI; rs A

со. 303 в-н : Hkrägfj.kk izkhrL; okD; inh; L; cãdk.ML; nk'ktudfl)kUr% Nk=k% ifjfprk%

HkofUr A

Co. 303 B-III : ukx kHkVVL; O\$ kdj.kfl ) kUrijey?ke×tWkk; k% vuq kja 'kfDrfu: i.ka

y{k.kkfu: i.k×p Nk=ku~ dk; rs A

Co. 303 B-IV :  $\vee$ fLeu~ [k.Ms Nk=ku~ o\$kdj.kfl ) kUrijey?kp×tikk; k% /kRoFktu.k; ks uke fo"k; ks /; kl; rs A

<b>%.de&amp;:: i r %iy%.eght; ej-i flee-v liõde-%4i ' liõde%244Ñrek; estA</b>	16 <b>Va%</b>
<b>%de&amp;2: Ht j %dD) i rh e-&amp;cãdkN}-díjdf%</b> -73	16 <b>Va%</b>
<b>%.cle&amp;a: uhshl@%.cSidj.ll ) ki jey%;%lk, 'lD fir i .lej-y{kilir i .leA</b>	16 <b>Va%</b>
<b>%.de&amp;4 : o\$kdj. 11 ) kdi jey %; %kk &amp;/1121111 (2%)</b>	16 <b>Va%</b>

f**Mi.;%** 

(d)  $\varphi''$  ui = l lr (7) v fuok, liZe, 'uk% Hio'', fUAr = k  $\varphi$ Fle  $\varphi''$  us 31/d pr  $\varphi'$ , xr i HBÔØeek(J R; p Rolij %(4) fod Yi j fgr k% (v fuok, light l 24 (kir kšij  $\varphi''$  uk%  $\varphi$ nki; USA v  $\psi$ s  $\varphi''$  uk% Øe'k%  $\varphi$ Fle 81 ) rh, 8 pr i ji Z 24 (kir kšij  $\varphi'''$  uk%  $\varphi$ nki; USA v  $\psi$ s  $\varphi''' uk%$  Øe'k%

([) OI; lied c' usiq50% v allow by builded c' usiqp 100% v allow Si Yi d % Hos A

(x) çfle 74.di KUrist)rh, rìh isç'uist biữrelè; esu ,oi ek/ şisv Uflik i oblik v Äöjbu% Hio''; frAv Usç'ui% I biữr ogun người Mihikilelè; ekuled alti ,dsu elè; esu i ek/ kraf ID) USA

## ç'ui #fuekZkfof/%

1. ç'ui =11; fuelZlei ŁÑrek/; eu HosA

2. ç'ui = lir (7) v fuok iZç'uk/Hio'', fUA

3. **ç'ulde~v Äldep foHit ue~v / liyf[ k: i sk Hio'', frµ** 

- I.  $cfle%c'u%\mu v; a(cfle%c'u%3Vd pr d/, xri IBÔðeel/J R HosAv fLeu-c'usp iðlj%()$  $fod Yijfgr k%(v fuok lijs I f(Ir kijc'u%crili; UA <math>(4x4346v \ddot{R})$
- II. f)rh,%ç'u%(çfle3Adl£Jr%,µlik_aoliril); al bÑrek; eu (91; k e, likúr£kbik, «oliril; a inl; rA (2×43% v Ä%)
- III. rrh%ç'u%(çRe3kliKJr%μ; IIIúńK/die-vKJR, da elfikedai zud kÑrek; eu i ek/krą i zu); a ul; rs. (8v Äl%
- IV. pr**ijž**ç'u%(f)rh 3kližJr%μliž⁻adlijdh; a**9i; kę ližúrižkih**: -dlijdk; a nl; rsλ (2x43% v ÄK%
- V. i »pe%ç'u%(f)rh; 3ktil/Jr%μ; iliúnik/die-vil/R, dal el/ikedai zuel el/ikeji zu); ai zli; rá (8v äl%)
- VI. "KB% ç'u% (rìḥ 3Ad KJr%) µlik ē~vorj.Ŗ; a ĢK; kq; likin Kklik ~vorj.k; aizl; rA v Hok
- VII. I Ire%ç'u%(pr**ijāv**ili£)r% μl i ἑ¯e~vorj.β; aϘįť; ἑq; **liúńškili**k ~vorj.k; ai ili; r£ v liok

; IIIúríškije-višję, da el(iRedaiza eldrejza); a ni; rst (16v AR% M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

#### vuqueli rxsse%

- **1 Oldj. legihik; e~(Hix&i)] | E liñ osoz] gij; k ik | ligi?, | lifiku] xiddy, >Ti j]** 1962
- 2- eghtik;e~(iblekshiks%;]Oji(;hñ;f(f'E)ekeblad]jleyhydijw\LL\[joyh]l bahrA
- 3- Qidj.legihik; (d,\$MaÑr 'i mi* r Fik uladskaÑr 'mak-las* i fgr] Haza(1)] i Eliñ v ljñ dã ' Lizh r Fik Niñ daply] objekt fj 1987
- 5. Ģldj. legihik; (vilišd 182)] I biÑr Ģlį; klij; ekkoʻli Lish Hix Nijsh; fgluih Ģlį; kā osi alikk foj lolip Lifr] espip lai y Neunit i f@rd SNU] fn VykA
- 6- ikr×ty eghtk; easikkt[;k lvk%,d leh(Meed vè;;u] Hkefig osalyelij] fuej/.cd, tWi) d4((lat) 1987
- 7- ik ×ty eghlik; eaviouzd Yiuk,] Hitefig o skydlij] ifjey id kluj fmYylji 1988
- 8- Ģldj. klil: h, yld Ukjikidj] Hiefi g oslydiji i se6 i f(y' k j// fm/ylji 2001
- 9- I Lá Nír Opidj. Inf Hill, Hitefig o saly díji foj Kul/ 'His I Lá Hiluj' Hyk divikal) dá (kal): 2006
- 10. Ģldj. legihik; % foj liui/ fgluh Ģlį; jį Hitefig osiyelij; foj liui/ 'lisi i kiliuj 'liyk divilai) deglai; 2004
- 11- olD) inhe~(cãdk Ne)] foluth Ol[; hījlextitolui 'llīp)] d kiln l klṽr xtillely kA
- 12- olD) inhe~(cãdk Ne)] Olf; ki olenskp k // Ñ". Int v dineljoljik ti ki
- 13. old) inhe~(cãdkNe)] íguh Qi(; lấ f lơ lư j vol. Hệ pişhick foi hou oljkit hì 1990
- 14 Hittació v (SolD) inh] i Ridle o e (ZHijrh, i dikku) fm/ył), 1983
- **15** Vākyapadīya of Bhartrhari, Ed. K.A.S. Iyer, Delhi, 1964.
- 16 Vākyapadīya of Bhartrhari (with the Comms : Vrtti & Paddhati), Ed. K.A.S. Iyer, Pune, 1995.
- 17- ijey 3q×t Uit I Liver Olt; klipt i a ditydit klar ' Hiy] cNLSit 1961
- **18- o, Sidj. N. 14 Wijey 3q×t Wijey 14 (Viji prikl Elő Mildifiymə ' *
- 19- i jey 3q×t Wit I Előt ő, yő f=k EB oljk k h 1985
- 20- ijey 3q×t 4k (fVi. lih fgr)] IE lñvy[ine 'lei‡Zoljk it fj. 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- Ģidj. kri hil-Hiedil(; jielki ki ki ki)] i Evhilik i kivr fo'ofojiy; joljik ki ka
- 25. Qidj.kdhntklikd Hiedlit I Rdle oelik etalije eulogiyly] fm\ylit 1971

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Credits

4

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

## COURSE CODE : SKT- SC-304-B pr q2a i = e-%Qidj. içfØ; k (1)

Paper-XIV : Vyakaranaprakriya (1)

**VHÄR/6**80

**v HJfj d e¥/ HÄülÄR%**20

le; %3 gisk (3 Hours)

Co. 304, B-I:  $VfLeu \sim ?kVds HkVVkstnhf{krfojfprL; o$kdj.kfl)kUr& dkeq; k% inoknZkL;$ 

vtUriqYy³xidj.kknkjH; vtUruiqdfy³xidj.kL; l⊯kYy{kio∂da:iflnf/kifØ;k

v/; kl; rs A

L

4

Co. 304, B-: II  $\vee$ fLeu~ Hkkxs Nk=k% o§ kdj.kfl n/kkUrdkôen; k% ivok $\mathcal{W}$ kL; L=hiR; ; idj.ka | kskgj.ka

I⊯0;k[;k iwoZda ifB";fUr A

Co. 304, B-III :  $\forall$ fLeu~ [k.Ms o\$ kdj.kfl n/kkUrdk@en; kuq kja  $\vee$ 0; ; hHkkol ekl idj.ka

rRi∉"kleklidj.k×p : iflnf/kifØ; kinodalE; d~ ∨oxfe"; fUr A

Co. 304, B-IV : VfLeu~ ?kVds o\$ kdj.kfl n/kkUrdken; ku( kja rnf/kršoi R; kf/kdj.kL; leFkkuka

iFkekn~ ok bfr l⊯knkjH; {kmkh;ks ok bfr ;kor~

V.k&v ´&u×Lu ´k&b ´&vd³&×; &Qd&; ´&Q ´&<d&, jd& <d~bR; 5% iR; ;% Nk=k%

ifjfprk% HkofUr A

?kVde&1% Hkêkîtnhf{kr%] o\$ kdj.kfl ) kUrdkêqh ¼i okû) ē½ %ckyeukjek&rùockf/kuhl fgrk%&16 v dæ vtUri fy Tidj.kkn~vkjH; vtUrui (dfy Tidj.ka; kor& I knkgj.ka I #&okfr2d&0; k[; k(I #@okfr2d&mYy{[ki obda:iflf) 'pA

 ?kVde&2%
 o\$ kdj.kfl ) kUrdkSemh ¼i nok() ≧½ ½ kckyeukjek&rUockt/kuhl fgrk½%
 16 v d1%

 L=hi R; ; i dj.ke& ¼d½ | ŁÑrek/; eu | knkgj.ka | ₩ & okfr2d&0; k[; k(
 ½ [k½ | ₩@okfr2d&mYy{[ki no2da L=hi R; ; L; | ŁÑrek/; eu ifriknua pA

?kVde&3% o\$kdj.kfl)kUrdk@qh ¼ivokD)&% %ckyeukjek& rilockt/kuhl fgrk%& 16 vdt%

 $\lekl & v0;; hHkkoleklidj.ke rRi#"kleklidj.ke lidj.ke lidj.ke lidj.ke likokgj.kal#&okfr2d&0; k[; k(l#@okfr2d&mYy{kim2da:iflf)'pA$ 

10(190)

?kVde&4% o\$ kdj.kfl) kUrdkôem,h ¼imok0) è½ ¼ckyeukojek&rÙock5/kuhlfgrk½% 16 vodk6/ rf) r5oiR; kf/kdkjizdj.ks ^leFkkUka iFkekn~ ok* ¼l⊯l{; k 1072½ bfr I⊯kn~ ∨kjH; ^{kmkH; ks ok* ¼l⊯l{; k 1137½ bfr I⊯a; kor& Ikonkoj.ka I⊯&okfr2d&0; k[; k( I⊯@okfr2d&mYy{skim2da: iflf) 'pA

f**Mi .** ; %

(d)  $\varphi''$  ui = s uo (9) v fuok HZ- $\varphi''$  ul%Hio"; fUA r=k  $\varphi$ He $\varphi''$  us 34/d pr  $\varphi$ /; xri HBÔĐeelf J R; p Helj %(4) fod Yijfgr 1% (v fuok HJ) I £(Hr Helj  $\varphi''$  ul%  $\varphi$ nH; USA v  $\varphi$ Is  $\varphi''$  ul% De' 1%  $\varphi$ He81) rh, 8ri h, 8pr HZ-24/d I E: 1/4%Hio"; fUA

([)) OI; lied c' usiq50% v alf/av by ipulied c' usiqp 100% v alf/aoSiYi d %HosA

(x) f)rh; 34.d L/JriSprijiZ-pelSç'ulSi LiÑirelè; esu ,ol ek/, siS/, UHk/loblik v Äijdu%Hlo'; frAv U/s ç'ul%/LiÑir@elul#@/Ä%UHKllelè; etuled alfi ,d su elè; esu l ek/ krg' LD) U/A

ç'ui #fuekZkfof/%

1. ç'ui=11; fuelZla 11. Ñrek/; eu HosA

2. ç'ui = suo (9) v fuck iZç'ul%Hio"; fUA

3. **ç' ulule~v Älulep foHit ue~v / léy f[ k: i sk Hio''; frµ** 

- I.  $cHe\%c'u\%\mu\nu; a(cHe\%c'u\%34dprd/; xriHBÔðeelfJR HosAvfleu~c'us pRij%(b) fod V jfgrk%(v fuok Hj6l f flrhijc'uk%cnil; USA (4x4346v ÄK%$
- II. frh;% i*t* u% &iFke?kVdkDridj.kIEc) a I#; a Iknkgj.ka 0; k[; krq; FkkfufnZVxbFkkr~ I#=; a inkL; rA  $\frac{1}{2}x4=8\sqrt{a}dk\%$
- III. r`rh; % i*t* u% &iFke?kVdkDridj.kIEc)L; in};L; ieq[kl #kYy{kino2da : iflf) ifØ; ka fyf[krq ; FkkfufnŽVxUFkkr~ in=; a inkL; rA  $V2x4=8\sqrt{a}dk\%$
- IV.
   prikk it u% &f}rh; ?kVdkDridj.klEc) a l#}; a l&Nrek/; eu lknkgj.ka 0; k[; krq

   ; FkkfufnZVxbFkkr~ l#=; a inkL; rfl
   %2x4=8vtdk%
- V.  $i \times pe\%$  itu% &frh; ?kVdkDridj.klEc)L; in; L;  $I # @okfr2d\&mYy{kimo2da L=hiR; ;L;$  $<math>I \& \tilde{N} rek/; eu ifriknuk; ;Fkkfufn2VxUFkkr~in=;a inkL; rA %2x4=8vadk%2$
- VI.
   "k"B% it u% &r`rh; ?kVdkDrizdj.klEc) a l ₩}; a l knkgj.ka 0; k[; krq; FkkfufnZVxbFkkr~ l ₩=; a

   inkL; rA
   ½2x4=8∨tdk%
- VII.I Ire% it u% &rrh; ?kVdkDrizdj.klEc)L;in}; L;ieq[kl #kYy{kiwbda : iflf) ifØ; kafyf[krq ; FkkfufnžVxbFkkr~ in=; a inkL; r\$ $\frac{1}{2}x4=8\sqrt{n}$ dk%
- IX. uoe% i*t* u% &pr@k2kVdkDrizdj.klEc)L; in};L; ie@[kl #kYy{[kiwozda : iflf) ifØ; ka fyf[krq ; FkkfufnŽVxbFkkr~ in=; a inkL; rA  $\frac{1}{2}x4=8\sqrt{a}dk$

∨u¢ kfl rxtJFkk%

#### TY SYLLABUS M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

- 1- o\$kdj.kfl)kUrdkennh %ckyeukjek&rÙockt/kuh&lfgrk% %inok2)e%]Hkêkttnhf{kr]ekrhyky cukjlhnkl]fnYyhA
- 2- o\$kdj.kfl)kUrdk&eqh ¼Hkkx 1&2½]0;k[;kñ xksikynÙk ik.Ms]pk{[kEck lgiHkkjrh]okjk.klhA
- 3- o\$kdj.kfl)kUrdkêqh ¼leklizdj.ke½] 0;k[;kñ ∨kpk;2 txnh'k 'kkL=h rFkk e/kqckyk 'kek] ekyrhyky cukjlhnkl] fnYyhA
- 4- Siddhāntakaumudī, (Vol. I), Eng. Tr. S.C. Vasu, Motilal Banarsidass, Delhi.

 $\star\star\star$ 

COURSE CODE : SKT- SC-305-B i **>pri ki :te - %Oki j. ki 107; k** (2)

Paper- XV : Vyakaranaprakriya (2)

L	Credits
4	4

**i villä 10%**80 **v livifj d elly k**äü**kä 10%**20 **l e; %8 gljik%** (3 Hours)

Co. 305, B-I: ?KVds fLeu~ o\$ kdj.kfl n/kkUrdk@q; k% mùkjkn#kLFk Hokfnx.kL;

Hk&, /k&ozt&de&ft&orq bR; rskka /kkrwka I⊯okfr2divo2da : ifI nf/kifØ; k ckyku~ ckg; rs A

Co. 305, B-II:  $V = kfi \circ kdj.kfl n + kkUrdken + k% mUkjkn + kkL; Hokfnx.kL;$ 

â ~ & . kh ~ & x & i k&?kt&"Bk&nk. k&Mq/Hk"k&xEy&nf' kj&Mq p"k&; t&ol &on , r\$kka /kkrwka

: ifI nf/kifØ;k;k% ckg/kks Nk=ku~ Hkofr A

Co. 305, B-III: O\$ kdj.kfl ) kUrdkeq k % mUkjknkkLFk  $\vee$ nkfnirdj.kL; ngevkl & kh³ & b.k~/kkruk

tgkR;kfnizdj.kL; ∨kçkd&Mqkk´~/kkrwk×p II⊯okfrZkVy{kivoZda:ifInf/kifØ;kaNk=k%

voxfe"; flr A

Co. 305, B-IV :  $\nabla$ fLeu~ Hkkxs Nk=K% o\$ kdj.kfl n/kkUrdk@q $\hat{\gamma}$  uq kja f.kPizdj.ka l Uizdj.keuq f.ktUr&l uUr' kCnkuka fl nf/ka l k/kf; "; fUrA

?kVde&1% Hkêkstnhf{kr% oşkdj.kfl)kUrdkenh Mmùkjk)e½ %ckyeukjek&rùocks/kuhl fgrk%& 16 VCR ¼d½ ∨/k‰ifjxf.kr/kkrd Ec) kuka I ⊯k.kka okfrðkuka p I alÑrek/; eu I knkq j ka 0; k [; kA¼[k½ **ceqk&l⊯@okfr2d&mYy**¶ki**p**2da | ŁÑrek/; eu : iflf)%A fr³Urs Hokfnirdj.ke& Hkw 1/11/2], /k 1/21/2] ort 1/2531/2] deg 1/4431/2] ft 1/5611/2] org 1/7581/A ?kVde&2% o\$ kdj.kfl ) kUrdk@mh %mùkjk) &% %ckyeukjek&rùockf/kuhl fgrk%& 16 VCR v/k‰ifjxf.kr/kkr¢Ec)kuka : ik.kka çe€k&l⊯@okfr2d&mYy€ki∞2da flf)% %µ fr³Urs Hokfnixdj.ke& g×k~ 1/8991/2] .kb×k~ 1/9011/2] xS 1/9171/2] ik 1/9251/2] Äk 1/9261/] "Bk 1/9281/] nk.k~ 1/9301/] MkyHk"k~ 1/9751/] xEy 1/9821/] nf'kj~%988%] Mip "k~%996%] ; t %1002%] ol %1005%] on %1009%A ?kVde&3% o\$kdj.kfl)kUrdk@ph %mùkjk)&% %ckyeukjek&rùock\$/kuhlfgrk%& 16 VOK v/k%ifjxf.kr/kkrqEc) kuka : ik.kka çeqk&l⊯@okfrbl&mYy∮kimbba flf)% %u (i) fr³Urs vnkfnikdj.ke& ng 1/10141/2 vkl 1/10211/2 'kh³~ 1/10321/2 b.k~ 1/10451/A (ii) tqckR; kfni;dj.ke& ∨kqkd~ ¼1090½ Mgkk×k~ ¼1092½A ?kVde&4% o\$kdj.kfl)kUrdk@ph %mùkjk)&% %ckyeukjek&rùock\$/kuhl fgrk%& 16 VOR √/kkfufnžVizdj.kkUrxikuka ¼d½ I⊯k.kka okfridkuka p I knkgj.ka 0; k[; kA ¼[k½ inkuka çe¢k&l⊯@okfr∂&mYy∮kiø∂da : iflf)% μ fr³Ur& (i) f.kpidj.keA (ii) luidj.keA f**Mi.;%** 

(d) ç'ui =ls I lr (7) v fuok, liZç'ul%Hio'', fUAr =k çHeç'us 31/d pr q4; xr i HBÖØeelf.J IR p felj %(4) fod Yijfgr l% (v fuok, lij), I f(llr lèj; ç'ul% çnll; USA v Us ç'ul% Øe'l% çHe81) rh, 8r i h, 8p rijli 24/d I E: ////Hio'', fUA

(x) çFle?AvlikUrist)rh,rřh,isç'ulsiblűrelè, esi,oiek/şist/ÿFlikioblikvÄöglu/%Hlio";frAvU;s ç'ul%iblűro@julk@väXil-hklielè, ekulecistři, disielè, esiiek/krefiD)USA

# ç'ui #fuekZkfof/%

- 1. ç'ui=lt; fuelZlei ŁÑrek/; eu HosA
- 2. ç'ui = l lr (7) v fuck lizç'ui%Hio'', fUA
- 3. ç'ulule~v Äliulap foHit ue~v / liyf[ k: i sk Hio"; frµ
  - I.  $cfle% c'u% \mu v; a (cfle% c'u% 34/d pr 4/; xr i HBÔðeelf J R Hos A v fleu~ c'us p folj%(p) fod Yi jfgr k%(v fuok lijs I f(itr kijc'uk%cril; UsA (4x43/46v Äk%))$

- II. frh; % it u% &iFke?kVdkDridj.kIEc) a I#}; a ItNrek/; eu Iknkgj.ka 0; k[; krq ; FkkfufnZVxbFkkr~I#=; a inkL; rA (2x4=8vÄR%)
- III. r`rh; % it u% & i Eke?kVdkDridj.klEc)L; in};L; l LÑrek/; eu ie([k&l #@okfr2d&mYy{kim2da : iflf) ifØ; ka fyf[krq ; FkkfufnZVxUFkkr~ in=; a inkL; rA (2x4=8♥ÅR6
- IV. prfk it u% &f}rh; ?kVdkDridj.kIEc)L; inprfV;L; ief[k&I #@okfr2d&mYy{[kim2da : ifIf) ifØ; ka fyf[krq; Fkkfufn2VxUFkkr~ "kV~ inkfu inkL; UrA (4x4346vÄK).
- V.  $i \times pe\%$  itu% &rrh; ?kVdkDridj.klEc)L; inprdV;L;  $ieq[k\&l#@okfrd&mYy{kivoda : iflf)ifØ; kafyf[krq; FkkfufnZVxUFkkr~"kV~ inkfu inkL; Ur& (4x4346vÄK)$
- VI. "k"B% i t u% & prfkt2kVdkDridj.klEc) a  $I \neq @okfr2d$ }; a  $I knkgj.ka 0; k[; krq; ; Fkkfufn2VxUFkkr~ I \neq @okfr2d=; a inkL; rA (2x4=8<math>\vee$ ÄR%)
- VII.I Ire%it u%&prfk2kVdkDridj.kIEc)L;in};L;ie([k&] #@okfr2d&mYy{kim2da: ifl f) ifØ; ka fyf[krq; Fkkfufn2VxUFkkr~in=; a inkL; rA $(2x4=8v Å R_{6})$

∨ud kfl rxtJFkk%

- 1- o\$kdj.kfl)kUrdk@eqh %mÙkjk)&%] Hkêkstnhf{kr] %ckyeukjek&rùocks/kuh&Ifgrk% eksrhyky cukjIhnkI] fnYyhA
- 2- vk[;kfrd%] Lokeh n;kuUn] o&nd ;U=ky;] vtejA
- 3- Siddhāntakaumudī, (Vol. 2), Eng. Tr. S.C. Vasu, Motilal Banarsidass, Delhi.

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M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

**Option (III)** 

ox226'x* Hijrhn' kile~

**Group-C** (Indian Philosophy)

COURSE CODE : SKT- SC-302-C

**) kri kai ±e~%djk, ni kile~** 

Paper- XII : Nyayadarshanam

L	Credits	
4	4	

i v**HÄR%**80 v HJfj d e<del>M</del> HÄüHÄR%20

le; %3 gisk% (3 Hours)

SKT-SC-302-C-1 fl ) kareqia koY; k% iR; {k[k.ML;  $\vee$ /; ; usu U; k; n' ku kuq kja iR; {ki ek.kL;

rùoeheka k; k% p Kkue~ Hkofr A

skt-sc-302-c-2 fl) kretäkoY; K% dkfjdkuka lii x0; k[; ki) r% Kkue~ o/krs A

skt-sc-302-c-3 fl) kreepikoY; k% i³ähuka 0; k[; kuk% fufeùka enyikBL; ln(ee~ v/;; ue~

fØ; rA

SKT-SC-302-C-4 U; k; n'kuL; ie(kfl) krkuka fVIi.khy(ku}kjk Nk=k.kke~oLrfu"Ba Kkue~ijh{; rA

?kVde&1	%	foüoukFkU; k; i×pkuu%] Hkk"kkifjPN\$% e\$prkoyhl fgr%] i k; {k[k.M%	
		1/48651/28 dkfjdk $\%$ $\mu$ fucl/kkRedit u%A	16 <b>V 08%</b>
?kVde&2	%	Hkk"kkifjPN\$% e@rkoyhlfgr%j i&;{k[k.M%	
		¼1&65½a dkfjdk‰ µ li <b>z ¯&amp;</b> enydkfjdk0; k[; kA	16 <b>Va%</b>
?kVde&3	%	Hkk"kkifjPN\$% e@rkoyhlfgr%j i&;{k[k.M%	
		1/1&65½a dkfjdk1/2/4 liz	16 V <b>ak</b>
?kVde&4	%	Hkk"kkifjPN\$% e@rkoyhlfgr%j i&;{k[k.M%	
		¼1&65½a dkfjdk‰ μ fo'knfVli.;kRediŮu%A	16 <b>VaR%</b>

f**Mi.;%** 

(w.e.f. Session 2021-2022)

(d) ç'ui=ls i×p (5) v fuck, MZ-ç'ul% Hio"; fulAr=k çReç'us 34/d prüj/; xri HBÔDeelk/JR; pReji%

(þ) fod Yijfgrk% (vfuok, kljó lít(klrkk) jç'uk% lítŘrek/;eu lek/kkraj çnkl; USA vUsç'uk% Øe'k% çfiest)rh, strih, sprijk 2001 i 61/48/hio''; fUA

([) OI; iled c'usiq50% v two ly ipulied c'usiqp 100% v two site of whether the set of the se

(x) çFle% ç'u% iblÑrelè;esa ,o iek/ş% v'çiFlk ioblk v'äğıfu% Hlo";frA v'çis ç'ul% iblÑr@gbb#@lÄXbHbKblelè;ekuledsalli ,dsa elè;esa iek/krefiD)blA

#### çüui #fuelZkfof/ %

- 1. iÜui=fuekZka l ŁÑrek/; eu HkorA
- 2. iÜui=s i×p ¼5½ ∨fuok; k‰ iłuk% Hkfo"; fUrA
- 3. it ukuke~ v dddap foHktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. çFle%ç'u%µv; a(çFle% ç'u%31/d pr q/; xri HBÔðeel/J R; HosA v fLeu~ç'usp Rolj%
     (b) fod Yi jfgr k%(v fuok, k% l f(ilr kk)ç'uk%i k%rekè; eu l ek k q çrki; UfA

(4x4346vÄK)

- II. ()rh %ç'u%(çHe 34d KJr% &; FkkfufnžVa xUFke~ ∨kfJR; , da fucU/ka fyf[krq fucU/k}; a

   inkL; rA

   ¼16v ÄK%
- III. rrh; % ç'u% ½}rh; ?kVdkfJr% &li1 adkfjdk}; a 0; k[; krq; Fkkfufn2Vx1Fkkr~dkfjdk=; a inkL; rA 2x8=16v ÄK%
- IV. pr[k‰ ç'u% ½r`rh; ?kVdkfJr‰ &li1 aif³ä}; a 0; k[; krq ; FkkfufnľVxbFkkr~ if³ä=; a inkL; rA ½x8=16v ÄK%
- v.  $i \times pe\%$  ç'u% ¼pr[k½kVdkfJr%2 &; FkkfufnžVa xb/Fke~ vkfJR; }; k‰ fo'knfVli.k° fyf[krq fcUne; a inkL; rA 2x8=16v ÅK‰

## ∨u¢ k&l rxtJFkk%

- 1- U; k; fl ) kUre@rkoyh] fnudjh&jke#nb&Vhdkl fgrk] pk{[kEck] okjk.kl h A
- 2- U; k; fl ) KUre@prkoyh] 0; kñ pUn/kkjh fl g] Hkkjrh; fo | k i zdk' ku] fnYyh A
- 3- U; k; fl ) kUre@prkoyh] i R; {k[k.M%] 0; kñ /keBnukFk 'kkL=h] ekrhyky cukjlhnkl] fnYyh A
- 4- U; k; fl ) kUreprkoyh] i R; {k[k.M%] 0; kñ xtkuu 'kkL=h eq yxkodj] pk[kEck] okjk.kl h A
- 5. Bhāṣāpariccheda with Muktāvalī, Eng. Tr. & Notes, Swami Madhavananda, Advaita Ashram, Calcutta.

#### ***

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

#### COURSE CODE : SKT- SC-303-C *** ki ki je~%i wižielisini kije~**

#### Paper- XIII : Purvamimamsadarshanam

L	Credits
4	4

i vilä 18/60 v Holfj d ett käälä 18/620

le; %3 gisk% (3 Hours)

SKT-SC-303-C-1 ekues kn; xt/FkL; v/;; usu eheka kn'kuL; ied[kfl) karkuka inkFkkuka p Kkue~

Hkofr A

skt-sc-303-c-2 ekues kn; xUFkL; dkfjdkuka egùoa voxE; rs 0; k[; ki) r% p Kkue~ tk; rs A

SKT-SC-303-C-3 ekueş kn; xUFkL; i ³  $\ddot{a}$  huka 0; k[; k; k% fufeùka enyi kBL; l (ee~ V/; ; ue~

fØ; rA

skt-sc-303-c-4 indéheka kn'kul; ieq[kf]) karkuka fVIi.khy{[ku]kjk olríju"Ba Kkue~Hkofr A

?kVde&1	%	ukjk; .k}; h]	ekues kn; % ¼doya es Hkkx% µ fucU/kkRediÜu%A	16 <b>Vak</b> ⁄o
?kVde&2	%	ekues k <b>n</b> ;%	¼dogaesHkkx‰µ lizl¯enydkfjdk0;k[;kA	16 <b>Va%</b>
?kVde&3	%	ekues k <b>n</b> ;%	%dogaes,Hkkx‰µ lizl [−] x if ³ ä0;k[;kA	16 <b>Va%</b>
?kVde&4	%	ekues kn;%	¼dρyaeşHkkx‰μ fo'knfVli.;kRediÜu%A	16 <b>VaR</b> ⁄6

## f**Mi .** ; %

(d) ç'ui = s i > p (5) v fuck lize; ul%Hio"; fulA r=k çHeç'us 34d prü/; xri lBÔ2eeli(J R p Rolij%

(þ) fod ¥ijfgr 1% (v fuok, H)jő i £(Hr kkijç'ul% al kűreke; esi i ek/ir qiçmil; UA v Usç'ul% Øe'1% çHe&1) rh, &r rh, &pr H)ZA dii 12:1/1% Hio''; fUA

(x) çFle% ç'u% iblÑrelè;esa ,o iek/ş% v'çiFlk iobbk vÄğdüu% Höo";frA v'çis ç'ul% iblÑro@juble@lÄXüHbkBlelè;ekuledisabli ,distelè;esa iek/kre(ib)bl&a

## çüui #fuelZffof/ %

- 1. iÜui=fuekZka l ŁÑrek/; eu HkorA
- 2. ḯ́ui=s i×p ¼5½ ∨fuok; ½% i≀uk% Hkfo"; fUrA
- 3. it ukuke~ v dddap foHktue~ v/k&yf[kr: isk Hkfo"; frµ
  - i. çHe%ç'u%µv; a(çHe% ç'u%31/d pr¢/; xri IBÔØeel/J R; HosAvfLeu-ç'uspiblj%
     (þ) fod Yijfgrk%(vfuok, lijk, lif(lirikijç'uk%) tiÑrelè; en lek/krqçniL; USA

(4x4**¾**6v Ä**K**‰

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

- II. f}rh; % i*t* u% ¼iFke?kVdkfJr% &; FkkfufnžVa xbFke~ vkfJR; , da fucU/ka fyf[krq fucU/k}; a inkL; rfk  $\chi_16vadk\%$
- III. r`h; % it u% ¼f}rh; ?kVdkfJr% &l it aenydkfjdk}; a 0; k[; krq; FkkfufnZVxUFkkr~ dkfjdk=; a

   inkL; rA
   ½2x8=16∨tdk%
- IV. pr[k‰ iłu% ¼r`rh; ?kVdkfJr‰ &lił **a**x | if**³ä**}; a 0; k[; krq ; FkkfufnžVxbFkkr~ if**³ä**=; a inkL; rA ½x8=16∨tdk‰
- V.  $i \times pe\%$  it u% % prik2kV dkfJr% &; FkkfufnZVa xUFke~  $\vee kfJR$ ; }; k% fo'knfVli.k° fyf[krq fcUnp; a inkL; rA %  $2x8=16 \vee idk\%$

∨u¢ k£l rxtJFkk%

- 1- ekueş ka; %] ukjk; .k}; hizkhr%] 0; kñ Lokeh ; kxhlnkulln%] okjk.kl hA
- 2. Mānameyodaya, Eng. Tr. & Comm., Surya Narayan Shastri, Adyar.
- 3- ehekal kn'kufoe'kkaj okpLifr mik/;k;%j Hkkjrh;fo|kizdk'ku] fnYyhA
- 4- ehekal kn'kū dk mnHko ∨k§ fodkl] MkWi inek ∨oLFkh] lýjHkkjrh indk'ku] dkuiýjA
- 5. Studies in the Schools of Pūrva Mīmāmsā, Ganganath Jha.

 $\star\star\star$ 

# COURSE CODE : SKT- SC-304-C prq2lai =le-%ploid n' lile-t (at lile-p

Paper- XIV : Charvakadarshanam Jainadarshanam Cha

T	Cradita	<b>i v#ä₽∕</b> 80	
		v Hufj d eM/ Käülä1%	20
+		<b>Ι e; %3 gijsk%</b> (3 Hoι	urs)

SKT-SC-304-C-1 I Oh' kul xgxbFkL; iFkeL; r'rh; L; p V/; k; }; L; V/; ; u}kjk

pkokdt&n'ku; k% ieq[kfl ) kUrkuka Kkue~ ikl; rs A

skt-sc-304-c-2 dkfjdkuka l i 2 ³x0; k[; kdj.ku y{kudkskyL; fodkl% Hkofr A

skt-sc-304-c-3 x | i ³ähuka 0; k[; k fo"k; L; l kee~ v/; ; ua ij; frA

skt-sc-304-c-4 pkokd&t&&n'ku&}; e~ vf/kNR; fVIi.khy{ku}kjk oLrfu"Ba Kkue~ vfHko/kts A

(w.e.f. Session 2021-2022)

?kVde&1	%	ek/kokpk;14j loħ'kulaxg%j pkokādn'kūa t§un'kū×p	
		¼iFke&r`rh; k/; k; k‰ µ fucU/kkRediÜu%A	16 V <b>ak</b>
?kVde&2	%	l oħ' ku l ʑɡɣj pkokādn' kua t sın' ku×p ¾i Fke&r`rh; k/; k; ksu	
		l i il "dkfjdk0; k[; kA	16 VCK
?kVde&3	%	loħ'külæg%j pkoködn'kūa t§un'kū×p ¼iFke&r`rh; k/; k; k§u	
		lizl [™] x  if ³ ää0;k[;kA	16 VCC
?kVde&4	%	loħ'kūlæg%j pkokðn'kūa t§un'kū×p ¼iFke&rrh k/; k; k%µ	
		fo'knfVIi.;kRed%iÜu%A	16 <b>Vak</b> ⁄o

f**\li.;%** 

(d) ç'ui=ks i ×p (5) v fuok, HZoç'ul% HIo"; fUAr=k çFleç'us 34/d prü//; xri HBÔðeek/JR; p Holj% (þ) fod ¥jfgrk% (v fuok, HZo I & (Hrkäjç'ul%) bu\reke; esil ek/krajçnik; USA v Usç'ul% Øe'k% çFle&1) rh&rih, 8prifiz34/di E: /4R/Hio"; fUA

([) OI; lied c' uliq50% v like ly ipulied c' uliqp 100% v like of Y i d % Hos A

(x) çFle% ç'u% iblÑrelè;esa ,o iek/ş% v'ç'Flak iobbak vÄögliu% Hotv';frA v'ç's ç'ul% iblÑro@jubl@vÄXbHbKblelè;ekulecisabi ,distelè;esa iek/kre(HD)bl&A

## çüui #fuelZlfof/ %

- 1. illui=fueklka l LÑrek/; eu HkorA
- 2. ḯ́ui=s i×p ¾5½ ∨fuok; № i'źuk% Hkfo"; fUrA
- 3. i*i* ukuke~ **v dkule**p foHkktue~ v/kkfyf[kr: isk Hkfo"; frµ
  - i. çfle%ç'u%µv; a(çfle%) ç'u%31/d prü/; xri HBÔØeelfJR; HosAvfLeu-ç'uspiblj%
     (b) fod V jfgrk% (v fuok, lij), l f(itrikijç'uk%) liÑrelè; eu l ek/k q çril; UfA

#### (4x4**34**6v Ä**R%**

- II. f}rh; % i*t* u% ¼iFke?kVdkfJr% &; FkkfufnZVa xbFke~ $\vee$ kfJR; , da fucU/ka fyf[krq fucU/k}; a inkL; rf  $16\sqrt{R}$
- III. rrh; % it u% ¼f}rh; ?kVdkfJr% &lit adkfjdk}; a 0; k[; krq; FkkfufnžVxbFkkr~ dkfjdk=; a

   inkL; rf
   %2x8=16v ÄK%
- IV. pr[k% i/u% ½rrh; ?kVdkfJr% &li] a x | if³ä}; a 0; k[; krq ; FkkfufnZVxbFkkr~ if³ä=; a

   inkL; r\$

   ½x8=16v ÄK%
- v.  $i \times pe\%$  i*t* u% %prfk2kVdkfJr% &; Fkkfufn2Va xUFke~ vkfJR; }; k% fo'knfVli.k° fyf[krq fcUn $\oplus$ ; ainkL; rA %2x8=16v ÄK%

∨u¢ kfl rxIJFkk%

- 1- ek/kokpk;Ñr% lont'külaxg%] latÑrVhdk] dk'khukFk oklopo ∨H;oogi%] iqkA
- 2- loħ'kūlaxg%] ∨kuUnkJe] iqkA
- 3- loħ'kūlaxg%] 0;kñ mek'kadj 'kekī _f"k] pk{[kEck fo|kHkou] okjk.kIhA

#### SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

- 4- SarvadarśanasaIngraha, Eng. Tr. E.B. Lowell and A.E. Gough, Parimal Pub. Delhi.
- 5- pkokidn'kiu dh 'kkL=h; leh{kk] lokiuUn ikBdA
- 6- Lokāyata, D.P. Chattopadhyaya
- 7- tûn'kû] egbînz deçkj 'kkL=h] okjk.kl hA
- 8- t§un'ku] euu ∨k§ ehekalk] efu uFkey] p∉A
- 9- tŷn'kù ∨kÿ iæk.k'kkL=&ifj'khyu] njckjh yky dk\$B;kA
- 10- t& /ke] dSyk'kpUnz 'kkL=h] eFkijkA

 $\star\star\star$ 

COURSE CODE : SKT- SC-305-C

## i xpn*lei ±le~%cl&n*litle~

Paper- XV : Bauddhadarshanam

L	Credits	
4	4	

i viiä 12/60 v HJ fj d ett kääkä 12/20 L et 2/2 dit 12/2 Henry

le; %3 gist% (3 Hours)

SKT-SC-305-C-1 loh'kul xgxUFkL; f}rh; s  $\vee$ /; k; s ck) n'kuL; ifriknue~ orrs A reoyEC;

ck() n'kuL; ieq[kfl ) kUrkuka Kkue~ikl; rA

SKT-SC-305-C-2 dkfjdkuka l i 2 ³x0; k[; kdj.ku y{kudkskyL; fodkl% Hkofr A

SKT-SC-305-C-3 X |  $i^3 \frac{\partial}{\partial h} \ln 0$ ; k[; k fo"k; L;  $l (e \otimes V/; u \in h + i)$ ; frA

skt-sc-305-c-4 cK) n' kue~ vf/kNR; fVIi.khy{ku}kjk oLrfu"Ba Kkue~ vfHko/krs A

?kVde&1% ek/kokpk; ½] loħ'kulæg% μckŷn'kue} f}rh; k/; k; % μ fucl/kkRediΰu%A 16 vodk% ?kVde&2% loħ'kulæg% μckŷn'kue} f}rh; k/; k; % μ liż dkfjdk0; k[; kA 16 vodk%

 $\frac{16 \text{ value}}{2} \text{ for kut kg/ } \mu \text{ k$ 

?kVde&4% loh'kulaxg% μck()n'kue}f}rh;k/;k;%μ fo'knfVli.;kRed%il/u%A 16 να 16 γα 16

**fMi . ; %** 

(d) ç'ui = s i > p (5) v fuok li‰ç'ul%Hio'; fuA r=k çHeç'us 34/d pri4/; xri lBÔ2eelfJ R p lelj%
(þ) fod Yijfgr k% (v fuok, ki‰ l £(krkèj ç'ul% l £Ñrek/; eu | ek/kkrą çnkl; UA v Us ç'ul% Øe' k% çHe80) rh, 8ri h, 8pri4E34/d l E: /48/Hio'; fuA

([)) QI(; Hed c' usig50% v at av by bulked c' usigp 100% v at av Si Yi d 3 Hos A

(x) çRe% ç'u% läÑrekè;esa ,o lek/s% v'⊎Rk lobbk vÄöglíu% Hio";frA v'⊎s ç'uk% IbÑro@jubh@kÄXahhkblekè;ekulecistii ,dsaekè;esalek/kre(HD)UAA

çüui **#fuelZhof/%** 

- 1. illui=fueklka | ŁÑrek/; eu HkorA
- 2. iÿui=s i ×p ¾5½ ∨fuok; № iżuk% Hkfo"; fUrA
- 3. it ukuke~ v ddulap foHkktue~ v/kkfyf[kr: isk Hkfo"; frµ
  - i. çHe%ç'u%µv; a(çHe% ç'u%3Nd prQ/; xri HBÔðeelfJ R HosAvfLeu-ç'uspRij%
     (b) fod YijfgrR%(vfuok Hjb I f(IIrkijç'uk%I HÑrekè eu I ek k qçnk; UfA

(4x4346vÄK)

- II. f}rh;% iźu% ¼iFke?kVdkfJr‰ &;FkkfufnŽVa xbFke~ ∨kfJR; , da fucU/ka fyf[krq fucU/k};a inkL; rA ¼16**v ÄK%**
- III.
   r`n'; % i z' u% ¼f}rh; ?kVdkfJr% &l i z' adkfjdk}; a 0; k[; krq ; FkkfufnzVxbFkkr~ dkfjdk=; a

   inkL; rA
   ½2x8=16v ÄK%
- IV. pr[k‰ iłu% ¼r`rh; ?kVdkfJr‰ &lił **a**x | if**³ä**}; a 0; k[; krq ; FkkfufnŽVxbFkkr~ if**³ä**=; a inkL; rA ½x8=16**v ÄK%**
- V.  $i \times pe\%$  it u% 4pr[k2kVdkfJr%2 &; Fkkfufn2Va xbFke~  $\vee$ kfJR; }; k% fo'knfVli.k° fyf[krq fcUn $_{\pm}$ ; a inkL; rA 2x8=16v ÄK%

#### ∨u¢ kfl rxIJFkk%

- 1. ek/kokpk;Ñr% loñ,'külaxg%[la:ÑrVholk] dk'khukFk oklapo ∨H;ooej%[iqkA
- 2- loħ'kūlxq%, 0;kñ mek'k**œ;** 'kek2 _f"k] pk\$(kEck fo|kHkou] okjk.klhA
- 3- U; k; fcUnlyhdk] 0; kñ JhfuokI 'kkL=h] ejBA
- 4- ck() n'kůehekátk] cyno mik/;k;] okjk.klhA
- 5- ckS)n'kū] jkgny IkbÑR;k;u A
- 6. Buddhist Logic (Vos I & II)], Theodore Stchervatsky.
- 7. okpLifr feJ }kjk ck\$) n'k²u dk foopu] Jhfuokl 'kkL=h] d∉{ks=A
- 8. ∨fHk/keħs'kuk % ck\$) fl)kUrka dk foopu]/kepUnz t\$i] d¢{ksA
- 9. Buddhist Philosophy as Presented in Mīmāmsāślokavārtika, Vijaya Rani, Parimal Pub., Delhi.

***

TY SYLLABUS M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

**Option (IV)** 

**ox2%3* | H**Ñr| HgRe~

Group-D (Sanskrit Literature)

COURSE CODE : SKT- SC-302-D }ht ki te~%ul\Ô kgRe~

Paper- XII : Natyasahityam

L	Credits
4	4

i villä 18/280 v livifj d elly käükä 18/220 l e; %8 gljst% (3 Hours)

Co. 302. DI: dfoifjp; su lkfgR; a le) a Hkofr A xUFkk/; ; su volFkkuÑfr& ukU/; RokRidj.kL; os' k"V; a Kk; rs A

Co. 302. DII: idj.kdFkkuda rRIEC)/kk'p ituk% xUFkL; o§'k"V;a iek.khdqtUr A

Co. 302. D III : dk0; ukV; o§' k"V; I fgra 0; ki fùki ja Kkuei yH; rs A

Co. 302. D IV : V = xUFkL; , frgkfl diek.kijLl ja ik=fo'kskk.kka of k"V; a ifjph; rs A

## TY SYLLABUS M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

?kVde&1	%	ˈkmd%] ePNdfVdeµ l ŁÑrek/; eu 'ykd0; k[; kA	16 V <b>CK</b>
?kVde&2	%	ePNdfVdeµ ∨kykpukRedk% iżuk%A	16 <b>Va%</b>
?kVde&3	%	Jhg"k&j jRukoyh ukfVdkµ dk0; Ik\$Bofun&kivo2da Iia <b>l "al</b> ykod0; k[; kA	16 <b>Va%</b>
?kVde&4	%	jRukoyh ukfVdkµ ∨kykpukRedk% iłuk% A	16 <b>Va%</b>

## f**\li . ; %**

(d) ç'ui = s i > p (5) v fuok, liZ, ç'ul% Hio"; fulA r=k çHeç'us 34/d p r iq/; xri lBÔðeeli(J R p liðlij%

(**þ) fod Vijfgri‰ (vfuok kijs If (krkkijç'uk%** Iek/kkraj **çnki; UfA vijs ç'uk% Øe'k%** ç**fie&()rh &rrh &prijiZ3uli iz %k/kio'; fuA** 

([) OI; lied c' usiq50% v at/av by ipulied c' usiqp 100% v at/aoSIY d %HosA

(x) f}rh;% ç'u% ibtÑrelè;esa ,o iek/ş% v'ç'Hik iobbk v'äğılu% Hio";frA v'ç's ç'ul% IbtÑr@gubl@zkäXbhHkblelè;ekuledishli ,disıelè;esaiek/krefiD)bt&

# çüui **#fueliZi**fof/ %

- 1. illui=fuek2ka l & Nrek/; eu HkorA
- 2. i̇́́ui=s i×p ¼5½ ∨fuok; ½% i̇́tuk% Hkfo"; fUrA
- 3. *it* ukuke~ **v dkle**p foHkktue~ v/kkfyf[kr: isk Hkfo"; frµ
  - I. çHe%ç'u%µv; a(çHe% ç'u%3Vd pr¢/; xri HBÔðeelfJ R; HosAvfLeu-ç'uspíðlj%
     (b) fod Yijfgrí% (v fuok lijb l f(ilríkijç'ul%) ek krąçnil; UA; (4x43/46v ÄK);
  - II.f}rh; % it u%  $\frac{1}{2}$  Fke?kVdkfJr% dk0; I kBofunk kinotda I it a' ykd}; a I t  $\tilde{N}$  rek/; eu0; k[; krq; FkkfufnžVxbFkkr~' ykd=; a inkL; rA $\frac{1}{2}x8=16v$  ÅK
  - III. r`rh; % ç'u%  $\frac{1}{16}$ rh; ? $\frac{1}{16}$  ; FkPNe~, da i*t* ua lek/kkrę~vkykpukReda i*t* u}; a inkL; r**s**  $\frac{1}{16}$
  - IV. pr{k% it u% %rrh; ?kVdkfJr%% dk0; lkSBofunk ki ko2da lit a'ykd; a 0; k[; krq ; FkkfufnžVxt/Fkkr~ 'ykd=; a inkL; rk %2x8=16v ÄK%
  - V.  $i \times pe\%$  ç'u% %prfk%WdkfJr%%% ; Fkkfufn%WkfVdka ukfVdkdkja p  $\vee$ kfJR; ; Fk%Ne~, de~  $\vee$ kykpukReda it ua lek/kkrę~it u}; a inkL; rÅ %16 $\nu$ ÅR%

∨u¢ kfl rxiJFkk%

- 1- ePNdfVde} 'kmad%] IEikñ MkWi JhfuokI 'kkL=h] IkfgR; Hk.Mkj] Ikfkk"k cktkj] ejjBA
- 2- ePNdfVde~ukVd] iFoh/kj&Ñr 0;k[;k Ifgr] pk{kEck I&Ñr I&Fkku] okjk.kIhA
- 3- ePNdfVde} xaxk laLÑr&fgUnh 0;k[;k lfgr] lEikñ xaxklkxj jk;] pK[kEck laLÑr laLFkku] okjk.klhA
- 4- Mrcchakațika of Śūdraka (A Critical and Cultural Study), S.K. Sharma, Parimal Publications, Delhi.
- 5- jRukoyhukfVdk] Jhg"k&] |Eikñ MkW f'kojkt 'kkL=h] |kfgR; Hk.Mkj] |b|kk"k cktkj] ejBA
- 6- jRukoyh ukfVdk] fdj.kkoyh lalÑr&fgUnh&0;k[;kisrk] lEikñ iñ jktšoj 'kkL=h eqlyxkpdj] pk[kEck lalÑr lalFkku] okjk.klhA
- 7- jRukoyh ukfVdk] Jhg"k], Hkkk.kk[; Hkk"kkVhdkley³Årk], fVli.kh&lfgrk], yni oztjRu Hkêkpk; ], Hkkjrh; fo|k

#### SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

idk'ku] tokgj uxj] fnYyhA

8- I & Ñr ukVddkj] dkfUrfd'kký Hkjfr;k] i dk'ku 'kk[kk] I (puk foHkkx] můkj i nšk] i z kxA

9- IbLÑr&ukVd&leh{kk] iknő bUnniky flog bUnn] lkfgR; fudsru] dkuigiA

10- I&iÑr ukVd] ,ñ chñ dhFk] vuqî MkWi mn;Hkkuq flog] ekorhyky cukjihnki] fnYyhA

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# COURSE CODE : SKT- SC-303-D

Paper- XIII : Kavyashastram (1)

L	Credits	
4	4	

i **vHÄR%**80 **v HJfjd eN/ HÄüHÄR%**20 **I e; %3 glji%** (3 Hours)

Co. 303. D I : , rsu I k  $\tilde{N}$  rek/; esu dk0; 'kkL=h; k.kkekpk; k2 kka 0; k[; kigLI ja d0; y{k.kHksniz, kstukfHk/kk'kDR; kRed% ifjp; ks fi I E; xokI; rs A Co. 303. D II : V = 'kCnkFk2, k% Lo: i V VFkk2r~ y{k.kka rnHksnkap fon; kfFk2u% Li"Vr; k

voxPNfUr A it uku~vfi Ik/k; fUr rRI Ecn+kku~A

Co. 303. D III : ?kVds fLeu~ Nk=k% | kjY; su 'kkCnh0; ×tuka p | kn/kj.keoxPNfUr A

 $Nk=k\% \vee k\gamma kpukRedku~ it uku~ foLrkj; fUr fo"k; ef/kxPNfUr p A$ 

Co. 303. D IV : VfLeu~ ?kVds jll #L; 0; k[; ki no 2da prqkk± jlfl n/kkUrkuka Kkua Hkofr A Hkoslfgrk% uojl k%] Hkko/ou; %] jl kHkkl k%] HkkokHkkl k' p Kkuxkopjk% HkofUr Nk=k1; % A

 ?kVde&1 % eEeV%] dk0; idk'k%] iFke% mYykl% μ
 16 vd%

 1 & Ñrek/; euμ dkfjdk0; k[; k \Fkok vkykpukRed% itu%A
 16 vd%

 ?kVde&2 % dk0; idk'k%] f}rh; % mYykl%] y{k.kkfu: i.ki; Dreμ
 16 vd%

 dkfjdk0; k[; k \Fkok l\$kfUrd% itu%A
 16 vd%

 ?kVde&3 % dk0; idk'k%] f}rh; % mYykl%] 0; ×tukfu: i.kr% lekfIri; Dre(
 16 vd%

 ?kVde&3 % dk0; idk'k%] f}rh; % mYykl%] 0; ×tukfu: i.kr% lekfIri; Dre(
 16 vd%

 ?kVde&4 % dk0; idk'k%] prik% mYykl% µdkfjdk0; k[; k \Fkok l\$kfUrd% itu%A
 16 vd%

 ?kVde&4 % dk0; idk'k%] prik% mYykl% µdkfjdk0; k[; k \Fkok l\$kfUrd% itu%A
 16 vd%

(d) ç'ui=ls i ×p (5) v fuok, li‰ç'ul%Hio'; fulAr=k çHeç'us 34/d prü/; xri lBÔðeelíJR; p lælj% (þ) fod ¥ijfgrl% (v fuok, li‰ I £(Hrkùj; ç'ul% |ek/kkra; çnlL; UsA v Us ç'ul% Øe'l% çHe&?)rh, &rih, &prüji£34.dl lē:/#%Hio'; fulA

([) OI; iled c'usiq50% v two by bulked c'usiqp 100% v two of Y d % Hos A

(x) f}rh;% ç'u% l biÑrelè; ea, o lek/s% v t/Fik lobbk v Äigifu% Hio"; frA v t/s ç'u% I biÑr cējuh@lÄXiftiktlelè; ekuled sifi, d a elè; ea lek/krefit) t/A

## çüui #fuelZkof/%

- 1. illui=fueklka | LÑrek/; eu HkorA
- 2. iÜui=s i×p ¼5½ ∨fuok; k‰ iłuk% Hkfo"; fUrA
- 3. it ukuke~ volulap foHktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. çHe%ç'u%µv; a(çHe% ç'u%3Vd prQ/; xri HBÔØeelfJ R HosAvfLeu-ç'uspRij%
     (b) fod Y jfgrR%(vfuok lijb l f(llrlig)ç'ul% ek k qçrll; UA (4x4¾ 6v Äl%)
  - II. f}rh; % it u% ¼i Fke?kVdkfJr‰ dk0; 'kkL=h; fl)kUrfoopuino2de~, dka dkfjdka | ½.Ñrek/; eu 0; k[; krq; Fkkfufn2VxUFkkr~dkfjdk}; e~ ∨Éok, da it ua l ½.Ñrek/; eu | ek/kkrq it u}; a inkL; rA
  - III. r`rh; % ç'u%  $\frac{1}{r}$ ; %VdkfJr%& dk0; 'kkL=h; fl ) kUrfoopuiøde~, dka dkfjdka 0; k[; krq ; FkkfufnžVxbFkkr~ dkfjdk}; e~  $\sqrt{Eok}$ , da it ua lek/kkrq it u}; a inkL; rA  $\frac{1}{16}$
  - IV. pr[k% ç'u% ½r`rh; ?kVdkfJr%& dk0; 'kkL=h; fl ) kUrfoopui@de~, dka dkfjdka 0; k[; krq ; FkkfufnŽVxbFkkr~ dkfjdk}; e~ $\vee$ Éok , da it ua lek/kkrq it u}; a inkL; rA ½16**v ÄK%**
  - V.  $i \times pe\%$  ç'u% %prfk2kVdkfJr%& dk0; 'kkL=h; fl ) kUrfoopuino2da dkfjdk}; a 0; k[; krq ; Fkkfufn2VxUFkkr~ dkfjdk=; e~  $\vee$ Éok , da izua lek/kkrq izu}; a inkL; rA %16**v ÄK%**

∨u¢ k£l rxtJFkk%

- 1- dk0; i dk' k] eEeV] Vhdkdkj& okeu >ydhdj] Hkk.Mkjdj vk(j; .Vy fjlp2 bULVhV; V] i wkA
- 2- dk0; i dk' k] 0; k[; kdkj& vkpk; l fo' os oj] Kkue.My fyñ] okjk.kl hA
- 3- dk0; i dk' k] I Ei kñ Jhfuokl 'kkL=h] I kfgR; Hk.Mkj] ej BA
- 4. V. Raghavan, Some concepts of Alamkāraśāstra.
- 5. P.C. Lahiri, Concepts of Riti and Guna.

#### SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

- 6. V. Raghavan, The Number of Rasas.
- 7. S.K. De, Sanskrit Poetics.

 $\star\star\star$ 

## COURSE CODE : SKT- SC-304-D prq2ki = te~%d K9 ad K9' HL:H; p bfrgH %

Paper- XIV : Kavyam Kavyashastrasya Cha Itihasah

T	Cradita	
4	4	v Høfj d eM/ HÄüllÄR⁄a
Ľ	1 •	ן <b>פ; % קוֹגוּל</b> (3 Hou

Co. 304. DI: VILeu~ ?kVds Nk=k% xbFkL; ifjp;igLlja 0; RifUkijka IkfgfR; dha

0; k[; kef/kxPNfUr A

Co. 304. D II : V = xUFkL;  $I \ge \tilde{N}rek/$ ; esu fu/kktjrkuka 'yksolkuka 0; li fùkijka 0; k[; ka

IE; xo/kkj; fUr A

Co. 304. D III :  $vfLeu \sim kVds Nk=k\% do\% rRIEC)/k xp xUFkeoxR;$ 

dk0; I KSBfunš ki kožda 0; ki fÜk; (rka 0; k[; kef/kxPNfUr A

Co. 304. D IV : VfLeu~ ?kVds fu/kktjrk% dk0; 'kkfL=.k% Nk=% i B; Urs A rškka dk0; 'kkL=s ; kxnkua tkufUr A

# KURUKSHETRA UNIVERSITY SYLLABUS M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

?kVde&1	%	Jhg"k&] u\$k/kpfjre} iFke% l x&] 'ykdk% 1&75%µ	
		NUnks y <b>od</b> ejfun <b>i</b> ški požda I i z <b>i Tal</b> iykod0; k[; k A	16 V <b>ak</b> ⁄o
?kVde&2	%	u\$k/kpfjre} iFke% l xXg 'ykcdk% 76&145%µ	
		ial "funsikino2da laLÑrek∕; esu ∣ykod0; k[; kA	16 <b>V ak</b>
?kVde&3	%	ck.kHkV¥%] g"kpfjre} i×pe% mPN₀kl% %µ	
		dk0; Ik\$Bofun≹kino2da Iiz <b>i ⊺a</b> x  0; k[; kA	16 V <b>ak</b>
?kVde&4	%	dk0; 'kkL=L; bfrgk1% µ Hkkeg%] n.Mh] okeu%] ∨kuUno/kū%]	
		∨fHkuox¢r% eEeV% fo'oukFk% txUukFk%A	16 <b>V ak</b> ⁄6

## f**\li . ; %**

(d) ç'ui = s i > p (5) v fuok, liZ, ç'ul% Hio"; fulA r=k çHeç'us 34/d p r iq/; xri lBÔðeeli(J R p liðlij%

(þ) fod Yijfgr 1% (v fuok; 14)6 I £(11r hkljç'u 1%) | ek/kkra; çnil; UfA v Us ç'u 1%) Øe' 1% çfie 81)r h, 8 rih, 8 pr 6 ji 23 kil 16:1/4% Hio'; fulA

([) OI; lied c' ušq50% v at/ar ly ipulied c' ušqp 100% v at/arSI d % Hos A

(x) r`rh;% ç'u% latÑrelè;ea, ,o lek(ş% v ŲHk, lobbk, v Äğdu%, Hko";frA, v Ųs ç'u%, IatÑro@juh@dÄX4Hkblelè;ekuladabbi,da,elè;ea,lek(krafib)U4A.

## çüui =fuelZfof/ %

- 1. illui=fueklka | LÑrek/; eu HkorA
- 2. iÜui=s i×p ¼5½ ∨fuok; k‰ iżuk‰ Hkfo"; fUrA
- 3. i*t* ukuke~ **v clula**p foHktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. çHe%ç'u%µv; a(çHe% ç'u%3Vd pr \$\frac{1}{2}; xri HBÔØeelfJ R HosAvfLeu-ç'usp Rolj%
     (b) fod Yijfgr k%(v fuok k% l f(llr k)jç'uk% ek k q çrkl; U% (4x4¾ 6v Äk%)
  - II.
     f}rh;%
     i t u%
     ¼i Fke?kV dkfJ r%/&
     NUnks y **de**j funk ki vo da
     I i t a 'ykd}; a 0; k[; krq

     ; FkkfufnžV x bFkkr~ 'ykd=; a inkL; rA
     (2x8=16 v dk%)
  - III.
     r`n'; % i t u% ¼f}rh; ?kVdkfJr% dk0; l kSBofunt ki no da li t al t Ñ rek/; eu 'yksd}; a

     0; k[; krq; ; FkkfufnžVxUFkkr~ 'yksd=; a inkL; r\$A
     (2x8=16 v dk%)
  - IV. pr[k‰ ił u% ½rrh; ?kVdkfJr‰ dk0; lkSBofunł ki udła lił  $a \times |k|k$ ; a 0; k[; krą ; FkkfufnžVxbFkkr~ x | k|k=; a inkL; rA (2x8=16 **Vdk**%
  - V.  $i \times pe\%$  itu% %pr[kt2kVdkfJr%% dk0; 'kkL=L; bfrgkIIEc) ku~  $\vee$ kpk; ku~  $\vee$ kfJR;  $\vee$ kykpukRede~, da itua lek/kkrg itu}; a inkL; rA (16**v dk%**)

∨uq kafl rxtJFkk%

- 1- uSk/kpfjre} IEikñ ∨kpk;2 'kSkjkt 'kekZ jXeh] okjk.kIhA
- 2- u\$k/kpfjre} ^thort ^ef.kiHkk* I & Ñr&fgUnh&Vhclk I fgr] okjk.kl hA
- 3- uSk/kpfjre} IEikñ f'kojkt 'kkL=h] IkfgR; Hk.Mkj] ejBA

#### SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

- 4- g"kpfjre] I Eikä txUukFk ikBd] pk[kEck fo|kHkou] okjk.kIhA
- 5- g"kapfjre} ∨axath ∨uqokn ,oa.fVlif.k;ka.lfgr] lEikñ ihñ ohñ dk.k§ fnYyhA
- 6- g"kipfjr] ck.kHkê] 'koogedfofojfpr Looes Vhdk] Hkkoizdkf'kdk fgUnh 0; k[; k] LEikñ MkW dskojko eqtyxkpdj] pk[kEck LiuÑr LiuFkku] okjk.kLhA
- 7- g"kipfjre~& ,d lkLÑfrd ∨/;;u] oklopo'kj.k ∨xokyA
- 8- l&Ñr dk0; 'kkL=], Iñ dã M&
- 9- History of Sanskrit Poetics, P.V. Kane, Motilal Banarsidass, Delhi.
- 10- History of Sanskrit Literature, A.B. Keith, Delhi.
- 11- ∨ytakj'kkL= dk bfrgkl] Ñ".k dqekj] IkfgR; Hk.Mkj] ejjBA

***

# COURSE CODE : SKT- SC-305-D i ght lai te~% fr ght d d k9a[ k Nt k9ap

Paper- XV : Aitihasikakavyam Khandakavyam Cha

L	Credits
4	4

**i viiä i?⁄**60

**v Həfj d ety HÄüHÄR%2**0

le; %3 gisk (3 Hours)

Co. 305. D I :  $\nabla$ fLeu~ ?kVds fu/kktjrkuka 'ykolkuka 0; ki jka 0; k[; ka Nk=k%

# xUFkifjp;imodef/kxPNfUr A

Co. 305. DII:  $\nabla$ fLeu~ ?kVds fu/kktjr% 'yksd% 0; ki fÙki j; k 0; k[;; kp fon; kfFku%

l of) rk% tk; Urs A

Co. 305. D III : VfLeu~ ?kVds do% ifjp; indda fu/kktjrkuka 'yksdkuka 0; kjifùkijka

0; k[; ka Nk=k% I ef/kxPNfUr A

Co. 305.  $D IV : VfLeu \sim ?kVds Nk=k\% [k.Mdk0; su ifjfprk% Hknkok xUFkL; fu/kktjrkuka 'yksdkuka 0; lijifùkijka I li<math>\tilde{N}r0$ ; k[; ka I E; xo/kkj; fUr A

KURUKSHETRA UNIVERSITY SYLLABUS M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

?kVde&1	%	fcYg.k%] foØek <b>æ</b> nopfjre} iFke% lx%] 'ykdk% 1&60%µ	
		NUnks y <b>ode</b> jfun <b>i</b> ški vožda I i z <b>i Tai</b> ykod0; k [; kA	16 <b>V a%</b>
?kVde&2	%	foØek <b>æ</b> nopfjre} iFke% l xXj 'ykdk% 61&118%µ	
		NUnks y <b>ode</b> jfun <b>i</b> ški nočda I i z <b>i Tal</b> ykod0; k [; kA	16 <b>Va%</b>
?kVde&3	%	if.MrjkttxUukFk%] HkkfeuhfoykI% %ikLrkfodfoykI%/µ 'ykcdk% 1&80%µ	
		dk0; IkSBofuniški nožda Iizi <b>Ta</b> iykod0; k [; kA	16 <b>Va%</b>
?kVde&4	%	dkfynkl%] e9knure} mùkje9k%] 'ykdk% 1&27%µ	
		l & Ñrek/; eu 'ykcl0; k[; kA	16 <b>Va%</b>

f**\li . ; %** 

(d)  $c^{t}$ ui=ks i ×p (5) v fuok, HZoc^tuk%Hio^{tt}, fulAr=k, cflec^tus 34/d prü/f, xri HBÔØeeH/JR; p Helj%

(**þ**) fod Yijfgr K% (v fuok; K)% I £(Kr kkijç'u K% | ek/kkr q çnH; UA v Us ç'u K% Øe' K% çfle&f)r h, &rih, &pr **quzau**li iz:1/4/4 Ko''; fUA

([) OI; iled c' usiq50% v at a ly ipulied c' usiqp 100% v at a loss A

(x) i×pe%ç'u% lahÑrelè;esa ,o leklş%v t≓Hk lobbak v Äögbu% Hko"⊱frA v t≓sç'ub% lahÑro@jubk@vä≫üHabblelè;ekuladsabi ,dsa elè;esa leklara†iD)Uda.

# çüui **Huekzkof/%**

- 1. iÜui=fuekZka l ŁÑrek/; eu HkorA
- 2. ḯ́ui=s i×p ¾5½ ∨fuok; № i≀u‰ Hkfo"; fIJrA
- 3. i*t* ukuke~ **v dula**p foHkktue~ v/kkfyf[kr: isk Hkfo"; frµ
  - I. çHe%ç'u%µv; a(çHe% ç'u%3Vd pr¢/; xri HBÔðeel/J R HosAvfLeu-ç'uspíðlj%
     (þ) fod Y jfgrí% (vfuok lijb l f(ilrikijç'uk/d ek/krąçnil; UA) (4x4¾ 6v ÄK)
  - II. f}rh; % i*t* u% ¼iFke?kVdkfJr‰ NUnks y**de**jfunik kivo2da li*t* **a** 'yksd}; a 0; k[; krq ; FkkfufniVxbFkkr~ 'yksd=; a inkL; rA  $\frac{1}{2}x8=16\sqrt{2}$ dk‰
  - III. r`rh; % it u%  $\frac{1}{2}$ rh; ?kVdkfJr% NUnks y **de**jfunt ki koʻda lit **a** 'ykd}; a 0; k[; krq ; FkkfufntVxtFkkr~ 'yksd=; a inkL; rt  $\frac{1}{2}x8=16\sqrt{t}$ dk%
  - IV. pr{k% it u% %/rrh; ?kVdkfJr%% dk0; lkSBofunkkino2da lit a; Fkkfufn2VxbFkkr~ 'yksd}; a 0; k[; krq 'yksd=; a inkL; rk %2x8=16vtdk%/
  - $v. i \times pe\% \quad c'u\% \quad \#prfk2kVdkfJr\%\& \quad dk0; IkBofun3ki ki ko2da \quad Ii1 \quad a'ykd}; a \quad I1 \quad Nrek/; eu \\ 0; k[; krq; Fkkfufn2Vxt0Fkkr~'ykd=; a inkL; rA \qquad \qquad \%2x8=16 \lor tdk\%2$
- ∨u¢ kfl rxtJFkk%
  - 1- foØek**oe**nopfjr] fcYg.k] |Eikñ fo'ukFk 'kkL=h Hkkj}kt] cukjl fgUnw fo'ofo|ky;] okjk.klhA
  - 2- foØekooenopfjr] jek låÑr&fgUnh Vholk Ifgr] okjk.klhA
  - 3- foØek**aæ**nopfjr] 0; kñ irkiukjk; .k ik.Ms] Hkkjrh; fo|k iclk'ku] tokgj uxj] fnYyhA
  - 4- foØek**ce**nopfjr & , d lkkuÑfrd v/;;u] MkMi _pk 'kpyk] ukx ifCy'kl] tokgj uxj fnYyhA

#### TY SYLLABUS M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

- 5- Hkkfeuhfoykl] txUukFk] | Eikñ Jh jk/ks;ke feJ] pk[kEck | &Ñr | &Fkku] okjk.kl hA
- 6- eŷknwr] I Eikñ , eñ ∨kjñ dky}; ekurhyky cukj I hnkl] fnYyhA
- 7- e9kmur] lathouh Vholk Ifgr] fu.k?; lkxj i\$1] e6jcbA
- 8- eŷknur ¼mùkjeŷk½] ^lathouh* Vhcklfgr] ^foe'kŽ lfgr fgUnh 0;k[;kckjµ MkW jktsoj çlkn feJ] ∨{k;oV çck'ku] bykgkckn ¼mñçñ¼A

 $\star\star\star$ 

**Option** (V)

## ox**2**6^A* / e**ZLik**e%

Group-E (Dharmatantrāgamah)

COURSE CODE : SKT- SC-302-E }int isi ie~%/ eZikLie~

Paper-XII : Dharmaśāstram

L	Credits
4	4

i v**HÄR%**80 v HJfjdeH/KÄüKÄR%20

le; %3 gisk% (3 Hours)

SKT-SC-302-E-1 ; kKoYD; Lefr% Hkkjrh; /ke2 kkL=L;  $\lor$ I; re% xUFk%  $\lor$ fLr A  $\lor$ L; xUFkL; iFkes  $\lor$ /; k; s cãpkfjidj.ks  $\lor$ kpkjfu; ek% ifrikfnrk% A  $\lor$ L;  $\lor$ /; ; us fgUnw/keL; Kkua yH; rs A

SKT-SC-302-E-2 ; kKoYD; Ler% iFkes v/; k; s jkt/keldj.kL; v/; ; us jkt/keL; ifjp;% ikl; rs A

SKT-SC-302-E-3 dKSVyh; & $\nabla$ Fk2 kkL=L;  $\nabla$ /; ; usu  $\nabla$ kUohf{kdh&=; h&okrk2 n.Muhfrfo | kuka bfUn; t; k; kfnfo"k; k.kke~ Kkue~ i kl; rs A

skt-sc-302-e-4 dk&VY; L; rU=; ¢; % 0; kogkfjda Kkua fofHkUufo"k; k.kke~ y{k.kkfu p innfr A

# **3Vd e8û% KoV). Leir %i Elelşe** k % v lj Elel kcã plij çd j. Ild e%1-50 ' y ld RA 16 v ÄR%

<b>31/d e&amp;ü%; lKoYD) Leir %i Belge; ķ %jit / eŖ</b> dj <b>. le~%</b> 09—368 <b>' y ki RA</b>	16 <b>v ÄR%</b>
<b>34.d e&amp;ý%d H5y h e~v H211.te~%</b> 1-7 v <b>è k KA</b>	16 <b>v ÄR%</b>

**34d e 8p%d Higy h e ~v Hight de ~%r Ux D; %r dx v f/ dj. lep 15 (1 blîr ele; esi)** 16 v Äl%

f**Vii . ; %¥** 

(d) ç'ui=ls i ×p (5) v fuok M2 ç'ul% Hio"; fUA r=k çFleç'us 31/d pr 4/; xri HBÔ ØeelkJ R p Folj% (þ) fod ¥ijfgr k% (v fuok, k%) l £(krkšijç'ul%, çnkl; USA v Us ç'ul%, Øe'k% çFle&f}rh, & pri HZ31/d & E:1/4%/Hio"; fUA

(x) profilikuli KUr%ixpe%ç'u%d ktÑrelè; esa, olek/ş%v/U/Fiklokiku/%Hio%; frAvU/s ç'uk%d ktÑr@quk@käXkHikilelè; ekuled sili, dsa elè; esal ek/krefik). UKA

## ç'ui #fuekZkfof/%

- 4- ç'ui =11; fuelZla 12. Ñrek/; eu HosA
- 5- ç'ui = s i xp (5) v fuok i Zç'uk/Hio"; fuA
- 6- ç'ulule~v Älulep foHit ue~v/lfyf[ k: i sk Hio"; frµ
  - I. **çHe%ç'u%µv; a(çHe% ç'u%3\/d pr 4/; xr i IBÔØeel(J Ŗ HosA v fLeu~ç' usp Rolj %**

(4**x**4=16**v ÅR**⁄6

- (4) fod Yi jfgr K/( v fuck lijs i f(ilr litjç' uK/çrill; UfA
- II.
   fr b % ç' u% (ç fle 34.d EJ r % µ lizi a 'ykd); a 0; k[; krq ; FkkfufnžVxbFkkr~ 'ykd=; a

   inkL; r 4
   ½2x8=16∨tdk%/2
- III. rrh% ç'u% (f)rh 3ktill r%µ
   I i i a'ykd}; a 0; k[; krq
   ; FkkfufnžVxt/Fkkr~'ykd=; a

   inkL; rA
   ½x8=16∨tdk‰
- IV. pr**ifi**  $\zeta'$  u% (rrh 34d LJr 2 µ; Hhum24 BÔ 2 ee~ v LJR fucU Heda  $\zeta'$ u); a l ek k q  $\zeta'$  upr 4 / aç{; r A  2 x8=16 $\vee$ tdk%
- V. i ×pe%ç'u%(prijit)ti/r% $\mu$ ; Hiufri2/ HÔõee~v i/J R i Hiufri2/; al çi Ääl tiÑrelè; eu Qii ; ir çi Hitch açril; r A 12x8=16Vid

#### vuble rx1111%

- 5. ; Koyo Leir % pişlicit ojak ta
- 6. / eZiL:k d k bir git ] i hiolii d k iş fnYy kA
- 7. / eilisk‰çiK i iB iyi okizi rişiA
- 8. dililyh, v Hiziki 🖞 v uğımı; olij 'likilih egipluk y Neunik 🕽 fmYykA
- 9. Kauțilya's Arthaśāstra, Tr. R. Shamasastry, Wesleyan Mission Press, Mysore.

***

# COURSE CODE : SKT- SC-303-E **\$ Is' Isi \$e~%uffed Ixe%**

Paper-XIII : Naigamikāgamaķ

LCredits44	<b>i viläik/</b> 80 V <b>kJ (j d e¥/ kÄükÄik/</b> 20 <b>I e; %3 gljšk/</b> (3 Hours)
sкт-sc-зоз-е- <u>_Xon</u> L; Jhluä% nohy{E;k% Lr(irij	d% Iwä% ∨fLr] ;L; ∨/;;ua
Lr <b>i</b> jiji;k% Kkue~ nnkfr A	
sкт-sc-303-e-2 Hkkoukifu"kn~ ∨FkobnL; 'kkäli	nk;L; mifu"kn~ ∨fLr ;L;ka
JhpØ;U=L; Kkue~iŁr¶e~A	
sкт-sc-303-е-3 ek.MD; dkfjdk ∨kpk; &kMiknL Ñfr%	% ∨fLr ;L;ke~ ∨ <b>}</b> sonkUrn'kuL;
ifriknue~∨fLr A	
sкт-sc-303-e-4 ek.MD; dkfjdk ∨kpk; &kMiknL Ñfr%	% ∨fLr ;L;ke~∨}\$ronkUrn'küL;
ifriknue~∨fLr A	
sкт-sc-303-е-4 ek.MD; dkfjdk; k% dkfjdk0; k[;k ∨}\$f	fl)kUrL; xguk/;uaiki;fr A
<b>34d e&amp;û%î Xar%Jih ih</b> e~(   <b>añr ele; ea)</b> A <b>34d e&amp;û%Houisfu'in</b> A 20d e &û%Hibuisfu'inA	16 <b>v ÄR%</b> 16 <b>v ÄR%</b>
<b>zva e cy zasa kupi, zpek ivay a nja k</b> ii, 1 <b>-2 ça j. K</b> i	16 <b>V AK⁄o</b>

<b>31/d e&amp;þ%:d51 kripķ \$6ek NB) d líjd i</b> µ11, 3—4 <b>çdj. lá</b>	16 <b>v ÄR%</b>

10(212)

f**Mi . ; %**¥

(d) ç'ui=ts i ×p (5) v fuok, 126 ç'ul% Hio"; fUA r=k çFleç'us 31/d prü/; xri HBÔðeelf.J R p Folj% (4) fod ¥ijfgrk% (v fuok, 14% I £(Hrkšij ç'ul% çml; USA v Us ç'ul% Øe'k% çFle&f}rh, & prij1231/d & 12:1/18/Hio"; fUA

(x) çFle 3Adıl LJr %d)r h, %ç'u%d LAÑrelè; esu ,o i ek/ş%v U;Fliki olzik v Äğillu%Hlo"; fr Av U;s ç'ul%d LAÑr @gluh@lÄXAHikilelè; ekuladısılı ,d su elè; esu i ek/kr@rilD) U&A

## ç'ui #fuekZkfof/%

- 1. ç'ui =11; fuelizia il Ñrek/; eu HosA
- 2. ¢'ui ±s i ×p (5) v fuok liZç'uk/difo", fUA
- 3. **ç'ulule~v Älulap foHit ue~v / liyf[ it : i sk Hio"; frµ** 
  - I. **çfle%ç'u%μv; a(çfle% ç'u%3Vd prψ/; xri HBÔðeeKJ Ŗ HosA v fleu~ç'us p Rij%** 
    - (4) fod Yi jfgr k% (v fuok lijb l f(llr kijc' uk%çrill; UfA  $(4x4=16v \ddot{A}k)$
  - II. f)rh‰ç'u‰(çHe¾diLJr¾μ; Hiluín&/ HÔÕee~v LJR, daç'ual bÑrelè; eu lekkq ç'u); açril; r& (16v ÄI‰
  - III. rì h % ç' u% (f) r h 34.ti L'J r % µ ; Hituín 24 IBÔðee~ v L'J R i IBRA); a l çi Äð Ģlį; k q i IBRA açnil; r A (2x8=16 v ÄR%
  - IV. prijiZ ç'u% (rrh 34d líJr $^{4}\mu$ ; HituínZ/ BÔŽee~v líJ R fuc<br/>U lited a ç'u); a l ek k q ç'uprių/ aç{; r<br/>A (2x8=16vÄR%)
  - V. i **pe% ç' u% (prijiku'i lí jr%µ ; Hituínži lBÔðee~ v lí j**Ŗ i **lEki}; a l çi Äã Ģlį; k q** i **lEkid; açril; r A** (2x8=16v Ä**%**)

#### vubjeirx**iiik**%

- 1. Í Xas¶‰Jinikasneksj&ikroydj%A
- 2. Í X66% jiľV; I HÑr I HRue}- fn¥y hA
- 3. HZK "VNK" k isfu'kr%pKSHEckfo| Houj oljkk h 1991
- 4. mifu'liRag%elshyly culji hiti] fnYylA
- 5. x Island I d t Ed. with English translation & Notes etc. by Raghunath Damodar Karmakar, Bhandarkar Oriental Research Institute, Poona, 1973
- 6. xKSI kad lijd († 1 käj HK; I fgr († p (\$ Hē)); oljak it kA
- 7. fuxelize; litr Woe' life HiDrick jigre% dykçdiklaj olijkit lij 2011

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10(213)

# COURSE CODE : SKT- SC-304-E pr q2lei =le~%Hkonkir ikfed Hik, e~(1)

Paper-XIV : Bhagavadgītāgamikabhāşyam (1)

L	Credits
4	4

i v**HÄR%**80 v HJfjd eM/ KÄüKÄR%20

le; %3 gisk% (3 Hours)

SKT-SC-304-E-1 JhenHkxonxhrk; K% jktkudkuUndfoÑrkuUnof/kUh& Vhdkykcds  $\vee$ /; ; ua xhrk; ka ifrikfnrn'kUL; Kkue~ nnkfr A iFkef}rh; k/; k; }; s fo"kkn; kx% I ka[; ; kx% p fo"k; }; e~ ifrikfnre~ A SKT-SC-304-E-2 xhrk; k% r`rh; &prfkZ  $\vee$ /; k; ; k% ifrikfnra dež kxL; Kkudel b; kI ; kxL; p SKT-SC-304-E-3 xhrk; k% i×p"kM/; k; }; ef/kÑR; fo'knk/; ; usu del U; kI I; kxL;

vkRela;e;kxL; pKkuaikl;rsA

SKT-SC-304-E-4 xhrk; k% IIreL;  $\vee$ "VeL; p  $\vee$ /; k; }; L;  $\vee$ /; ; usu r= ifrikfnra

KkufoKku& $\vee$ {kjcã&; kx}; L; Kkua ikl; rs A

- 34.dl e&û%/Hxondril; jit ludiddfoÑrkviddof/ih Qi[; i]; vè; k iSi -2 (l iÑrelè; es) A
   16 v Äl%

   34.dl e&û%/Hxondril; viddof/ih Qi[; i]; vè; k iSi -4
   16 v Äl%

   34.dl e&û%/Hxondril; viddof/ih Qi[; i]; vè; k iSi -6
   16 v Äl%

   34.dl e&ý%/Hxondril; viddof/ih Qi[; i]; vè; k iSi -6
   16 v Äl%

   34.dl e&ý%/Hxondril; viddof/ih Qi[; i]; vè; k iSi -6
   16 v Äl%

   34.dl e&ý%/Hxondril; viddof/ih Qi[; i]; vè; k iSi -6
   16 v Äl%

   34.dl e&þ%/Hxondril; viddof/ih Qi[; i]; vè; k iSi -6
   16 v Äl%

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   16 v Äl%
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   34.dl e&þ%/Hxondril; viddof/ih Qi[; i]; vè; k iSi -6
   16 v Äl%

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   34.dl e&þ%/Hxondril; viddof/ih Qi[; i]; vè; k iSi -8
   16 v Äl%

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   17 vida is i ×p (5) vída il‰/Hö'; fd/A r=k çfleç' us 34.dl pr ä/; xri ibÔØeek/J R
- p Bolj% (4) fod Yijfgr K% (v fuok, K)% I £(Hr Kijç'u K% çnkl; U & v U s ç'u K% Øe' K% çFle&f)r h, & pr HZZALI & E: 148/Hio''; fUA
- (x) çHe3AktikUr%{}rh,%ç'u%{ktivelè;est,oiek,ş%v,ÿHkkiokkav,Äğıku%Hko";frAv.ÿs ç'uk%{ktive@kuk@kä,XkHkklelè;ekuladıskti,dstelè;estiek,krafik),vsA

## ç'ui #fuekZkfof/%

- 1. ç'ui=1; fuelZla LÑrek/; eu HosA
- 2. ç'ui = s i > p (5) v fuck iZç'ui%Hio'', fUA
- 3. ¢ ulule~v Älulep foHit ue~v / liy f[ k: i sk Hio"; frµ
  - I. **çHe%ç'u%µv; a(çHe% ç'u%3Ud pr q/; xr i HBÔØeek/J R HosA v fLeu~ç' usp Rolj %** (4) fod Yi jfgr k% (v fuok, k% l f (llr ký c'uk%crkl; UA)  $(4x4=16v \ddot{A}k\%)$
  - II. () rh % c' u% (cHeRMILJr% aykd); a 1 cI ÄõI tNrelè, eu 0; k[; krq; FkkfufnZVxUFkkr~'ykd=; a inkL; rA 2x8=16 vd k%
  - III. rrh% ç'u% (f)rh 3kt lijr $\gamma_{\mu}$  aykd}; a l çi Äã Ģij; k q; FkkfufnVxUFkkr~ 'ykd=; a çril; r fa  $(2x8=16v \ddot{R}_{b})$

  - V. i  $\Rightarrow$  pe% c¹ u% (pr **iii** i LJr%µ i aykd}; a l cl Ää  $\mathbf{O}$ [; k q ; Fktfufn VxUFkkr~ 'ykd=; a cril; r s (2x8=16v ÄB)

vubleirx**iiik**%

- 1. Havendarlit jit kud kuluid foñr kuluio// ill@it; it fgrif fcYod et çdik kuj i qlA
- 2. Haxomehrili: v fiHuxxday Ñir k xda li HiZang Qili; ; ili di keliji i Godille ky ili J hang A
- 3. Haxondar (; jit kud Jid. Bç. In Vid (; ditelij' Kadillely (; Jhanj A

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M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

## COURSE CODE : SKT- SC-305-E i **>pri ki :le~%Hkonski ikfed Hik; e~**(2)

Paper-XV : Bhagavadgītāgamikabhāşyam (2)

L	Credits
4	4

i v**HÄR%**80 v HJfjdeH/KÄüKÄR%20

le; %3 gisk% (3 Hours)

sкт-sc-305-e-1 xhrk; k% uo&n' k&, dkn' kk/; k; kuke~ vkxfedHkk"; ykds v/; ; usu vkxfedn"V÷k

jktx¢ájktfo/kk; kx%j foHkfir; kx% fojkV∻kx% p ∨oxE; Urs A

skt-sc-305-e-2 xhrk; K% }kn'kk/; k; r% prq2kk/; k; i; Øra 'ykokukHk/; ; usu HkDr% ekgkRe; a

{ks={ks=KfoHkkx] xqk=; foHkkx%] p fo"k; k% voxE; Urs A

sкт-sc-305-е-3 xhrk; k% i×pn'k&"k\\/'k\v/; k; \$kq ifrikfnrL; fo"k; L;

i∉"kkkike;kx&nooklojlainfoHkkx;kx;k% Kkue~ikl;rsA

SKT-SC-305-E-4 xhrk; k% IIrn'k& $\vee$ "Vkn'k& $\vee$ /; k; kuka A  $\vee$ /; ; ua J) k=; foHkkxL;

ek{klø;kl;kk;pKk;ankfrA

<b>3V.d e &amp;û%Hxondr (), jit kud kululd fo$\widetilde{N}$r k v kululof/ilih (91), ; (), v è, k K/$_{ m O}$</b> –11	16 <b>v ÄR%</b>
<b>3.ki e&amp;ü%Hxondri{ v kulioí/ ih Ģi{; i</b> t v è, k <b>k%</b> 12–14	16 <b>v ÄR%</b>
<b>% ki e&amp;ý% Hxondrif, v kuldof/ilh Ģlij; iļ v è, ķ i§</b> 5—16	16 <b>v ÄR%</b>
<b>34d e&amp;p%Hxondri} v kuldof/ iih Ģlį; ji v</b> ę ķl§ 7—18 <b>(1 liÑrelę es) A</b>	16 <b>v ÄR%</b>

fMi . ; %¥

(d) ç'ui=ls i ×p (5) v fuok HZoç'ul% HIo"; fUA r=k çHeç'us 31/d prů/; xri HBÔðeelf.J R p Rolj% (4) fod ¥ijfgrk% (v fuok, H3j6 l £(Hrkšijç'ul% çnH; U5A v U/s ç'ul% Øe' KáHeal}rh, arrh, aprejezadial E:1/47/Hio"; fUA

([) OI; Hed c' usiq50% v the pulled c' usiqp 100% v the set of the set

(x) pr**ijāl**uli líjr%i »pe%ç'u%i blīrelē; esu ,o i ek/ ş%a/ŲHikiolikuv Äğilu%Hio"; frAv U;s ç'ul%i blīr@juk@käXuHikilelē; ekulecistii ,dsu elē; esu i ek/ krej li). USA
M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

# ç'ui #fuekZkfof/%

- 1. ç'ui=11; fuel21a 12.Ñrek/; eu HosA
- 2. ¢'ui = i > (5) v fuck i Z ¢'ul% i i > fuA
- 3. ¢ ulule~v Älulep foHit ue~v / lig/f[ k: i sk Hio"; frµ
  - I. **çHe%ç' u%\muv; a(çHe% ç' u%3Ud pr \$\u03e4, xr i HbÔðeel(J R) HosA v fLeu~ç' usp fðlj %** (4) fod Yi jfgr **k% v fuok lifts i f(ilr klig' uk%grili; UA** (4x4=16**v** Ä**k%**)
  - II.
     **)**r**h**%**ç'u%(ç<b>ReAdi KJr%**µ **a**yksd}; a **i çi Äã**0; k[; krq ; FkkfufnľVxbFkkr~ 'yksd=; a i nkL; r**A** 

     ½x8=16∨tdk‰
  - III. rrh%ç'u%(f)rh 3kti EJr%µ aykd}; a lçi Äã0; k[; krq ; FkkfufnžVxt/Fkkr~ 'ykd=; a

     inkL; rA
     ½x8=16∨tdk‰
  - IV. projection of the set of the
  - V. i >pe%ç'u%(pr**iji**kiti £Jr% $\mu$  àykd}; a l çi Ääl tiÑrelè; eu Ot; kq; FkkfufnžVxt/Fkkr~ 'ykd=; a çril; r $\Delta$  (2x8=16v ÄK)

vubjeirx**ssi**k%

- 1. Havonahrik jat kuch kulaki foliv kulakof/ illiqik; ti for k foc Vod et çelik kuji i qiA
- 2. **Hromdr k** S. Radhakrishnan
- 3. Essays on Gita, Sri Aurobindo
- 4. Hixometrik i kidi xikouh Qiki; kixhrkçisi xişi kişA
- 5. Haxonada (trừ được o pung) xha k çi Sji xiệt là jA
- 6. Hixomehrik v fiHuoxely Ñir k xeln HilZang Ģiki; ki di kelini HiBedillely ki Jhavij A

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#### SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

# **CHOICE BASED CREDIT SYSTEM**

# **Open Elective COURSE CODE : SKT-OE-306**

# प्राचीनभारतीयसंस्कृतिः, दर्शनं भाषाविज्ञानं च (2)

Prācīnabhāratīvasamskrtih, Darśanam Bhāṣāvijnānam Ca (2)

L Cred 4 2	its	अङ्काः 40 आन्तरिकमूल्याङ्क योगः 50 समयः 3 होराः	न्नाङ्काः 10
घटकम्-1:	वैदिक	त्साहित्यस्य सामान्यः परिचयः।	8 अङ्काः
घटकम्-2:	भारर्त	ोया वर्णाश्रम-धर्म-व्यवस्था (मनुस्मृतेः आधारेण)।	8 अङ्काः
घटकम्-3:	भारर्त	ोयदर्शनस्य सामान्यः परिचयः।	8 अङ्काः
घटकम्-4:	गीता,	, चतुर्थः अध्यायः  –	
	(क)	श्लोक-व्याख्या।	4 अङ्काः
	(ख)	लिप्यन्तरणम् (Transcription) – श्लोकस्य देवनागरीलिपितः, स्वरादिभेदचिह्न	<b>नैः</b>
		सह, परिवर्त्य रोमनलिप्यां लेखनम् (Convertion of the verse from Devanaga	ari
		script into Roman script with diacritical marks)	4 अङ्काः
टिप्पण्यः ∶-			
1. आन्ती	रेकमूल	याङ्कनाय सत्रपरीक्षा भविष्यति। तत्र 10 अङ्काः निर्धारिताः।	

- परीक्षायाः माध्यमः संस्कृतम् अथवा हिन्दी अथवा आंग्लभाषा भविष्यति। 2.
- प्रश्नपत्रे पञ्च (5) प्रश्नाः प्रदास्यन्ते। प्रथमप्रश्ने चतुर्णां घटकानाम् आधारेण लघूत्तराः चत्वारः (4) विकल्परहिताः 3. (अनिवार्याः) प्रश्नाः प्रक्ष्यन्ते। अस्मिन् प्रश्ने 8 अङ्काः भविष्यन्ति। अन्ये चत्वारः (4) प्रश्नाः क्रमशः प्रथम-द्वितीय-तृतीय-चतुर्थघटकाधारिताः भविष्यन्ति। एषु प्रतिप्रश्नं 8 अङ्काः भविष्यन्ति।
- व्याख्यात्मकप्रश्नेषु 50% अंशः, आलोचनात्मकप्रश्नेषु च 100% अंशः वैकल्पिको भविष्यति। 4.

#### प्रश्नपत्रनिर्माणविधिः

- 1. प्रश्नपत्रस्य निर्माणं सरलसंस्कृतभाषया भविष्यति।
- 2. प्रश्नपत्रे पञ्च (5) प्रश्नाः प्रदास्यन्ते।
- प्रश्नानाम् अङ्कानां च विभाजनं निम्नरूपेण भविष्यति : 3.
  - ।. प्रथमः प्रश्नः अस्मिन् प्रश्ने चतुर्णां घटकानां पाठ्यक्रमस्य आधारेण चत्वारः (4) विकल्परहिताः (अनिवार्याः) लघूत्तरप्रश्नाः प्रदास्यन्ते। ८ अङ्काः

- Ⅲ. तृतीयः प्रश्नः द्वितीयघटके निर्धारितविषयाणाम् आधारेण प्रश्नद्वयं दत्त्वा एकस्य प्रश्नस्य उत्तरं प्रक्ष्यते। 8 अङ्काः
- IV. चतुर्थः प्रश्नः तृतीयघटके निर्धारितविषयाणाम् आधारेण प्रश्नद्वयं दत्त्वा एकस्य प्रश्नस्य उत्तरं प्रक्ष्यते। 8 अङ्काः
- V. पञ्चमः प्रश्नः (क) चतुर्थघटके निर्धारितस्य ग्रन्थस्य श्लोकद्वयं दत्त्वा एकस्य श्लोकस्य व्याख्या प्रक्ष्यते। 4 अङ्काः
   (ख) चतुर्थघटके निर्धारितस्य ग्रन्थस्य एकं श्लोकं देवनागरीलिपितः स्वरादिभेदचिह्नैः सह परिवर्त्य रोमनलिप्यां लिखितुं श्लोकद्वयं प्रदास्यते।

अनुशंसितग्रन्थाः -

- 1. cyme mile; k] o Bud i lígi?; v jiši láÑír] o ijk lí lá
- 2. jit fol'liş figi o Gind i lígi?, dk bírgit j foula i brol e fulji v brojkA
- 3. t; no oslydiji) ofind i lígi? dktárgit ] Hijrh, foj kçditkuj fmyi& 10007
- 4. v HEnlikki kN\$] olind I Higi?, o al HÑir dki eh(Hied Efrgik] U;v,t i f(\$)d\$HU] 4835/24] v baijh jib) nij; kmb] ubZimVy i) 2008
- 5. eulpir) d'éyel: HIARÑr ^eléfizip loy it Velkrfik gixiliola ' IlizikiÑr ^el. içilit fgluh Vel (; elk ita
- 6. I jahzdenji fo'ktá euleir v kizi lígik çpir VLV 455 [lijhcloyi] fnYyka 10006
- 7. jit cyhi k M\$ j fglih / idijA
- 8. fionùk Kiulj Hijrh, i Hilfra
- 9. ihőhődki‡s/e2511±kdkbfrgak ([kN&)
- 10. Jieni-ikondirk (fgluih v uqin i fgr)] xirk çis] xişi ik jA
- 11. JHÑ". k f=k HEŊ JhenHixonnah k (f)r hj rì h, oapr bjizv è, k) A
- 12. Radhakrishnan, Gītā.

# Ο

# ,eñ,ñi bÑre~13)rhaoÔE1⊉proff±i≠e~

M. A. Sanskrit (Final), Fourth Semester

# fyf[ kri ‡k klafoLrì%i kBÔØe%

**Detailed Syllabus for written papers** 

COURSE CODE : SKT-HC-401

# **'H&/ lai ±e~%çlíÑr HK!k | lígi? ap**

Paper- XVI : Prakritabhasa Sahityam Cha

L	Credits
4	4

i v**HÄR%**80 v HJfjdeN/HÄülÄR%20

le; %3 disk% (3 Hours)

Co-401-I: ikÑrioś' kdk; ka l adfyrikBkuka ek/; eu ikŇry{kdkuka thouifjp; % rškka

ÑfrfHk% Ig ∨Leku~ t§u/keĽ; fl n/kkUrkuka Kkuefi ikl; rs A

Co-401-II: ikÑrids'kdk; kaladfyrikBkuka ek/; eu rRdkyhulekt0; oLFkk

jktu§rd0; oLFkk/kkfe2d0; oLFkk; k% ifjp; % ikl; rs A

Co-401-III: ikÑrlkfgR; L; \$rgkl & ikÑrHkk"kk; k% mRifÙkfodkl ; ksp] t&/keL;

 $vkxe"kV{k.Mkxe& ippul kjkfnxbFkkuka Kkua ikl; rs l k/kep Je.k&Jef.kdk& mikl dkfnuka$ 

fu; ekuka ckg/kks Hkofr A

Co-401-IV: ik $\tilde{N}rHkk''kk$ ; k%  $Vocks'kkFk\pm VfLeu~?kVds$  ik $\tilde{N}r0$ ; kdj.kL; Kkua dk; rs A

?kVde&1 % ikÑrlkfgR; e~ % ikÑriɒś'kdk] v/kkśufnžVk%, o ikBk% μ 1&8] 15μ16] 18μ24] 29μ32 % l ఓÑrek/; eu l ił ax |kåk0; k[; kA 16 volk% 10(220)

KURUKSHETRA	UNIVERSITY SYLLABUS	
	M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)	
	(w.e.f. Session 2021-2022)	
	: LTL-1 LE-D - 0/ : LTL-2 - ELL-11 //LE-E-TN/0/	
?KVQ&&2 %	I KINFI KTGK; e~ % I KINFI DS KOK $\mu$ V/KKSUTNZVK% , O I KBK% $\mu$	
	9&14] 17] 25] 27µ28] 33 % Li <i>i</i> l Ta 'ykcd0;k[;kA	16 <b>Va%</b>
?kVde&3 %	ikÑrlkfgR;L; bfrgkl%μ	16 <b>VaR%</b>
	i kñrHkk"kk; k% mnHko% fodkI 'p] Hkkjrh; &I kfgR; Hkk"kk. kka fodkI Øes	
	i kñrHkk"kk, kke~ vonkueł Hkkirh; &vk 1 kñr% bfrakts i kñrHkk"kk, kka	
	ikūri ktagu – povonkuel Hkkirh & btrakili – tuekiks ikūrikkikka	
	$i\hbar$ $h$	
	INNTINGR, L, P EQUOEA	
?KVAE&4 %	I KINTU; KOJ. Kelj	16 V <b>CR/</b> 0
	¼d½ lfU/k¾ lekl¾ dkjde~ ¼8 <b>vÄK%</b>	
	¼[k½ <b> </b> K <k: <b="" ikf.k="" ikf.k]="" kkrq="" ¼8="">v ÄR%</k:>	
	½½½ lkKk: ikf.kµ no] eqkh] x¢#] fi∨k] ynk] c(j)] /kskýl ek;k] jk;k] ∨	/likA
	¼ii½ /kkrqikf.kµ dj] Hkny gl] dFk] Bk] fnLl] xe ¼xPN½[ ng] ip]	i 🕅 N
	<b>%doya</b> yV&y ³ &yV&ykV&fof/kfy ³ <b>&amp;ydkj\$kk</b> A	
<b>fMi . ; %%</b>		

**(d)** ç'ui=ls i ×p (5) v fuok, liZaç'ul% Hio"; fUAr=k çHeç'us 34/d pr ζ4/; xri lBÔðeelkJ R p Folj% (4) fod ¥ijfgr k% (v fuok, kijb l £(kirkkijç'ul% çnkl; UsA v Us ç'ul% Øe' kýellest)rh, srih, sprijlizavit st Fz:1/4% Hio"; fUA

([) OI; Hed c' usiq50% v that by invalided c' usiqp 100% v that 0% of 100% v the 100

(x) çFle 34.d KUr%{}rh, %ç'u% HÑrelè; esu , o | ek/ ş%/ Ü/Flk | oblk v Äğlfu%Hlo"; fr A v Ü s c'u%/ HÑr@kuh@kä.XiHKlelè; ekuled sifi , d su elè; esu | ek/ kr@r HD, WA

# ç'ui =fuekZlfof/%

- 1- itui=L; fuektka l & Ñrek/; eu HkorA
- 2- it ui=s i ×p ½5½ ∨fuok; ½% it uk% Hkfo"; fUrA
- 3- i*t* ukuke~ **v dsule**p foHkktue~ v/kkfyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç' u%µv; a(çHe% ç' u%3Ud pr q/; xr i HBÔðeelí J Ŗ HosA v fLeu~ç' usp Rij %** (4) **fod Y jfgr k% v fuok lijs i f(ilr kijç' uk%çril; UA**  $(4x4=16v \ddot{A}k%)$
  - II. f)rh%ç'u%(çHe3ktill)r%µ li $i^ax|kik$ ; a liNrek/; eu 0; k[; krq; Fkkfufn2VxUFkkr~ x|kik=; a inkL; rA (2x8=16v ÄR%)
  - III. r`rh; % ç'u% ¼f}rh; ?kVdkfJr%4µ li½ a 'ykd}; a 0; k[; krq ; FkkfufnžVxbFkkr~ 'ykd=; a inkL; r& (2x8=16**v ÄR%**

- IV. prfk% it u%  $\frac{1}{2}$  WdkfJr% $\frac{1}{2}$  it  $\tilde{N}$  r kfgR; L; bfrgkl kfJr%, d% fucU/k% y{kuh; % r nɱ fucU/kkReda it u}; a inkL; r a  $\frac{1}{2}$
- v. i×pe% itu% %prfk2kVdkfJr%/µ ikñr0;kdj.ks lfU/k&lekl&dkjdbl;% 8 vÄRedk% fodYilfgrk% ituk%] lKk&/kkrqibl;'p 8 vÄRedk% fodYilfgrk% ituk% inkL;UrA %8+8=16vÄR%

∨u¢ kfl rxtJFkk%

- 1- ikŇrioś'kdk] okW/;we&1] ∨kYÝM lhñ oW/uj ½cukjlhnkl t§u&Ňr fgUnh ∨upkn½
- 2- ∨fHkuo i kÑr&0; kdj.k] u\$epUn 'kkL=h] okjk.kI h] 1963
- 3- ikū̃ridk'k] oj#fp] lEikā dkosy] dydrk] 1932
- 4- ikÑr lkfgR; dk bfrgkl& txnh'kpUnz t&j okjk.klh
- 5- iklÑr lkfgR; ∨kg mldk ∨kykpukRed bfrgkl] uslepUn'kkL=h
- 6- ikÑr xkej] ihñ ,yñ o\$] iwk] 1958
- 7- iktÑr&0;kdj.k] gepUn&Ñr fl)ge'kCnku≬kklu ds ∨kBoa ∨/;k; dk fgUnh ∨uppkn] iktā MkWi daā okā ∨k1Vs %pk{[kEck laLÑr Òkjrh] 8%A

***

**Option** (I)

ox**2**⁄d * o**s**%

Group-A (Veda)

# COURSE CODE : SKT- SC-402-A I Ir n' kai **: le~%a/ HolZfgr k i kei fgr k p**

Paper- XVII : Atharvasamhita Samasamhita Cha

L	Credits
4	4

**i viilä i?⁄6**80

**v Həfj d ety HÄülÄR%2**0

le; %3 gisk% (3 Hours)

Co-402A-I : VFkoDsh; I Dr‰ jk"VL; klufr] Ñehuka uk' k% nh?kk?, k‰ i kf1r% dFka Hkosr~ , rškka

fo"k; k.kka Kkua ∨LekfHk% ikl; rs A

co-402A-II : vfLeu~ ?kVds _f"k% Hknie InDrL; ek/;esu Hkne% ifr% vR;Urka Jn/kka ifjp;u~ dFk;fr ;r~ ekrkHknie% in=ks.ga ifFk0;k% A ,rL; v/;;ukr~ iñ/r% LokFkb'knkngua fogk; i;kbj.klji{k.kL; inj.kk yHkrs A co-402A-III : Ikeonah;ioekudk.ML; en=% Nk=ku~ Iknenapr% IknejILo:iL; p Kkua dk;7rs

Ik/kēpo ; koxhuka Ñrs Kku: ihl knejl L; cks/kks fi ikl; rs A

 $Co-402A-IV : Ik; .k\tilde{N}r\&_Xonh; Hkk"; Hkhedk; k% ek/; esi onL; I Ukk] ea+k.kka I kFkD; kuFkD; a$ 

onik#"ks &vik#"ks kfnfo"k; k. kka Kkua ikl; rs A vkpk; Zkk&idfojfpra cgnnor; k norkuka Kkua

nsorkuka I {; knhuka Kkua i kl; rs A

?kVde&1%	fuEul Drkuka i kjEifjd&i k' pkÙ; Hkk"; dkjkuq kjsk xgue/; ; ue~ ¼l ŁÑrek/	; eu‰
	√Fko⊅n% ¼'kkudh; ½ & jk"VkfHko/kue~ ¼1-29½] egn∈ã ¼1-32½]	
	Ñfeuk'kue~ ½2-32½] nh?kk½ & kflr% ½3-11½] cãkhue~ ¼4-34½]	
	jkfgrl Dre~ 1/13-3-1&101/j l w kJ Dre~ 1/14-1-1&161/j dky% 1/19-531/A	16 V <b>ak</b>
?kVde&2%	fuEul 10rL; ikjEifjd&ik' pkÙ; Hkk"; dkjkuq kjsk xgue/; ; ue&	
	vFkobn% ¼ kkudh; ½ μ Hknel Dre~ ¼12-1-31&63¼A	16 <b>Vak</b>
?kVde&3%	fuEueU=k.kka ikjEifjdHkk"; dkjkuq kjsk xgue/; ; ue&	
	I keon% ¼dkfkqe%/j inoktp2d%j i oekudk.M%j ∨/;k;%&5j dk.MkS 1&2	
	4dpya 20 eU=k%A	16 <b>V ak</b>
?kVde&4%	fuEux¥Fk; k% leh{kkRedn"V∻k ∨/;;ue&	

¼d½ lk;.k%] __XonsHkk";Hknjedk ¼vik#"ks,foopui;Dre½( ¼[k½ 'kk&udh;&c`gnnnork] प्रथमोऽध्याय% µ 55 'ykndk% ¼1&21] 42&45]

61&80] 91&100 i;Øre½A

fMi . ; %¥

(d) ç'ui=ls 'N/~(6) v fuok 1126 ç'ul% Hio''; fUA r=k çHeç'us 34/d pr q4; xri HBÖØeelkJ R p Telj% (4) fod Yijfgr 1% (v fuok; 1436 l 12(11 r kijç'ul% çnil; U4A v U/s ç'ul% Øe' RogHest)rh, strìh, spr Hazavd si 12:1/38/Hio''; fUA

16 VOR%

([) Oli; Hed ç' ušiq50% v al%v jy ipulied ç' ušiqp 100% v al%o&fYi d %HosA

(x) çFle 3441 KUr%{}rh, %ç'u%{blirelè; esu, olekl ş%v Ü, Flikloblikv Äğifu%Hlio"; fr Av Ü, s ç'ul%{blir@jul%@KÄXKHKlielè; ekuladısılı , dısı elè; esu leklir q'hD; USA

# ç'ui #fueliZlfof/%

- 1- itui=L; fuektka l & Ñrek/; eu HkorA
- 2- iźui=s "₩~(6) ∨fuok; № iźuk% Hkfo"; fUrA
- 3- iłukuke~ **v dłała**p foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç'u%µ v; a(çHe% ç'u%3Ud pr ¢/; xr i HBÔðeelí J Ŗ Hos**A v fLeu~ç' usp **iðij %** (4) fod ¥ j f**çr i%( v fuok lijs i tí lir iði**; **c' u%çnii; UA**  $(4x4=16v \ddot{A}K)$
  - II. **()** rh%**c'u%(cfe3kti Ľ) r%** $\mu$  ikjEifjd&ik'pkÙ; Hkk"; dkjku( kjsk eU=}; a | t.Ñrek/; eu 0; k[; krq; FkkfufnžVI Drk]; % eU==; a inkL; rk  $\frac{12}{2}x8=16\sqrt{10}k\%$
  - III. rrh; % i  $\hat{U}u$ % Mfrh; ?kVdkfJr%4µ i kjEifjd&i k' pkÙ; Hkk"; dkjkuq kjsk eU=}; a 0; k[; krq; ; FkkfufnŽVI DrkI; % eU==; a i nkL; rA  $M2x8=16\sqrt{a}$ dk%2
  - IV. pr[k111 it u% 1/rrh; ?kVdkfJr%4 $\mu$  ikjEifjdHkk"; kuq kjsk eU=}; a 0; k[; krq; ; Fkkfufn2Vk/; k; kr~ eU==; a inkL; rA  $1/2x8=16\sqrt{a}$ dk%2
  - v. i×pe% itu% ¼prfkk2kVdkfJr%4µ, de~ vkykpukReda itua lek/kkrą  $4d^{1}$  Hkk×s fufn2Vkn~ xUFkkr~ itu}; a inkL; rfk  $4d^{1}$  Hkk×s fufn2Vkn~  $4d^{1}$  Hkk×s fufn2Vkn~  $4d^{1}$  Hkk×s fufn2Vkn~  $4d^{1}$
  - VI. "k"B% i*t* u% ¼pr@k2kVdkfJr%4µ 'yksd}; a 0; k[; krq ¼[k½ Hkk×s fufnžVkn~ xbFkkr~ 'yksd=; a inkL; r&% %2x4=8vadk%2

∨u¢ k£l rxtJFkk%

- 1- Ik;.kÑr ∨Fkoðon-Hkk";] IEikñ fo'ocU/knj fo'os'ojkuUn o&nd 'kks/k&IbLFkku] gksťk;kjinj ¼intkc½A
- 2- ∨FkoЪn dk lipkøkHkk";%] iñi Jhikn nkeknj lkroydj] ikjMhA
- 3- ∨Fkoðn&l figrk ¼Hkkx 1&2½] MCY;w Mhñ] fàVuA
- 4- Hymns of the Atharvaveda : M. Bloomfield, Motilal Banarsidass, Delhi, 1964.
- 5- vFkobn ¼v/;kReHkk";½ Hkkx 1&9] fo'oukFk onkyndkj] jkeyky dinj VLV] joyh] I kuhirA
- 6-  $\nabla$ FkoDn ¼I ukruHkk"; ½] Hkx 1&4] Jhd.B' kkL=h] ek/ko i µrdky; ] fnYyhA
- 7- Ikeons dk Inçkøk Hkk";] in Jhikn nkeknj Ikroysdj] ikjMhA
- 8- I keon I figrk] MkWi j keuk Fk on kyndkj] gfj}kjA
- 9- __XonHkk"; Hkniedk] 0; k[; kdkj] Mkni ohjkinz dekj oekj dk'kh fgUnw fo'ofo ky; ] okjk.kl hA
- 10- _XonHkk"; Hknedk] 0; k[; kdkj] Mkn txUukFk ikBd] pk{kEck ∨ktj; .Vkfy; k] okjk.kIhA
- 11- cgíork ¼'klud½] jkedlekj jk;] pk{[kEck | LÑr | hjht vkfQ|] 1963
- 12- cgíork ¼v/;k; 1&2½] |Eiknd ,oe~ vupkn] jkednekj jk;] pk[kEck |LNr |LFkku] okjk.klh] 1983

 $\star\star\star$ 

# COURSE CODE : SKT- SC-403-A v **'Vhri kai :le~%v lj. ; d lisfu'k l-kigRe~**

Paper- XVIII : Aranyakopanisatsahityam

L	Credits
4	4

i vikä 10%30 v kyfj d ety käükä 10%20 I e; %3 **disk**% (3 Hours)

 $c_{0-403A-I} : \forall j.; s iBukr~, s \forall kj.; dk% dF; Urs A r$Ukjh; kj.; dL; nforh; iikBdL;$   $iFken'kkupkdkuka ek/; eu Nk=k%; KksiohrL; 10; & ikphuohrh Hknku] 1a'; kikluk; k% fof/kj
ik; f'prLo: ij dtjek.Mgke] Lok/; k; j ipegk; Kkuka p Kkua ikIL; Urs A
<math display="block">c_{0-403A-II} : , rfLeu~ ?kVds \lor; ktuh; s ; Kdkj.ks nf{k.kk; k% \lor knku& inkusl fr ik; f'pUkj
Lok/; k; %] /kp/; kuj fnx&miLFkkukfnfo'k; k.kka ek/; eu deZdk.ML; xkrk \vocks'; rs A
<math display="block">c_{0-403A-III} : onL; kfUreHkkxdkj.kkn~ I kjHkurfI n/kkUrkuka ifrikndRokr~ mifu'knp onkUrukEuk
fo[; krefLr A r$Ukjh; kifu'knk o; a f'k{kk; k% Lo: i} nh{kkUrs fon; kfFkua inh; ekua minskj
ipfo/kk I kigrkskluk] ok#.khfon; k bR; knhuka Kkua ikIuę% A
<math display="block">c_{0-403A-IV} : eqMdkifu'knk Nk=k% fon; k; k% ijk&vijk Lo: ij \vXu& IIrftgok% \\v{kj\fouk'khcã.k% Lo: ia ek{kikIr% I k/kukuka Kkua ikIL; Urs}$ 

?kVde&1%	fuEu&∨kj.;dL; xgue~∨/;;ue~¼l &Ñrek/;eu%&	
	r\$ùkjh; kj.; de} izikBd%2] ∨upkdk%1&10	16 <b>V ak</b>
?kVde&2%	fuEu&∨kj.; dL; xgue~ ∨/; ; ue&	
	r\$Ùkjh; kj.; de} izikBd%2] ∨upkdk%11&20	16 <b>V CE%</b>
?kVde&3%	fuEufyf[krkifu"kn% 'kkædjHkk";kuqlkjsk xgue~ v/;;ue&	
	r\$Ùkjh; ki fu"kn~ A	16 <b>Val%</b>
?kVde&4%	fuEufyf[krkifu"kn% 'kkæljHkk"; ku¢kja xgue~ v/; ; ue&	
	eqMdki fu"kn~ A	16 V <b>ak</b>
<b>fMi . ; %¥</b>		

(d) ç'ui=1s 'N/~(6) v fuok 1126 ç'ul% Hio''; fUA r=1x çHeç'us 34/d pr Q/; xri HBÔðeelf.J R p Tolj% (4) fod Yijfgr 1% (v fuok, 1436 l £(11 kkijç'ul% çnH; U5A v Us ç'ul% Øe' RáHeal}rh, arrh, apr HEAUd al E: 1/2% Hio''; fUA

(x) çFle3kti LUr%f)r h, %ç'u%l LÑrelè; esu , o i ek/ ş%v UFlik i olik v Äğlfu%Hlo"; frAv Us

# **ç'ul%i bi\r@ul#@läXiltikilel**è; eluled sifi , d sı elè; esı i el⁄ k **e'ii) UfA**

### ç'ui #fuekZkfof/%

- 1- itui=L; fuektka l & Ñrek/; eu HkorA
- 2- it ui =s "₩~(6) ∨fuok; № it uk% Hkfo"; fUrA
- 3- iłukuke~ **v dłała**p foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç' u%µ v; a(çHe% ç' u%3Vd pr q/; xr i HBÔðeelí J Ŗ HosA v fLeu~ç' usp Tølj%** (4) fod Yi jfg**r k%( v fuok lijs i tí(lir liðj ç' uk%çril; USA**  $(4x4=16v \ddot{R})$
  - II. f)rh% ç'u% (çfle 3kd kJ r 3 µ i dj.k}; a l k Ñ rek/; eu 0; k[; krq ; Fkkfufn ZVkupk dkl; % i dj.k=; a i nkL; r A

     ½x8=16∨d k%
  - III. r`rh; % i*t* u% ¼f}rh; ?kVdkfJr%4µ izdj.k}; a 0; k[; krq ; FkkfufnŽVkupkdkl; % izdj.k=; a inkL; rA %2x8=16∨xdk%2
  - IV. pr@k% it u% %r`rh; ?kVdkfJr%4µ idj.k}; a 'kkadjHkk"; ku@kjsk 0; k[; kr@; FkkfufnZVkifu"kn%

     idj.k=; a inkL; rA

     %2x8=16\vadk%2
  - v. i×pe% i*t* u% %pr[k2kVdkfJr% $\mu$  eU=}; a 'kkadjHkk"; kuq kjsk 0; k[; krq ; Fkkfufn2Vksifu"kn% eU==; a inkL; rA % $2x5=10\sqrt{a}$ dk%

∨u¢ kfl rxtJFkk%

- 1. r\$Ùkjh; kj.; de} I k; .kHkk"; ] ∨kuUnkJe] i wkA
- 2. r\$Ùkjh; kj.; de} Hkk"; dkj&HkêHkkLdjA
- 3- r\$Ùkjh; ki fu"kn~ ¼" kkaclj Hkk"; ½] xhrk i xl ] xkj [ki jA
- 4- eqMclkiifu"kn~¼'kkadjHkk";½] xhrk isl] xkgi[kigA
- 5 bZkkfn ukSmifu"kn} xhrkixl] xkyj[kiyjA
- 6. mifu"kn&n'kū dk jpukRed lo₹k.k] jkepUnz nÙkk=ş jkukM} ∨uq jkekuUn frokjh] jktLFkku fgUnh xUFk ∨dkneh] t;ijA
- 7- Eight Upanishads (Volumes 1-2), Swami Gambhiranand, Advaita Ashrama, 5, Delhi Entally Road, Calcutta, 1995.

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# COURSE CODE : SKT- SC-404-A , **d kafočka ize~%osiĢi(; ki ¼r; %osi+k; d lj k p**

Paper- XIX : Vedavyakhyapaddhatayah Vedabhasyakarashcha

L	Credits
4	4

i v**HÄI%**80 v HJfjde**H**/HÄüHÄI%20 Ie; %3g**j**jk% (3 Hours)

co. 404-A-I:, rfLeu~ ?kVds ikjEifjdHkk"; **)** inikBL; fu; ek%] vu¢pe.kh lkfgR; L; ifjp; % c`gnnorkfnxUFkkuka Kkua yHkrs A

co. 404-A-II : , rLekn~ ?kVdkn~ o; a dYil⊯j fu#Drj LdUnegs ojHkk"; a ek/kolk; .k; k‰ Ñrhuka

ifjp; a iklL; ke% A

co. 404-A - III vfLeu~ ?kVds onkuka Hkk"; držkka ik' pkR; fontikka thouifjp; a rškka onHkk"; in/kr%

Kkua ikl; rs A

co. 404-A-IV : , rfLeu~ ?kVds onšką Hkk"; držkka Hkkjrh; fontikka thouifjp; a r%

fyf[krHkk"; xlJFkkuka ckg/kks Hkofr A

?kVde&1%	i <b>kphu&amp;o\$ndk/; ; ufooj.ke~ % ifjp; ek=e~</b> ¼I <b>k</b> .Ñrek/; eu½µ	
	ikjEifjdHkk";e} inikB%] c`gíork] Lojkuø/e.khA	16 <b>Va%</b>
?kVde&2%	ikphu&o\$ndk/;;ufooj.ke~%ifjp;ek=eµ	
	dYil⊯e} fu#Dre} LdUneg\$ojHkk";e} ek/ko%j lk;.k%A	16 <b>Va%</b>
?kVde&3%	∨k/kų̃udo <b>s</b> ndk/; ; ufooj.ke~% ik' pkÙ; fo}ki % &	
	Wilson, Roth, Whitney, M. Müller, Oldenberg, Grassman, Hillebrantt, Luders, Weber, Caland.	16 <b>V œ%</b>
?kVde&4%	∨k/kų̃udo§ndk/; ; ufooj.ke~ % Hkkjrh; fo}ka % &	
	Lokeh n; kuUn%j ∨jfoUn%j e/k¢j mu% ∨ks>kj nkeknji kn1 kroycdj%A	16 <b>Va%</b>
f\li • %94		

# (d) ç'ui=ls i ×p (5) v fuok HZ ç'ul% HIo"; fUA r=k çHeç'us 34/d prů/; xri HBÔ Øeelf.JR pRolj% (4) fod Yijfgrk% (v fuok, HB l £(Hrkšljç'ul% çnH; USA v Us ç'ul% Øe'ktýfie81)rh, 8rih, 8prij E21/d 81 E21/47/HIo"; fUA

# (x)çFle3AktikUr%{}rh,%ç'u%{bklirelè;esu,olek(ş%v/ŲFlikloblikvÄödi/)frAvŲs ç'uk%{bklir@{bklikklelè;ekuledsali,dsuelè;esulek(krq'lD)UKA ç'ui=hfueli/2140f/%

- 1- itui=L; fuektka l & Ñrek/; eu HkorA
- 2- iżui=s i 🖛 (5) ∨fuok; 🕊 iżuk% Hkfo"; fUrA
- 3- i*i* ukuke~ **v didle**p foHkktue~ v/kkfyf[kr: isk Hkfo"; frµ

  - II. f)rh% ç'u% (çHe3küll)r%µ olndk/;; ufooj.kfo"k; de~, da i i ua l i Nrek/; eu l ek/kkrą; FkkfufnžVfo"k; kl; % fo"k; }; a inkL; rk
     %16\vdk%/2
  - III. r`rh; % **ç' u%** ¼f}rh; ?kVdkfJr‰µ o§ndk/; ; ufooj.kfo"k; de~, da i z' ua lek/kkrą

     ; FkkfufnžVfo"k; kl; % fo"k; }; a inkL; rA

     ¾16 \ndk‰
  - IV. pr{k%  $r^{*}$  u%  $r^{*}$ ; ?kVdkfJr%  $\sqrt{k}$  v/k/kųdosndk/; ; ufooj.kfo"k; de~, da it ua lek/kkrą ; FkkfufnžVik' pků; fo}nH; % fo}n; a inkL; rs  $\frac{16}{16}$
  - V.  $i \times pe\%$  i Uu%  $4prik/2kVdkfJr\%\mu \vee k/kf\mu dosndk/; ; ufooj.kfo"k; de~, da <math>it$  ua lek/kkrq; Fkkfufn/2VHkkjrh; fo}nH; % fo}n; a inkL; rst  $16 \vee tdk\%$

∨u¢ kfl rxtJFkk%

- 1- on Hkk"; dkjka dh on kFk&i) fr; kj MkW jkeukFk on kyadkj] fo'os ojkuUn ofind 'kksk&l & Fkku] gkf k; kjijA
- 2- olind 0; k[; kuekyk] I Ei kñ Mknii Ñ".kyky] bLVuZ copl fyndl 1, fnYyh] 1982
- 3- olind 0; k[; k&foopu] MkWi jke xki ky] us kuy ifCyf'kax gkml] fnYyhA
- 4- A History and Principles of Vedic Interpretation, Ram Gopal, Delhi, 1983.
- 5- o\$nd lkfgR; ,oa lkLÑfr dk leh{kkRed bfrgkl] MkWi ∨keizdk'k ik.Ms] U;w ,t ifCydskUl] 4835@24] ∨alkjh jkMi nfj;kxat] ubZ fnYyh] 2008
- 6- laLÑr&'kkøk % o\$ind ∨/;;u] MkWi Ñ".kyky] foHkap§ikoue~ fo'ouhM] bZ 937] ljLorh fogkj] 'kadj cLrh] fnYyh] 1987
- 7- on &0; k[; k dh fn'kk, i i kā oztfcgkjh pkôc; dkR; k; u o fnd I kfgR; i zdk'ku] gkf'k; kji j 2006
- 8- onçkek.; &ehekal k, oa _f"k n; kulln] çkñ Jhfuokl 'kkL=h] d#{k⊊ fo'ofo | ky; ] d#{k⊊A

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#### COURSE CODE : SKT- SC-405-A foldi = -%ofid Old j. le~

Paper- XX : Vaidikavyakaranam

L	Credits
4	4

i **vikä ik%**80 **v ku/j d e\/ k**äü**kä ik%**20 **l e; %3 gljik% (**3 Hours)

Co-405A-I: VfLeu~?KVds ofindif@; k; k% ek/; esu l figrklq i?, pr'kCnkuka fln/kKkua ikl; rs A

co-405A-II:, rfLeu~ ?kVds Nk=k% /kkrwka fofHkUu: i% I k/k± rškka fofo/k&vFkkuka ręFkdkfniß; kuk×p

Kkua i klL; fUr A

co-405A-III : OnkukeoxeukFk± onk³xkukeko' ; drk Hkofr] ršką onk³xšką f'k{kxb/Fkkuka Lodh; of k"V; a

orins A ikf.kuh; kf k{kk; k% ek/; esu o; a Lojk.kkelppkj.kLFkkuknhuka I v(eKkua ikIL; ke% A

co-405A-IV : vfLeu~ ?kVds Lokehn; kuUnfojfprl kbjL; ek/; eu

o\$ndLoj&mnkÙk&vuqkÙk&Lofjr&ip;&dEiknhuka Kkua ikl;rs A

?kVde&1%	<b>o\$nd0; kdj.kL; v/; ; ue~</b> ½1 ½.Ñrek/; eu½& Hkêk\$tnhf{kr%{ fl.) klrdk\emb&o\$ndh_ifØ:k]_v/:k:k% 1&4	16 <b>V al%</b>
?kVde&2%	of nd0; kdj.kL; $V/$ ; ; ue&	
	fl) kUrdkennk&o\$ndh ifØ; k] ∨/; k; k% 5&8	16 <b>VCB%</b>
?kVde&3%	f'k{kkxb/FkL;       /;;;ue~ & ikf.kuh;f'k{kk   ¾l Eiwkkb/A	16 <b>V CE%</b>
?kVde&4%	o\$nd&Loj&ifjp%¼~1kbj% bR;uqlkjsk½&	
	mnkùk%, ∨u <b>n</b> kùk%, Lofjr%, ip;%, dEi%, ∨kefU=rLoj%,	
	∨k[;krLoj%] i₨;;Loj%] ∨uçU/k?kfVrk% Loji/Ñr;%A	16 <b>Va%</b>
<b>A.E.</b> . 0/0/-		

f**Mi . ; %¥** 

(d) ç'ui=ls i ×p (5) v fuok 112 ç'ul% Hio'', fulA r=k çHeç'us 34/d prüµ/; xri HBÖØeelk J R p Telj% (4) fod Yijfgrl% (v fuok, 1136 l £(Hrkùjç'ul% çnil; U5A v Us ç'ul% Øe' Rûfle&1)rh, & rih, & prüµ234/d & 12:1/37/Hio'', fulA

(x) çFle 314di LJr%{}rh, %ç'u% la Mîrelè; esu ,o | ek/ ş%/ U/Flk | oblik v Äğifu%Hio"; fr A v U/s ç'ul% la Mîr @guh@lÄ X4H kilelè; ekuled sifi ,d su elè; esu | ek/ kref HD, U/SA

# ç'ui #fuekZkfof/%

- 1- itui=L; fuekZkal&Ñrek/;eu HkorA
- 2- it ui =s i →p (5) ∨fuok; K‰ it uk% Hkfo"; fUrA
- 3- iłukuke~ **v dłała**p foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç' u%µ v; a(çHe% ç' u%3\/d pr \$\/; xr i HBÔðeek/J Ŗ HosA v fleu~ç' usp iðlj %** (4) **fod \i j fgr k%( v fuok lib i f(llr l\d); c' uk%cnl; UA**  $(4x4=16v \ddot{A}k%)$
  - II. f}rh; % i*t* u% ¼iFke?kVdkfJr% $\mu$  I #prtV; a I  $\hbar$ Nrek/; e $\mu$  I knkgj.ka 0; k[; krq; ; FkkfufnžVk/; k; k]; %  $\vee$ "V I #kf.k inkL; Ur $\hbar$   $\frac{1}{4}x4=16\sqrt{2}dk\%$
  - III. r`rh; % i*t* u% ¼f}rh; ?kVdkfJr‰µ l⊯pr¢V; a lknkgj.ka 0; k[; krq; FkkfufnžVk/; k; kl; % l⊯k"Vda inkL; r£k ¼4x4=16∨£dk‰
  - IV. pr{k% it u% %rrh; ?kVdkfJr%4 $\mu$  'ykdpr{v}; a 0; k[; krq ; FkkfufnZVxbFkb; % "kV~ 'ykdk% inkL; Ur\$ %4x4=16 $\nu$ tdk%
  - v. i×pe% iłu% ¼prĘk2kVdkfJr%4µ Lojfo"k; da fVli.k}; a fyf[krq; FkkfufnZVo§ndLojfu; ekl; % fu; e=; a inkL; rA  $%2x8=16\sqrt{a}$ dk%2

∨u¢ kfl rxtJFkk%

- o\$kdj.kfl)kUrdkemph ¼o\$ndh ifØ;k½ ¼fgUnh 0;k[;klfgr½ lEikñ] mek'kadj 'kek2 ^_f"k*] pk{[kEck fo|kHkou] okjk.klhA
- 2. o\$kdj.kfl)kUrdkenth ¼o\$ndh ifØ;k½ fgUnh 0;k[;kŒ nkeknj egrkA
- 3. Vedic Grammar for Students, A.A. Macdonell, Motilal Banarsidass, Delhi.
- 4. i kf. kuh; f' k{kk]  $\wedge$  kHkk* fgUnh Vhclk] i kä Jhukjk; .kfeJ] pk{[kEck | kfgR; ] okjk.kl hA
- 5. ikf.kuh; f'k{kk] ^inhi* fgUnh Vhclk ¼^igykn* fgUnh 0; k[; kl fgr½] l Eikñ xk&okeh igyknfxfj onkUrdskjh] pk[kEck] okjk.kl hA
- 6. Ikôj% Lokeh n; kuln] o£ind ; U=ky; ] ∨tejA
- 7. olindLojehekalk] i a ; (j/kf"Bj ehekald] jkeyky di y VLV] joyh] IkuhirA
- 8. ofindLoj&cks/k] MkWi cztfcgkjih pk6c3; ofind IkfgR; & Inu] gk6t'k; kjigi ¼iatkc½A
- 9. o\$ind&Loj&∨o/kkj.kk] MkMi ikjl ukFk f=ikBh] Innhi izdk'k] cLrh] 1978
- 10. LojifØ;kizdk'k] MkWi okeno feJ] xhrk låÑr izdk'ku] jktefUnj] okjk.klh] 1975

 $\star\star\star$ 

### COURSE CODE : SKT- SC-406-A <u>VIVA-VOCE</u> (el§ kl hi j kl k)

i viii kommum Marks): 50

Credits: 2

# fMi.kh%,eññ (lktÑre)-&prepz=1k; i BBÔðel ektr%/vukujarrh,prepz=1k,1%/v/kra i BDÔðee-vkUR; NickkalktÑrekè;eu ekt\$kdhijk(kkvk,1sf;";r&

**Note:-** Viva-Voce of the students, based on the syllabus covered in their  $3^{rd}$  and  $4^{th}$  Semester courses, will be conducted through Sanskrit medium after the completion of the syllabus of M.A. Sanskrit, Fourth Semester.

**Option (II)** 

ox**Z**⁶[ k Øk j. k~ Group-B (Grammar)

COURSE CODE : SKT- SC-402-B

Paper- XVII : Vyakaranaparampara (2)

L	Credits
4	4

i vHÄR%60 v HJfjdeH/KÄüHÄR%20 le;%3 gljik%(3 Hours)

Co. 402- B-I : VfLeu~ ?kVds Nk=K% Hkrgfj&d\$ V&dKSMHkVV&ukx\$ kHkVV% bR; r\$kka 0; fDrRoÑfrRou

ifjfprk% HkofUr A

Co. 402- B-I : Nk=k% ∨"Vk/; k; h&egkHkk"; &dkf' kdkofÙk&okD; i nh; &

'kCndK&rt#ko\$kdj.kHk#k.kTkj&o\$kdj.kfTn/kkUrijey?ke×t#kk , R; r5kka xUFkkuka fo"k; oLruk

∨oxrk% HkofUr A

Co. 402- B-I : VfLeu~ [k.Ms V"Vk/; k,; k% iFkeks /; k; L; iFkeiknkUrx7k%

fu"Bk&I oùke&I oùkeLFkku& I Ei i kj.k&yki &fv&mi/kk&on/ke~ bR; rs I Kk% Nk=ku~ v/; kI; rs A

Co. 402-в-I: VfLeu~ Hkkxs i kf.kuh; f' k{kk; ka o.kkukeqi fùk% o.kkuka foHkkx% o.kkukeqpkj.kLFkkua

o.kkuke@ppkj.kL; xqknkskk% bR; rs fo"k; k% Nk=ku~ i kB; Urs A

- ?kVde&1 % Hkrigfj%] d\$ V%] dkSMHkê%] ukxš kHkê%A
   16 v dk%

   ?kVde&2 % v"Vk/; k; h] egkHkk"; e} dkf kdkofùk%] okD; inh; e} 'kCndk&rt#k%]
   16 v dk%

   o\$ kdj.kHk#k.kl kj%] o\$ kdj.kfl ) kUrijey?ke×t#kkA
   16 v dk%
- ?kVde&3 % ikf.kfu%] ∨"Vk/; k; h&iFkeks /; k; %] iFke% ikn%A 16 volk
  √/kkfyf[krl×Kkfo/kk; dl ⊯k.kka dkf'kdkfn'kk I ± Ñrek/; eu I knkgj.ka
  0; k[; k&
  fu"Bk ¼1-1-26½] I ołuke ¼1-1-27½] I ołukeLFkkue~ ¼1-1-42&43½]
  I Ei i kj.ke~ ¼1-1-45½] yki% ¼1-1-60½] fV ¼1-1-64½] mi/kk ¼1-1-65½]
  o) e~ ¼1-1-73¾A
- ?kVde&4 % ikf.kuh; f'k{kk ¼l Eiwkk/2⁄A

16 V**CR** 

fMi . ; %¥

(d)  $\phi''$  ui = is i x p (5) v fuok HZ  $\phi''$  ul% Hio"; fUA r=k  $\phi$  He  $\phi''$  us 34/d pr  $\phi$ /; xr i HB  $\hat{O}$   $\hat{O}$  eelf J R p Rolj % (4) fod Yi j fgr 1% (v fuok, HZ = 1 & (Hr k)  $\phi''$  ul%  $\phi$  = HZ = V =  $\phi''$  ul%  $\hat{O}$  e' R $\phi$  He 81) r h, 8 pr HZ = V =  $\phi''$  ul% =  $\hat{O}$  = V =  $\phi''$  ul%

([) OI; Hed c' usiq50% v at a v pulled c' usiqp 100% v at a of the set of the

(x) rìh, 34d lí Jr% pr**iji% ç'**u% l líÑrelè; esa, ol ek/ ş% v U/Hk lokak v Äğdfu% Hio"; frA v U/s ç'u% l líÑr@guh@lÄXH kilelè; ekuled sifi, d sa elè; esal ek/ kref HD, USA

# ç'ui #fuelZlfof/%

- 1- itui=L; fuektka l & Ñrek/; eu HkorA
- 2- it ui =s i xp (5) ∨fuok; k‰ it uk% Hkfo"; fUrA
- 3- it ukuke~ v dalap foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. **çRe%ç' u%µ v; a(çRe% ç' u%3Vd pr ¢/; xr i HBÔðeelf J Ŗ HosA v fLeu~ç' usp Rolj %** (4) fod Yi jfgr **K% (v fuok lijs l f(ilr ki); c' u% çnl; U\$A**  $(4x4=16v \ddot{A}R%)$
  - II. f}rh;% it u% ¼iFke?kVdkfJr‰µ iFke?kVdkDrkuka o\$kdj.kkuka dL; fpn~, dL; o\$kdj.kL; thouifjp;e} jpuk% I&Nr0;kdj.k'kkL=s rL; ;kxnkua p vf/kNR; fyf[krq o\$kdj.k};IEc)kS o&dfYidkS it ukS inkL;rA %16vrdk‰

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

- III. r`rh; % i t u% ¼f}rh; ?kVdkfJr‰µ f}rh; ?kVdkDrkuka xt/Fkkuka dL; fpn~, dL; xt/FkL; y{kd&jpukdkykfnifjp; e} ifrik | fo"k; e} egùoa p vf/kÑR; fyf[krq xt/Fk}; IEc) kS o&dfYidkS it ukS inkL; rfA %16vt/kdk‰
- IV. pr[k% it u% %rrh; ?kVdkfJr%4µ rrh; ?kVdkfDrikB; ØelEc) a l #pr(V; a l & Ñrek/; eu l knkgj.ka 0; k[; krq; FkkfufnZVxUFkkr~ "kV~ %6½ l #kf.k inkL; Ur\$A %4x4=16\tabk%2
- v. i×pe% it u% %pr@k2kVdkfJr%4u pr@k2kVdkDrikB;ØelEc)a 'yksd};a lit a0;k[;krq ;Fkkfufn2VxbFkkr~=;%%3% 'yksdk% inkL;Ur\$k %2x8=16\sdk%

vu¢ kfl rxtJFkk%

- 1- I & Ñr & 0; kdj.k' kkL = dk bfrgkl ¼Hkkx 1 & 2½]; (j/kf"Bj ehekald] jkeyky divj VLV] joyh] I kuhirA
- 2- I LiÑr 0; kdj.k dk mnHko vkj fodki] I R; dke oekj ekurhyky cukji hnki] fnYyhA
- 3- lauÑr0; kdj.kn'ku] jkelajsk f=ikBh] jktdey izdk'ku] fnYyh] 1972
- 4- ikf.kuh; 0;kdj.k dk vuqkhyu] jke'kadj Hkêkpk;] b.Mksykstdy gkml] okjk.klh] 1966
- 5- 0; kdj.k'kkL=\$rgkl%] ohñ f=ikBhA
- **6-** Belvalkar, Shripada Krishna, An Account of the Different Existing Systems of Sanskrit Grammar, Bharatiya Vidya Prakashan, Varanasi.
- 7- George Cardona, Pāņini : A Survey of Research, Motilal Banarsidass, Delhi.
- 8. Hartmnt Scharfe, Wiesbaden; A History of Grammatical Literature, Otta Marrasowitz, 1977.
- 9- dkf'kdkofUk ¼U;kl&ine×tjh&lfgr½] lEikñ ,oa fgUnh Vhdkdkj& MkWi t;'kxdjyky f=ikBh ,oa l¢(kkdj ekyoh;] rkjk ifCydšku] okjk.klhA
- 10- dkf'kdk] fgUnh Vhdkdkj& Jhukjk; .k feJA
- 11- v"Vk/; k; h ¼Hkk"; ½ i Ekekofük ¼i Eke Hkkx½] i @E cãnük ft Kklýr jkeyky divýr VLV] joyh ¼ kuhir½A
- 12- v"Vk/; k; h&dkf'kdk ¼i Fkek/; k; ½ on i ky fo kHkkLdj] [kfgR; Hk. Mkj] ej B] 1985
- 13- o\$ kdj.kfl) kUrdkemh ½mùkjk) ½ Hkêk\$tnhf{kr] ekrhyky cukjlhnkl] fnYyhA
- 14- m.kkfndksk% Lokeh n; kuUn] I Ei kñ ; f/kf"Bj ehekaldA
- 15- ikf.kuh; f'k{kk] 0; k[; kdkj& Jhukjk; .k feJ] xkxdaynkl lalÑr xbFkekykA
- 16- Pāṇinīyaśikṣā, Ed. & Tr. M.M. Ghosh, Delhi, 1986.

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### COURSE CODE : SKT- SC-403-B v "Vint lai = le~%@ldj. Int lile~(2)

Paper- XVIII : Vyakaranadarshanam (2)

L	Credits
4	4

i **vHÄR%**80 **v HJfjde₩ KÄüKÄR%**20 **le;%3 gljiK** (3 Hours)

co. 403-B-I : ?KVds fLeu~ ir×tfyefufojfpregkHkk"; L; nforh; kfgæda i R; kgkjkfgæda i kB; rs A vus

Nk=k% iR; kgkjI #k.kka oKkfudi {keoxfe"; UrA

Co. 403-B-II : Hkrðjfjgfj.kk fojfpra okD; inh; L; cãdk.ML; pr& I Irfrdkfjdkr%

i×pi×pk'knf/kd'kra dkfjdki; Øra v/khrs A vusu Nk=k% LQkt/fln/kkUrsu /ofufln/kkUrsu ifjfprk%

HkofUr A

со. 403-в-ш:, rfLeu~ o\$ kdj.kfl ) kUrijey?kev tWkk; k% 0; ×tukfu: i.ka LQkVfu: i.k×p fo"k; a

∨/kh; rs A

Co. 403-B-IV : VfLeu~ ?kVds o\$ kdj.kfl n/kkUrijey?ke×tWk; k% dkjdfu: i.kizdj.ku fØ; k; k% fuorda

dkjda  $\lor$ ; a fcUnt I kFkdks Hkfo"; frA

?kVde&1	%	ir×tfy%] egkHkk";e~	
		f} <b>rh; e~ ∨kfÐde~ ¼i &amp;; kgkjkfÐde½ {</b>   <b>ఓ</b> Ñrek/; e <b>u}A</b>	16 <b>Val%</b>
?kVde&2	%	HkrÿfjÿjokD;inh;e}cãdk.Meµdkfjdk%74&155	16 <b>V al%</b>
?kVde&3	%	ukx\$kHkê%j o\$kdj.kfl)kUrijey?kæ×t%k&	
		0;×tukfu:i.ke} LQkVfu:i.keA	16 <b>Vai%</b>
?kVde&4	%	o\$kdj.kfl)kUrijey?kæ×tWkk&dkjdfu:i.keA	16 V <b>CK</b>

f**\li . ; %**#

([) Olf; Hed ç' usiq50% v al%a ly ipulied ç' usiqp 100% v al%aOSfYi d %HosA

# (x) i Ele 314 (l LJrk3) rh, rìh, i zuk3, bhữ relè; en; , o lek/şk3v (J Hik lo Elk v Äight/% Hio"; frAv (J s ç'uk% la Nir @ Juh@ kä X4 Hikble)è; ekuled shii , d ni elè; en; lek/kref HD, UKA.

### ç'ui #fuekZkfof/%

- 1- itui=L; fuektka l & Nrek/; eu HkorA
- 2- it ui =s I Ir (7) ∨fuok; K‰ it uk‰ Hkfo"; fUrA
- 3- it ukuke~ **v dala**p foHktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç'u%µ v; a (çHe% ç'u% 3Ud pr 4/; xr i HBÔðeelf J R HosA v fleu~ç'us p Folj %(4)** fod Yi jfgr **R%(v fuck H% I f(ilr kijç'u R%çril; UA** (4x4=16v Å R%)
  - II. frh;% i*t* u% % iFke?kVdkfJr%/µ lit**a** okfr2d}; a ltNrek/; eu 0; k[; krq ; FkkfufntVxbFkkr~ okfr2d=; a inkL; r**A** % 2x4=8∨**t**Ck%/2
  - III. r`rh; % i t u% % i f ke?kV d kf J r %  $\mu$  ; Fkkf u f n  $ZV \times b$  Fke~  $\vee$  kf J R; , da leh {kk Reda i t ua l L  $\tilde{N}$  rek/; e $\mu$  lek/kk ra i t u}; a inkL; r Å %  $\vee$  ad k% 2
  - IV. pr[k‰ i²u% ½f}rh; ?kVdkfJr‰µ li²l adkfjdk}; a 0; k[; krq; Fkkfufn²Vxb/Fkkr~ dkfjdk=; a inkL; rA  $\frac{1}{2}x4=8\sqrt{a}$ dk‰
  - V.  $i \times pe\%$  it u%  $\frac{1}{2}rh$ ; ? $kVdkfJr\%\mu$ ; F $kkfufntVxbFke \sim kfJR$ ; , da  $leh\{kkReda it ua lek/kkrq it u\}$ ; a inkL; rk  $\frac{1}{2}vdk\%$
  - VI. "k"B% it u% %rrh; ?kVdkfJr% $_{\mu}$  lit **e** vorj.k}; a 0; k[; krq ; FkkfufntVxt/Fkkr~ vorj.k=; a inkL; rA

∨Fkok

- ;  $FkkfufnZVxWFke \sim vkfJR;$ , da leh{kkReda it ua lek/kkrq it u}; a inkL; ra (16 vadk%)
- VII. | lre% itu% %pr@kt2kVdkfJr%4u | it=e~ vorj.k}; a 0; k[; krq ; Fkkfufnt2VxbFkkr~ vorj.k=; a inkL; rA

∨Fkok

;  $FkkfufnZVxUFke \sim vkfJR$ ; , da leh{kkReda it ua lek/kkrq it u}; a inkL; ra (16vadk)

∨u¢ kfl rxtJFkk%

- 1- 0; kdj.kegkHkk"; e~ ¼Hkx&1½] |Eikñ onor] gfj; k.kk |kfgR; |bLFkku] x#day >Ttj] 1962
- 2- egkHkk"; e~ ¼i Ekeks Hkkx%/2 0; k[; kñ ; f/kf"Bj ehekald] jkeyky diw VLV] joyh] I kuhirA
- 3- 0; kdj.kegkHkk"; ¼d\$ V&Ñr ^inhi* rFkk ukxš k&Ñr ^mn-|kmr* | fgr] Hkkx&1½] | Eikñ ∨kjñ dñ 'kkL=h rFkk Mhň dnpky] okjk.klh] 1987
- 4- 0; kdj.kegkHkk"; e~ ¼vkfĐd 1&5½] 0; k[; kñ rFkk lEikñ eFkġkizlkn feJ] pk{[kEck fo|kHkou] okjk.klhA
- 5- 0; kdj.kegkHkk"; ¼vkfĐd 1&2½] l kNr0; k[; kdkj& ek/ko 'kkL=h Hkk.Mkjh] fgUnh 0; k[; kñ onidk'k fo | kokpLifr] enjpUn yNeunkl ifCydskUI] fnYyhA

#### SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

- 6- ikr×ty egkHkk"; es ik;k[;kr l⊯ % ,d leh{kkked ∨/;;u] Hkheflag onskyadkj] fue3y cqd ,tblh] d#{ks=] 1987
- 7- ikr×ty egkHkk"; ea vinoZ dYiuk,∦ Hkheflag onkyadkj] ifjey izdk'ku] fnYyh] 1988
- 8- 0; kdj.k'kkL=h; ykcdU; k; jRukdj] Hkheflog onkynclkj] isueSu ifCy'kl], fnYyh] 2001
- 9-  $l \ge Nr0$ ; kdj.kn'ku] Hkhefleg onkyedkj] fo | kfuf/k 'kkg/k  $l \ge Fkku$ ] 'khyk dkklykuh] det {ks=] 2004
- 10-0; kdj.kegkHkk";] fo|kfuf/k fgUnh 0; k[; kεHkheflog onskyndkj] fo|kfuf/k 'kks/k liuFkku] 'khyk dkWyksuh] d∉{ks=] 2006
- 11-okD; inh; e~ ¼cãdk.Me½, fgUnh 0; k[; kŒ jkexkfoUn 'kpy] dk'kh lŁÑr xUFkekykA
- 12- okD; i nh; e~ ½cã dk. Me½) 0; k[; kñ okenokpk; } Ñ". knkl ∨dkneh) okjk. kl hA
- 13- okD; inh; e~ ½cãdk.Me½ fgUnh 0; k[; kŒ fÓoÓædj ∨oLÉh] pk{[kEck fo|k Òou] okjk.klh] 1990
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- 17- ijey?kę×tikk] l k. Ñr0;k[;kdkj i i dkfydki i kn 'kpy] cMki kl 1961
- 18- o\$kdj.kfl)kUrijey?kep×t#kk] 0;k[;kdkj rFkk lEikñ MkWi dfiynos 'kkL=h] d#{k⊊ fo'ofo|ky; idk'ku] d#{k⊊] 1975
- 19-ijey?ke×tWkk] LEikñ tñ ,yñ f=ikBh] okjk.klh] 1985
- 20-ijey?k∉×tWkk ¼7VIi.khlfgr½, lEikñ ∨y[kno 'kek], okjk.klh] 1981
- 21. P.C. Chakravarti, The Philosophy of Sanskrit Grammar, Kolkata.
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- 23. Gaurinath Shastri, A Study in the Dialectics of Sphota, Motilal Banarsidass, Delhi, 1980.
- 24-0; kdj.kn'küHknedk] jkekKk ik.Ms;] lEiwkküUn l&Nr fo'ofo|ky;] okjk.klhA
- 25-0; kdj.k dh nk'kłud Hkłiedk] I R; dke oeklj et khjke eukgjyky] fnYyh] 1971

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# COURSE CODE : SKT- SC-404-B , **d kafočkaj že~%Okd j. ki £9; k**(3)

Paper- XIX : Vyakaranaprakriya (3)

**i viiäi?⁄**&0

v Həfj d et Häüläk/20

le; %3 gisk% (3 Hours)

Co. 404-B-I: O kdj.kfl n/kkUrdkeq; k% gyUriqYy³xidj.kknkjH;

gyUruid dfy³xidj.ka ; kor~ I knkgj.ka I ⊯k¥y{{kiodda : ifI nf/kifØ; ka Nk=k%

voxfe"; fUr A

Credits

4

L

4

Co. 404-B-II: ?KVds fLeu~% o\$ kdj.kfl n/kkUrdken; k% inokhikkL; cgphfgl ekl idj.ka

noUnłeklizdj.ka l⊯0;k[;kinozda : iflnf⊀kifØ;k in';rsA

Co. 404-в-ш: o\$ kdj.kfl) kUrdkêq; k% rnf/kršoiR; kf/kdkjidj.ks fir"olqN.k~ bfr l⊯knkjH;

n\$;fKñ bfr I⊯a ;kor~ N.k&< ´&;r&[k&<d&∨ ´&[k ´&N&Bd&.k&fQ ´&.;&b ´&"; ³~ bR;**r**s

iR;;k% Nk=ku~ ikB∻Urs A

со. 404-в-iv : vfLeu~ [k.Ms Nk=k% o\$ kdj.kfl n/kkUrdk@eq; kuq kja rnf/krskq eRoFkh? idj.kkUrxra

erq&yt&byp&'k&u&.k&fofu&bfu&v.k&mjp~

j&e&bju&bjp&oyp&bfu&Bu&B ~&; i &; ¢ &bR; knhu~ i R; ; ku~ KkL; fUrA

?kVde&1% Hkêkftnhf{kr%] o\$kdj.kfl)kUrdkên h%inok() ē½ ½ckyeukjek&rùockf/kuhlfgrk½% 16 v dæ gyUrif(Yy ī i dj.kkn~vkjH; gyUruif(dfy ī i dj.ka; kor& I knkgj.ka I ⊯@okfrd&0;k[;k( I ⊯@okfrd&mYy{{kinoda:iflf)'pA

- ?kVde&2% o\$kdj.kfl) kUrdk&ennh ¼inok() E½ ¼ckyeukijek&rùockt/kuhlfgrk½%& 16 ∨ dk% lekl% & cgophfgleklidj.ke} }U}leklidj.ke& lknkgj.ka l⊯@okfr2d&0;k[;k( l⊯@okfr2d&mYy{{kino2da : iflf) 'pA
- ?kVde&3% o\$kdj.kfl)kUrdk&mh ¼iok) &½ ½ckyeukjek&rùockf/kuhlfgrk½& 16 vđ& rf) ršoiR; kf/kdkjidj.ks ^fir"ol (N.k* ¼l⊯l{;k 1138½ bfr l⊯kn~ vkjH; ^n&; fKñ* ¼l⊯l{;k 1201½ bfr l⊯a; kor& l⊯@okfr2d&mYy{kio2da:iflf)%A

 ?kVde&4%
 o\$ kdj.kfl ) kUrdkenth ¼i tok?) è½ ½ ½ ½
 %ckyeukjek&rùockt/kuhl fgrk½%
 16 ∨ d‰

 rf) r\$kq eRoFkh? idj.ke& l LÑrek/; eu l #@okfrd&mYy{ki toba : ifl f) %A

fMi . ; %¥

(d) ç'ui=ls IIr (7) v fuck Hzoç'ul% Hio'', fUA r=k çHeç'us 34/d pr Q/, xri HBÖØeek(JR; p Folj% (4) fod Yijfgr K% (v fuck, Hjb, I £(Hr kijç'ul%, çnkl; U£), v U;s ç'ul% Øe' R&He&T)rh, & pr HzAud & E:1/4%/Hio'', fUA

([) Olf; Hed ç' usiq50% v al%a ly ipulied ç' usiqp 100% v al%aOSIYi d %HosA

# ç'ui #fuekZkfof/%

- 1- itui=L; fuekZkal&Nrek/;eu HkorA
- 2- it ui =s I Ir (7) √fuok; K‰ it uk‰ Hkfo"; fUrA
- 3- it ukuke~ **v dala**p foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç'u%µ v; a (çHe% ç'u% 34d pr 4/, xr i HBÔðeelf J R HosA v fleu~ç'us p Folj %(4)** fod Y jfgr K% (v fuck H% I ff Ir k¥jç'uK% çrll; UA  $(4x4=16v \ddot{A}K%)$
  - II. frh; % it u%  $4iFke?kVdkfJr\%\mu$  iFke?kVdkDridj.kIEc) a I#; a  $Iknkgj.ka 0; k[; krq; FkkfufnZVxUFkkr~I#prtV; a inkL; rA <math>\%2x4=8\sqrt{n}dk\%$
  - III. r`rh; % i*t* u% ¼iFke?kVdkfJr% $\mu$  iFke?kVdkfDridj.kIEc)L; in}; L; iæq[kl **#**k¥y{[kimo2da flf) ifØ; ka fyf[krq ; FkkfufnžVxb/Fkkr~ inprtV; a inkL; rA  $\frac{1}{2}x4=8\sqrt{n}dk$
  - IV. pr[k‰ it u% ½f}rh; ?kVdkfJr‰µ f}rh; ?kVdkfDridj.kIEc) a I #; a  $I knkgj.ka 0; k[; krq; ; FkkfufnZVxUFkkr~I #prtV; a inkL; rA <math>\%2x4=8\sqrt{n}dk\%$
  - V.  $i \times pe\%$  itu% #frh;  $?kVdkfJr\%\mu$  frh; ?kVdkDridj.kIEc)L; in; L; $ieq[kI \#kYys[kino2da fIf)ifØ; ka fyf[krn; pRokfj inkfu inkL; UrsA <math>\%2x4=8 \lor ndk\%$
  - VI. "k"B% it u% ¼r`rh; ?kVdkfJr%½µ r`rh; ?kVdkDridj.klEc)L; inprţV;L; ieq[kl⊯k¥ys[kino2da flf) ifØ; ka fyf[krq; FkkfufnžVx₺Fkkr~ "kV~ inkfu inkL; UrA

#### (4x4=16**v ÄR**⁄6

VII. I Ire%itu% %prfk2kVdkfJr%u prfk2kVdkDridj.klEc)L; inprfV;L; l1.Ñrek/;eu
ie(kl #kYy{kino2da flf) ifØ; ka fyf[krq; Fkkfufn2VxUFkkr~ "kV~ inkfu inkL; Ursk

(4x4=16**v ÄR**⁄6

∨u¢ kfl rxtJFkk%

- 1- o\$kdj.kfl)kUrdkenh %inok2) E% %ckyeukgiek&rùockt/kuh&lfgrk%] Hkêkttnhf{kr] ekrhyky cukjlhnkl] fnYyhA
- 2- o\$ kdj.kfl) kUrdk@emph ¼Hkkx 1&2½] 0; k[; kñ xki kynÙk i k.Ms] pk{[kEck lj]Hkkjrh] okjk.klhA
- 3- o\$kdj.kfl)kUrdk@emh ¼leklizdj.ke½] 0;k[;kñ vkpk;Z txnh'k 'kkL=h rFkk e/kopkyk 'kek2] ekorhyky cukjIhnkl] fnYyhA
- 4. Siddhāntakaumudī (Vol. I), Eng. Tr. S.C. Vasu, Motilal Banarsidass, Delhi.

#### $\star\star\star$

COURSE CODE : SKT- SC-405-B

Paper- XX : Vyakaranaprakriya (4)

L	Credits
4	4

i vHÄR%60 v HJfjdeH/HÄüHÄR%20 Ie; %3 gljik% (3 Hours)

co. 405-B-I: O\$ kdj.kfl n/kkUrdkêçq; k% mÜkjknžks fr³Urs ifjxf.krka iæ(k/kkruuka
I #okfrölkYy{kinočda : ifl nf/kifØ; k v/; kl; rs ; Fkk& fnokfniclj.k&tuh] .k'k] Lokfniclj.k& vkly] rqnakfniclj.k&f{ki} b"kq fony] #/kkfniclj.k& fhkfnj} f ´ bU/kh] rukfniclj.k& "k.kq
euq Ø; kfniclj.k& yw'} xg] pojkfniclj.k& ihM] Ki bR; knhukeA
co. 405-B-II: vfLeu~ ?kVds o\$ kdj.kfl n/kkUrdkêçq; kuq kja ; ³iclj.kg vkReusiniclj.kg
ijLe\$iniclj.ka l knkgj.ka l #k¥y{kinočda Nk=k%voxfe"; fUrA
co. 405-B-III: o\$ kdj.kfl n/kkUrdkêçq; k% mÜkjknžks ÑnUrÑR; iclj.ks r0; &
r0; r&; r&D; i&.; r&vuh; j&d§yej bR; r% iR; ; % Nk=k% ifjfprk% HkofUrA
co. 405-B-IV: vfLeu~ ?kVds o\$ kdj.kfl n/kkUrdkêçq; uq kja mÜkjÑnUr& iclj.ks

?kVde&1 % Hkêkstnhf{kr% oşkdj.kfl)kUrdkênh %mûkjk) 24%/ckyeukjek&rûocks/kuhl fgrk%& 16 val% √/k‰ifjxf.kr/kkrd Ec) kuka inkuka I⊯@okfr∂l&mYy∮kim∂da : iflf)% μ %d% fr3Ur& fnokfnidj.ke& tuh %1149%] .k'k %1194%A ¼[k½ Lokfnidj.ke& √kly` ¼1260%A ¼x½ rqkfnizdj.ke& f{ki ¼1285½] b"kq ¼1351½] fony ¼1432½A 1/2/k½ #/kkfnizdj.ke& fHkfnj~1/1439½ f×k bU/kh 1/1448½A 1/431/2 rukfnizdj.ke& "k.kg 1/4641/2] eug 1/4711//A 140½ Øîkfnizdj.ke& ywk~1483½ xg 14533½A 1/N½ pikfnidj.ke& ihM 1/15441/2] Ki 1/16251/A ?kVde&2 % o\$ kdj.kfl ) kUrdkenh %mùkjk) &% %ckyeukjek&rùocks/kuhl fark%% 16 VOR √/kkfufnZVizdj.kkUrxłkuka inkuka I⊯@okfr2d&mYy∮kim2da : iflf)% IEc) kuka I⊯k.kka okfr2dkuka p Iknkgj.ka 0; k[; k& fr³Ur& ¼d½; ³idj.ke¹ ¼[½ ∨kReusinidj.ke¹ ¼x½ ijLe³nidj.keA ?kVde&3 % oskdj.kfl) kUrdkenh /mùkjk) E1/2 //ckyeukjek&rùocks/kuhl fgrk///& 16 VOK ŇnUrŇR;idj.ke& IŁŇrek/;eu I⊯@okfrð&mYy∮kiøða:iflf)% Iknkgj.ka I⊯@okfr2d&0;k[;k pA ?kVde&4 % o\$kdj.kfl)kUrdkenh /mùkjk) E½ /ckyeukjek&rùockf/kuhl fgrk/2/& 16 VCR mùkjÑnUridj.ke& I⊯@okfr2d&mYy∮kiwo2da : iflf)%( Iknkqj.ka

l⊯@okfr2d&0;k[;k_pA

f**Mi . ; %**#

(d)  $\varphi^{t}$  ui = s v "V (8) v fuok HZ  $\varphi^{t}$  uk% Hio"; ful A r = k  $\varphi$  He  $\varphi^{t}$  us 34/d p r  $\varphi$ /; xr i HB  $\hat{Q}$   $\hat{Q}$  eek(J R p He ij % (4) fod Y j fgr k% (v fuok; Hij) I £(Hr kij  $\varphi^{t}$  uk%  $\varphi$ nH; UsA v  $\psi$ s  $\varphi^{t}$  uk%  $\hat{Q}$  e' R $\varphi$  He 81) r h, 8 pr HZ 34/d 81 E: 1/27/Hio"; ful A

([) Olf; Hed c' usiq50% v alkar by builted c' usiqp 100% v alkaosi Yi d % Hos A

(x) rìh, 34.41 KJrlišç'ul S(i×pe%) "KB% p½ | klÑrelè; esi, o | ek/şiSv URk | oblik v Äğifu%) Hio'', frAv Usç'ul% | klĨr@julk@käXil-iktilelè; ekuladistii, disi elè; esi | ek/krefil) UA

# ç'ui #fuelZhfof/%

- 1- itui=L; fuektka l & Nrek/; eu HkorA
- 2- iłui=s **v "V** (8) ∨fuok; k‰ iłuk% Hkfo"; fUrA
- 3- it ukuke~ volulap foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç'u%µ v; a (çHe% ç'u% 34/d pr 4/; xr i HBÔðeelf J R HosA v fLeu~ç'us p iðlj %(4)** fod ¥ j fgr **i%( v fuck lijs I f(ihr iki)ç'u i%çril; UA**  $(4x4=16v \ddot{A}i\%)$

- II. f}rh;% it u% ¼iFke?kVdkfJr%ų iFke?kVdkDridj.kIEc)L; inpr∜V;L; ieų[kI⊯k¥yų[kino2da:ifIf)ifØ;kafyf[krq;FkkfufnŽVxUFkkr~"kV~inkfu inkL;UrA ¼4x4=16∨dK%
- III. r`rh; % i*t* u%  $\frac{1}{1}$ rh; ?kVdkfJr% $\mu$  f}rh; ?kVdkDridj.klEc)L; in}; L; iæ([kl #k¥y{[kimo2da:iflf)ifØ; ka fyf[krq; FkkfufnZVxUFkkr~inprtV; a inkL; rf.  $\frac{1}{2}x4=8\sqrt{n}$
- IV. pr{k% it u% %f}rh; ?kVdkfJr% $\mu$  f}rh; ?kVdkfDridj.kIEc) a l#}; a lknkgj.ka 0; k[; krq ; FkkfufnŽVxbFkkr~ l#prtV; a inkL; r&% $2x4=8\sqrt{a}$ dk%
- v. i×pe% it u% %rrh; ?kVdkfJr%4u rrh; ?kVdkfDridj.klEc)L; in};L; l&Nrek/; eu iæ([kl m=kYy{[kimo2da : iflf) ifØ; ka fyf[krq ; FkkfufnžVxbFkkr~ inprtV; a inkL; rfk

1/2x4=8∨10k%/2

- VI. "k"B% it u% ½rrh; ?kVdkfJr%½µ rrh; ?kVdkfDrizdj.klEc) a  $l \neq$ ; a  $l \perp \tilde{N}$ rek/; eu  $l \leq 0$ ; k[; krq; FkkfufnžVxbFkkr~  $l \neq$ prtV; a inkL; rf 2x4=8vtdk%
- VII. I I re% it u% ¼pr@K2kVdkfJr%/µ pr@K2kVdkDridj.kIEc)L; in};L; iæ@[kI ⊯k¥y@[kino2da:ifIf)ifØ;kafyf[krq;FkkfufnZVxb/Fkkr~inpr@V;ainkL;r& ½2x4=8∨xdk%/
- VIII.  $\vee$ "Ve% i*t* u% ¼pr(k2kVdkfJr%4µ pr(k2kVdkDridj.klEc) a l#}; a lknkgj.ka 0; k[; krq ; Fkkfufn2VxUFkkr~l#=; a inkL; rA  $\frac{1}{2}x4=8\sqrt{10}k\%$

∨u¢ kal rxtJFkk%

- 1- o\$kdj.kfl)kUrdk@enh %ckyeukgek&r\u0cks/kuh&lfgrk% %m\u00fbkjk)&%]Hkêkstnhf{kr]eksrhyky cukjlhnkl] fnYyhA
- 2- ∨k[;kfrd% & Lokeh n;kuUn] ofind ;U=ky;] ∨tejA
- 3. Siddhāntakaumudī (Vol. 2), Eng. Tr. S.C. Vasu, Motilal Banarsidass, Delhi.

***

### COURSE CODE : SKT- SC-406-B <u>VIVA-VOCE</u> (el§ kl hi j kl k)

i viii kommum Marks): 50

Credits: 2

# fMi.kh%,eññ (lktÑre)-&prepuzik; i BBÔðel ektr%/vukujarrh,prepuzik,1%/v/kra i BDÔðee-vkUR; Nokk kalktÑrekè; exiektiki hijk(kkvk,1sf;",r&

**Note:-** Viva-Voce of the students, based on the syllabus covered in their  $3^{rd}$  and  $4^{th}$  Semester courses, will be conducted through Sanskrit medium after the completion of the syllabus of M.A. Sanskrit, Fourth Semester.

**Option (III)** 

# ox226'x* Hijrhn' lile~

**Group-C** (Indian Philosophy)

COURSE CODE : SKT- SC-402-C I Ir n' lei **:e~%; kun' lile~** 

Paper- XVII : Yogadarshanam

L	Credits
4	4

i vHÄR%80 v HJfjdeH/HÄÜHÄR%20 I e; %3 gljsk% (3 Hours)

SKT-SC-402-C-1ikraty; kxl #L; lekf/kiknL; v/;;usu ;kxL; Lo:ia egÙoa p voxE; rs A

SKT-SC-402-C-2 Nk=K%; kx I ₩0; kI Hkk"; L; V/;; usu I ₩k.kke~ xwkkFke~ ∨oxUrq i kj; fUr A SKT-SC-402-C-3 x | i ³ähuka 0; k[; k fo"k; L; I v(e&v/;; ukFk± i j; frA

SKT-SC-402-C-4; kxn'kuL; fl) kUrkukekifj fVIi.khy{ku}kjk oLrfu"Ba Kkue~vfHko/krs A

?kVde&1%ir×tfy%]; kxl #e]0; kl Hkk"; l fgre]l ekf/ki kn%  $\mu$  l i l  $\neg$  l #0; k[; kA16 v d%?kVde&2%; kxl #e]0; kl Hkk"; l fgre]l ekf/ki kn%  $\mu$  l i l  $\neg$  l #0; k[; kA16 v d%?kVde&3%; kxl #e]0; kl Hkk"; l fgre]l ekf/ki kn%  $\mu$  l i l  $\neg$  Hkk"; i f 3  ä0; k[; kA16 v d%?kVde&4%; kxl #e]0; kl Hkk"; l fgre]l ekf/ki kn%  $\mu$  l i l  $\neg$  Hkk"; i f 3  ä0; k[; kA16 v d%

#### fMi . ; %¥

([) OI; Hed c' usiq50% v at av by ipulied c' usiqp 100% v at av of f' d Hos A

(x)çFle%ç'u% latÑrekè;esa ,o lek/ş%v t/Flak lobblk v Äijdfu% Hlo";frA v t/sç'uk% IbtÑro@uhozuÄXkHkblekè;ebulecishti ,dsa ekè;esa lek/krefkD)t/sA

# ç'ui #fuekZkfof/%

- 1- izui=L; fuekzka l & Nrek/; eu HkorA
- 2- iżui=s i xp (5) ∨fuok; k‰ iżuk% Hkfo"; fUrA
- 3- it ukuke~ **v dala**p foHkktue~ v/kkfyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç'u%µ v; a(çHe% ç'u%3**/kd pr**4/; xr i HBÔðeelf J R Hos**A v fLeu~ç'usp **iðlj %** (4) fod Yi jfgr **i%( v fuok li% i tí lir iki**jç'u**i%i k**Ñr elè; eu i elk ir qçril; UfA(4x4=16v Ä**I%**
  - II. f}rh;% it u% ¼iFke?kVdkfJr $\%\mu$ ; FkkfufnZVa xUFke~ vkfJR; , da fucU/ka fyf[krq fucU/k}; a inkL; rA %16vdk%
  - III. r`rh; % i*t* u% ¼f}rh; ?kVdkfJr‰µ li**d ¯a**l⊯}; a 0; k[; krq ; FkkfufnŽVxUFkkr~ l⊯=; a inkL; rA ½2x8=16∨tdk‰2
  - IV. pr[k½ i1u% ½rrh; ?kVdkfJr½µ li1 a Hkk"; if a Hkk"; if a 0; k[; krq; ; Fkkfufn2VxbFkkr~ if a =; a inkL; rf
  - v. i×pe% iłu% ¼prtkl2kVdkfJr%½µ ; Fkkfufn2Va xUFke~ vkfJR; }; k% fo'knfVli.kö fyf[krt fcUnt; a inkL; rA 2x8=16vtdk%/

#### ∨u¢ kfl rxtJFkk%

- 1- ikr×ty ;kxn'ku] 0;kñ cãyhu equ] pk{[kEck] okjk.k1hA
- 2- ikr×ty ;kxn'kū] 0;kñ Lokeh gfjgjkuUn ∨kj.;] ekrhyky cukj1hnk1] fnYyhA
- 3- Studies in Patañjali, S.N. Dasgupta.
- 4- ikr×ty ;kxinhi] ∨kekuUn rhFk] xhrkill] xkg[kigA

#### $\star\star\star$

#### 

Paper- XVIII : Advaitavedantadarshanam

L	Credits
4	4

i v**HÄR%**80 v HJfjd e¥ kÄükÄR%20

le; %3 gisk (3 Hours)

 $SKT-SC-403-C-1 \quad C\tilde{a} I # \&' kkaclj Hkk''; e^{V} forkUrn'kuL; \quad Vk/kkj Hkar xUFk\% \quad VfLr]; L;$ 

Iello; k/; kIL; pr¢l ⊯∻ k% ∨/; ; ua Hkkjrh; onkUrn' kuijEi& jk; k% ifjp; a nnkfr A

skt-sc-403-c-2 pr%d ₩÷kifj 'kk³djHkk";L; if³ä0;k[;k cãftKklk;k% cã.k%

rVLFky{k.kkj; 'kkL=kiæk.kdL; p fo"k;k.kka Lo: ia mn?kkV;fr A

SKT-SC-403-C-3 /kejktk/ojhUn&fojfpr&onkUrifjHkk"kk  $\lor$ } onkUrn'kuL; iek.keheki ke~

m}kV; fr] rL; iR;  $k[k.ML; \vee/;; ua on UrkfHkeriek.kifjp; Ifgre~ u0; U; k; 'KY; k%$ 

Kkuefi nnkfr A

SKT-SC-403-C-4 ORKUrifjHKK"KK; K% iR; {k[k.M% ieky{k.ke} iR; {ky{k.ke} iR; {kL;

i; kstdku~ bR; kfnfo"k; ku~ ifrikn; fr A

 ?kVde&1% cãl#e] pr¢l#h] 'kkoejHkk"; &Hkkerh&Ifgrk % fucU/kkRediÜu%A
 16 vol%

 ?kVde&2% cãl#e] pr¢l#h] 'kkoejHkk"; &Hkkerh&Ifgrk %
 16 vol%

 il Tij% ja I#e&Hkk"; &Hkkerh&If³ä&0; k[; kA
 16 vol%

?kVde&3%/kejktk/ojhUn%onkUrifjHkk"kk]i R; {kifjPNn%% fucU/kkRediiu%16 valk?kVde&4%onkUrifjHkk"kk]i R; {kifjPNn%% I i I ~& i  $f^3$  ä 0; k[; kA16 valk

fMi . ; %¥

(d) ç'ui=ts i ×p (5) v fuok HZ ç'ul% Hio"; fUA r=k çHe ç'us 34 d p r 4/; xr i HBÔ 20 ee kJ R p Rolj % (4) fod ¥ j fgr k% (v fuok, HZ l k k j ç'ul% I k relè; es I e k/ kr q çn k; USA v  $\downarrow$ s ç'ul% 20 e' k 4 He 8 r h, 8 pr 4 Z 24 d 8 E 24 k Hio"; fUA

(x)çFle%ç'u% | blÑrelè;eou ,o | ek/ş%v U;Flk | obblk v Äghtu% Hlo";frA v U;sç'ub% | blÑr @gubh@käXih-bblee;ebuled salfi , dou elè;eou | ek/bref hD;Ub&

10(244)

# ç'ui #fuekZkfof/%

- 1- itui=L; fuekZkal&Nrek/;eu HkorA
- 2- iżui=s i → (5) ∨fuok; k‰ iżuk% Hkfo"; fUrA
- 3- it ukuke~ **v dala**p foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç'u%µ v; a(çHe% ç'u%3V**d pr**¢/; xri HBÔðeek(J R) HosA v fleu~ç'usp Tølj%** (4) fod Yi jf**qri%( v fuok lifk i f(ilriki); c'u%3 k** $\tilde{N}$ relè; en i ek/k **r qcrii; UA**(4x4=16**v Ä**k%
  - II. f}rh;% itu% ¼iFke?kVdkfJr% $\mu$ ;FkkfufnžVa xbFke~ vkfJR; , da fucU/ka fyf[krq fucU/k}; a inkL;rfA %16 vtdk%
  - III. r`rh; %
     iÜu% ¼}rh; ?kVdkfJr%µ
     l i 1 a
     l ₩&Hkk"; &Hkkerh&if³ä}; a
     0; k[; krq

     ; FkkfufnŽVxUFkkr~ if³ä=; a inkL; r\$
     %2x8=16∨tdk%/2
  - IV. pr[k% i bu% %r`rh; ?kVdkfJr%4µ ; FkkfufnZVa xbFke~ vkfJR; , da fucU/ka fyf[krq fucU/k}; a inkL; rA %16 vtdk%2
  - V. i×pe% il/u% ¼prfk/2kVdkfJr%/µ li/l a if³ä}; a 0; k[; krq; Fkkfufn/2Vx/JFkkr~ if³ä=; a inkL; rA

∨u¢ kfl rxtJFkk%

- 1- cãl⊯'kkœjHkk"; e} Hkkerhlfgre} 0; kñ Lokeh ; kxhUnkuUn%] okjk.klhA
- 2- cãl#] pr¢al#h] dkešoji1kn >k] pk{[kEck] okjk.klhA
- 3- cãl⊯] pr¢ki⊯h] 0; kñ ∨kpk; Z foÜo\$jojA
- 4- Brahmasūtrabhāṣya of Śaṅkarācārya, Eng. Tr. & Notes Swami Gambhirananda, Advaita Ashram, Kolkata.
- 5- onkUrifjHkk"kk] /kejiktk/ojhUn] I kNrVhdk ∨uUrN".k 'kkL=h] dkydkrkA
- 6- onkUrifjHkk"kk] 0; kñ xtkuu 'kkL=h eq yxkpdj] pk[kEck] okjk.klhA
- 7- Vedānta Paribhāṣā, Eng. Tr. & Notes, Swami Madhavananda, Advaita Ashram, Kolkata.
- 8- Paul Deussen, The Vedānta System, fglinh vu ik.Ms A

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M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

### COURSE CODE : SKT- SC-404-C , d kafo'alei :le~%a/ } 6 Kike%34 k elj' Kirt kile%i vik75n' kilek

Paper- XIX : Advaitashaivagamah (Kashmirashaivadarshanam) Purnadvaitadarshanancha

L	Credits
4	4

i v**HÄR%**0 v HJfjd e¥/ HÄüHÄR%20

le; %3 gisk% (3 Hours)

skt-sc-404-c-1 jktkudkulnofÙkl fgr% "kfV≤U' krrÙol Unkg% xUFK% ∨}\$'kôn'kuL; rÙoeheka k;k%

lf"VifØ;k;k% p ifjp;annkfr A

skt-sc-404-c-2 "kfV=U' krrÙol Unkgxt/FkL; dkfjdkuka liz x0; k[; k l kjek/;; ukFk± inh; rs A

skt-sc-404-c-3 vjfollnkifu"kn% ikB; Øes Lekosk% iwkk}fn'kuL; ifjp; kFk± Ñr% A

skt-sc-404-c-4 vjfollnki fu"kn% if³ä0; k[; k olrfu"By{ku& dkskya o/k} fr A

 ?kVde&1% "kVf=3 kÙkÙol Unkg%] jktkudkuUnofÙkI fgr% % fucU/kkRediÜu%A
 16 va‰

 ?kVde&2% "kVf=3 kÙkÙol Unkg%] jktkudkuUnofÙkI fgr% % çl īġ%I ja dkfjdk&ofÙk&
 16 va‰

 if³ä0; k[; kA
 16 va‰

 ?kVde&3% JhvjfoUn%] JhvjfoUnkifu"kn~ % fucU/kkRediÜu%A
 16 va‰

 ?kVde&4% JhvjfoUnkifu"kn~ % lijl aif³ä0; k[; kA
 16 va‰

fMi . ; %¥

(d) ç'ui=ls i ×p (5) v fuok li26 ç'ul% Hio"; fUA r=k çHeç'us 34/d pr 4/; xri HBÔðeel (JR p folj% (4) fod ¥ j fgr k% (v fuok, ki)6 l £(lir ki)j ç'ul% l k\relè; es l ek/ krq çnkl; U£ v  $\downarrow$ s ç'ul% (2° k\u00e) k\u00e) h & r`h & pr 4/234/d & E-1/4//Hio"; fUA

([) Ol; Hed c' usiq50% v alkar by ipulied c' usiqp 100% v alkaosi Yi d % Hos A

(x) çFle% ç'u% | blÑrelè; esu ,o | ek/ ş% v Ü/Flk | oblk v Äightu% Hlo"; frA v Ü;s ç'ub% | blÑr @guh@uÄXkiHibile); ekulad sili ,d sı elè; esu | ek/ krafib) UbA

### ç'ui #fueliZlfof/%

- 1- itui=L; fuektka l & Ñrek/; eu HkorA
- 2- it ui=s i xp (5) ∨fuok; k‰ it uk‰ Hkfo"; fUrA
- 3- iłukuke~ **v dłała**p foHkktue~ v/kk§yf[kr: isk Hkfo"; frµ

- I. çfle%ç'u%µ v; a(çfle% ç'u%3Vd pr 4/; xri HBÔðeelfJ R. HosA v fLeu~ç'usp Rolj%
   (4) fod Vijfgr K% (v fuok lij6 lif(iltrikijç'uk% laÑreke eu liek/kreçnil; UfA(4x4=16v Äl%)
- II. f}rh; % i*t* u% ¼iFke?kVdkfJr% $\mu$ ; FkkfufnžVa xbFke~ vkfJR; , da fucU/ka fyf[krq fucU/k}; a inkL; rA (16 vadk%)
- III. r`rh; % iÜu% ¼f}rh; ?kVdkfJr%4u li½ **a** if³**ä**}; a 0; k[; krq ; FkkfufnŽVxUFkkr~ if³**ä**=; a inkL; rA %2x8=16∨10K%2
- IV. pr[k% i Üu% ¼r`rh; ?kVdkfJr%4µ ; FkkfufnZVa xbFke~ vkfJR; , da fucU/ka fyf[krq fucU/k}; a inkL; rA
- V.  $i \times pe\%$  i Uu%  $4prik/2kV dkf Jr\%\mu$  Iil **a**  $if^{3}\ddot{a}$ ; a  $0; k[; krq; Fkkfufn/2V xUFkkr~ if^{3}\ddot{a}=; a$ inkL; rA  $42x8=16 \vee tdk\%$

∨u¢ k£l rxtJFkk%

- 1- Şaţtrimśattattvasangraha, Eng. Tr. & Notes, D.B. Sensharma, Kurukshetra.
- 2- dk'ehj 'kôn'kù] cyftlukFk if.MrA
- 3- Kashmir Shaivism, The Secret Supreme, Swami Lakshmanjoo, Ishwar Ashram Trust, Srinagar.
- 4- Jh∨jfollnknifu"kn} Jh∨jfolln ∨kJe] if.Mp§hA
- 5- Life Divine, Sri Aurobindo Ashram, Pondicherry.
- 6- Synthesis of Yoga, Sri Aurobindo Ashram, Pondicherry.
- 7- Savitri, Sri Aurobindo Ashram, Pondicherry.

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### COURSE CODE : SKT- SC-405-C foalei =le~%rik Hild fi 1%Hill%a/ k fud foKluck

Paper- XX : Darshanikasiddhantah Adhunikavijnanancha

L	Credits
4	4

i viijä ik/₆₈₀

**v kiji d ett käükät%**20

le; %3 gljsk% (3 Hours)

skt-sc-405-c-1 loškka i kphuHkkjrh; n' kukuka i e(kfl) kUrk% ryukRedk/; ; ukFk± lek; kftrk% A

skt-sc-405-c-2 Hkkjrh; nk' kłudl ink; kuka ie(kfl) kUrkuka Kkue~ ikl; rA

SKT-SC-405-C-3 Hkkjrh; n'kuL; dškkapr~ fo"k; k.kka vk/kaudfoKkuu Ig I $\epsilon$ U/k% I k/kE; ± ok

ijh{;rs A

SKT-SC-405-C-4 I f"V&i ; kbj.k&' kjhj&; KkfnfoKkukuke~ Hkkjrh; n' kukyksds  $\vee$ /; ; ua fØ; rs A

(w.e.f. Session 2021-2022)

?kVde&1%	nk'kłudlEink;kuka iæ([kfl)kUrk%%ykschk;re}t&a)ck)}lk{[;};;kxÜpA	16 V <b>CR</b> %
?kVde&2%	nk'ktudlEink; kuka iæ([kfl ) kUrk% &	
	o\$k\$"kd≱ U;k;%] indēhekalk] ∨}\$ronkUr% ∨}\$r'k6okxeÜpA	16 V <b>ak</b> ⁄o
?kVde&3%	Hkkjrh; n' kušką ∨k/kų̃udfoKkurÙokfu &	
	i;kbj.kfoKkue} ∨k\$k/kfoKkue} 'kjhjfoKkue} f=xqkf=nk\$kfI)kUr%j	
	I f"VfoKkue} eukfoKkueA	16 V <b>a%</b>
?kVde&4%	Hkkjrh; n' kušką ∨k/kų̃udfoKkurÙokfu &	
	ijek.kqkn%j 'kCnk&ifÙkfoKkue} Hkk&rdfoKkue} Iki{krkfI)kUr%j	
	; KfoKkue} fnDdkykdk' kfopkj%	16 V <b>a%</b>

### fMi . ; %¥

# (x)çFle%ç'u% | blÑrelè;eou ,o | ek/ş%v U/Flk | oblk v Äöghu% Hlo";frAv U/sç'ul% | blÑr @gulh@lÄXilHibllelè;elulad sali ,dou elè;eou | ek/kref bD) U/sA c'ui =lfueli21/fof/%

- 1- itui=L; fuekZkalłNrek/; eu HkorA
- 2- it ui =s i ★p (5) ∨fuok; K‰ it uk% Hkfo"; fUrA
- 3- it ukuke~ v ddalap foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I.  $cfle%c'u%\mu v; a(cfle%c'u%3Wd pr $\u03e4, xri HBÔðeekl J R. HosA v fLeu~c'usp Rolj%$  $(4) fod Vijfgr k%(v fuok 1% I f(11r kijc'uk%l k\u03e4relè, eu I ek/kr qcril; Wfa(4x4=16v \u03e4k%$
  - II. f}rh; % i*t* u% ¼iFke?kVdkfJr‰µ; FkkfufnžVa fo"k; e~ vkfJR; , da fucU/ka fyf[krq fucU/k}; a inkL; rA (16 vdk‰
  - III. rrh; % illu% krh; ?kVdkfJr% $\mu$ ; FkkfufnŽVa fo"k; e~ vkfJR; , da fucU/ka fyf[krq fucU/k}; a inkL; rA (16 vadk%)
  - IV. pr[k% illu% %rrh; ?kVdkfJr%4µ; FkkfufnZVa fo"k; e~ vkfJR; , da fucU/ka fyf[krq fucU/k}; a inkL; rf. (16 vfdk%)
  - V.  $i \times pe\%$   $i Uu\% \propkov klJr\%\mu$ ; FkkfufnZVa fo"k;  $e \sim \sqrt{kJR}$ ; , da fucU/ka fyf[krq fucU/k}; a inkL; rA (16  $\sqrt{kU}\%$ )

vu¢ kal rxtJFkk%

- 1- Hkkjrh; n'ku dk rkfùod lo{(k.k] Mkti pUnzkj 'keki] ekrhyky cukjlhnkl] fnYyhA
- 2- History of Indian Philosophy, S.N. Dasgupta

#### SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

- 3- History of Indian Philosophy, S. Radhakirshnan, Vol. I, II.
- 4- Essentials of Indian Philosophy, M. Hirianna.
- 5- rllo&ehekal k dh : ij{[kk] vfu#) >k] fnYyhA
- 6- Hkkjrh; n'ku dh eq[; IeL;k,] egsk Hkkjrh;] xkft;kcknA
- 7- on ∨kg mldh oKkfudrk] fiz or on okpLifr] x∉day dkxMn+ fo'ofo|ky;] gfj}kjA
- 8- ; K&foKku] jkeidk'kA
- 9- on&foKku&ohfpdk] n;kuln Hkkxb] ukx izdk'ku] fnYyhA
- 10-Hkkjrh; n'ků ½r'ùo vký Kkuehekálk dsektyd lEikt;;½ t;no onskytdkj] ekrhyky cukjlhnkl] fnYyhA
- 11- An Introduction to 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- Śrījñānāmṛtam, Ed. Vijaya Rani, Primal Prakashan, Delhi.
- 20- Vijñānasārathī, Ed. Vijaya Rani, Parimal Pub., Delhi.
- 21- Māyā in Physics, N.C. Panda.
- 22- Buddhism and Science, Buddhadass, 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.

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# COURSE CODE : SKT- SC-406-C <u>VIVA-VOCE</u> (el§ kl hi j k(k)

#### i viii R/(Maximum Marks): 50

Credits: 2

# fMi.h%,eññ (l HÑre)-&pre#Z=11; i BBÔðel e Hr‰vubbjarrh,pre#Z=1,11%v/ha i BDÔðee-vi£JR: Nodk hal HÑrelè;eu e HŞkihijk(hkvk,hsf;",r\$A

**Note:-** Viva-Voce of the students, based on the syllabus covered in their  $3^{rd}$  and  $4^{th}$  Semester courses, will be conducted through Sanskrit medium after the completion of the syllabus of M.A. Sanskrit, Fourth Semester.



# COURSE CODE : SKT- SC-402-D

Paper- XVII : Natyashastram

L	Credits
4	4

i villä 18/080 v livlij di elli/ käüllä 18/020 li e; %3 glijil% (3 Hours)

co. 402-D-I: vfLeu~ ?kVds Nk=k% ikfjHkkf"kdukV; 'kCnkoyheFk p

fl n/kkUrkufHktkufUr A fl n/kkUrl Ecn/kka 0; k[; ka l ef/kxPNfUr A

Co. 402-D-II: V= fVIi.; kRedku~ it uku~ l & Nrek/; esikoxPNfUr A

Co. 402-D-III : VfLeu~ ?kVds dkfjdk.kka 0; k[; ka i i ukuka | k/ku×p tkufUrA

Co. 402-D-IV:  $V = ukV_{\dot{7}}'kkL=L$ ; fu/kktjrkukekpk; kt/kka ; kxnkusu Nk=k% l i fjfprk%

## Hkoflr A

 ?kVde&1%
 /ku×t;%] n'k: ide] iFke% idk'k% μ dkfjdk0;k[;k vFkok
 16 vd%

 vkykpukRed% itu%A
 16 vd%

 ?kVde&2%
 n'k: ide] r`h;% idk'k% μ l&Ñrek/;eu fVli.;kRed% itu%A
 16 vd%

 ?kVde&3%
 n'k: ide] prik% idk'k% μ dkfjdk0;k[;k vFkok vkykpukRed% itu%A
 16 vd%

 ?kVde&3%
 n'k: ide] prik% idk'k% μ dkfjdk0;k[;k vFkok vkykpukRed% itu%A
 16 vd%

 ?kVde&4%
 ukVÔkL=L; bfrgkl% μ Hkjr%] jkepUnxqkpUnk\$ IkxjuUnh] /ku×t;%]
 16 vd%

 fo'oukFk%] f'kxHkiky%] : ixk&okeh] 'kkjnkru;%A
 16 vd%

fMi . ; %¥

(d) ç'ui = s i × p (5) v fuok HZ ç'ul% Hio"; fUA r=k çHeç'us 34/d p r 4/; xr i HBÔ 20 ee kU R p Rolj % (4) fod Yijfgr k% (v fuok; kHz I & (kr kkij ç'ul% çnkl; USA v Us ç'ul% Øe' k4 Heal} r h, ar r h, ap r hHZ AU al K2: / R/Hio"; fUA

# ([) Ģl(; Hed ç'ullq50% v latvar by bpulled ç'ullqp 100% v latva 65 (Yid % Hos A (x) f)r h; 3 ktill Jr % r r h; % ç'u% Ja Ñrelè; esi, o i ek/ş % v U Hikiollak v Äğilu% Hio'; fr A v U s ç'ul% Ja Ñr @ Juh@ Kä XiHikilelè; ekuled ulli, d si elè; esi i ek/k q'iD, UA c'ui = ifuelizitof/%

1- itui=L; fuekZkal&Nrek/; eu HkorA

2- iźui=s i → (5) ∨fuok; k‰ iźuk% Hkfo"; fUrA

3- itukuke~ **v didle**p foHkktue~ v/kkfyf[kr: isk Hkfo"; frµ

- II. f}rh;% it u% ¼iFke?kVdkfJr%4µ, dka dkfjdka 0;k[;krq;FkkfufnžVxt/Fkkr~dkfjdk};e~vFkok dkfjdk};a 0;k[;krq dkfjdk=;e~vFkok, da it ua lek/kkrę~vkykpukReda it u};e~vFkok , dk dkfjdk vFkok vkykpukRed% it u% inkL;rA ¼16vtdk%2
- III. r`rh; %illu%M rh; ?kVdkfJr%/µfVli.; kRedaitu}; al L Ñ rek/; eulek/kkrq; FkkfufnŽVxbFkkr~ itu=; a inkL; rA $M_2x8=16\sqrt{a}$ dk%/2
- IV. prfk% iÜu% ¼rrh; ?kVdkfJr%µ , dka dkfjdka 0; k[; krq ; FkkfufnžVxbFkkr~ dkfjdk}; e~ vFkok , da izua lek/kkrq- vkykpukReda izu}; e~ vFkok , dk dkfjdk vFkok vkykpukRed% izu% inkL; rfk %

∨uq kfl rxtJFkk%

- 1- n'k:id] /ku×t;] IEikñ MkWi JhfuokI 'kkL=h] IkfgR; Hk.Mkj] ejBA
- 2- n'k: id] | Eikñ Hkksyk'koogi 0; kl] pk{[kEck idk'ku] okjk.klhA
- 3- n'k: id] | Eikñ Jhpj.krhFkZ egkjkt] pk{[kEck idk'ku] okjk.klhA
- 4- IŁÑr dk0; 'kkL= dk bfrgkI] MkWi , Iñ dã M} fcgkj fgUnh xWFk ∨dkneh] iVukA
- 5- I & Ñr dk0; 'kkL= dk bfrgkI] i hñ ohñ dk.k§ ekrhyky cukj I hnkI] fnYyhA
- 6- I & Ñr ukVÔI) kUr] jekdkUr f=i kBh] pk{[kEck fo|kHkou] okjk.kI hA
- 7- ∨yœgi'kkL= dk bfrgkl] Ñ".kdækj] I kfgR; Hk.Mkj] I klkk"k cktkj] ejBA
- 8- I L Ñr Mitek], ñ chñ dhFkA
- 9- D.R. Mankad, Types of Sanskrit Dramas.
- 10- C.V. Vaidya, History of Sanskrit Literature, Parimal Publications, Delhi.

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COURSE CODE : SKT- SC-403-D V "Vint" kai te ~%d k@' kilte ~(2)

Paper- XVIII : Kavyashastram (2)

10(251)

(w.e.f. Session 2021-2022)

4 4

i vHÄR%80 v Hufj d eM HÄüHÄR%20 I e; %3 gljsk% (3 Hours)

Co. 403-D-I: VfLeu~ ?kVds Nk=k% dk0; nksk% IE; Difjfprk% HkofUr rRIEc) ka

dkfjdk0; k[; ka i z ul k/ku×p tkufUr A

Co. 403-D-II: VILeu~ ?kVds Nk=k% xqkkuka of k"V; a izul k/ku×p IE; xoxPNfUr A

Co. 403-D-III: ?kVds fLeu~ fu/kkfjrkukey³dkjk.kka y{k.kkskgj.kLi "Vhdj.k& : i%

ifjfprk% HkofUr A

Co. 403-D-IV: V = /OU; kykclL; ykpul fgrka 0; k[; ka Nk=k% | ef/kxPNfUr A /Ou%

[k.Mu&e.MuijEijkefi tkufUr A

?kVde&1%	eEeV%] dk0; i.dk'k%] IIre% mYykI% ¼innk\$kk%] vFkħk\$kk%] jInk\$kk'p½µ	
	dkfjdk0; k[; k=1\$ kfUrd% i t u% okA	16 <b>Va%</b>
?kVde&2%	dk0; i dk' k%j ∨"Ve% mYykI% µdkfjdk0; k[; k_l\$ kfUrd% i žu% okA	16 <b>Va%</b>
?kVde&3%	dk0; izdk'k%] uoe&n'kek\$ mYykIk\$ µdɒya fuEufyf[krk% vy <b>æ</b> jk%	
	laLÑrek/;eu o.kūh;k%μ	16 <b>Va%</b>
	vuqikl%];ede}'y\$k%] oØk\$Dr%] miek]:ide} mRix{kk] leklk\$Dr%]	
	∨iÐq́r%] n"VkUr%] ∨fr'k;k\$Dr%] fun'kūk] ∨FkkØrjU;kI%] foHkkouk]	
	fo'k\$kkfDr%j 0;frjsd%j nhide} dk0;fy ⁻ e} ladj%j la!f"V%A	
?kVde&4%	√kuUno/kūv∦ /oU;kyksd% ¼ykspulfgr%2] iFke% mn√ksr%A	16 <b>Va?⁄</b> 6

fMi . ; %%

(d) ç'ui = s i > p (5) v fuok, HZoç'uk% Hio'', fulA r=k çHeç'us 34/d p r q/; xr i HBÔØeek(J R)

p Folj% (4) fod ¥jfgr K% (v fuok, KB% I£(Hr Kijç'uK% çnH; UA% v Us ç'uK% Øe' K¢Fle&f}r h, &rih, &pr HZZA/1&IE:%K%Hio"; fUA

(x) rìh, 34.d lí Jr% proježç'u% la bÑrelè; esu ,ol ek/ ş%/ ÿHklonzkv Äğıbu% Hio"; frAv ÿs ç'ul% la Ñroguh@ ÄXHHkilelè; ekuled sili ,d su elè; esu l ek/ krej HD, WA.
#### SYLLABUS

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

### ç'ui #fuekZkfof/%

- 1- itui=L; fuektka l & Ñrek/; eu HkorA
- 2- it ui =s i >p (5) ∨fuok; K‰ it uk‰ Hkfo"; fUrA
- 3- it ukuke~ v ddalap foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I. **çHe%ç' u%µ v; a(çHe% ç' u%3**\/d pr **µ/; xr i HBÔðeek/J Ŗ Hos**A v fLeu~ç' usp **iðlj %** (4) fod Y j fgr **k% (v fuok lijs i f f i l'i lij; c' uk% cnil; UfA**  $(4x4=16v \ddot{A}R)$
  - II. f}rh; % itu% ¼iFke?kVdkfJr‰µ dk0; 'kkL=h; fl )kUrfoopuinode~, dka dkfjdka 0; k[; krq ; FkkfufnžVxbFkkr~ dkfjdk}; e~ vÉok , da itua lek/kkrq itu}; a inkL; rA ¼16vndk‰
  - III. r`rh; % iÜu% ¼f}rh; ?kVdkfJr‰µ dk0; 'kkL=h; fl) kUrfoopuivo2de~, dka dkfjdka 0; k[; krq ; FkkfufnŽVxUFkkr~ dkfjdk}; e~ vÉok, da izua lek/kkrq izu}; a inkL; rA %16vtdk‰
  - IV. pr{k% i u% %/rrh; ?kVdkfJr%/µ l knkgj.ke~ vy@ejpr{V; a l LNrek/; eu Li"Vhdr ; FkkfufnZVxUFkkr~ "kM~ vy@ejk% i nkL; UrA %/4x4=16vdk%/2
  - v. i×pe% il/u% %pr@k/2kVdkfJr%/µ dk0; 'kkL=h; fl)kUrfoopuino/da dkfjdk}; a 0; k[; krq ; FkkfufnZVxUFkkr~ dkfjdk=; e~ vÉok , da lekykpukReda izua lek/kkrq izu}; a inkL; rA %16vndk%/

∨u¢ kfl rxtJFkk%

- 1- dk0; idk'k] VhdkE okeu >ydhdj] Hkk.Mkjdj vk\$j; .Vy fjlpZ bULVhV; W] iwkA
- 2- dk0; idk'k] 0; k[; kE vkpk; 2 fo'osoj] Kkue.My fyfefVM] okjk.kl hA
- 3- dk0; izdk'k] | Eikñ Jhfuokl 'kkL=h] | kfgR; Hk.Mkj] ejBA
- 4- /oll; kykod ¼ykopulfgr½] 0; k[; k0E jkelkxj f=ikBh] fnYyhA
- 5- /oU; kykd ¼ykpulfgr½] 0; k[; kŒ ∨kpk; Z txUukFk ikBd] pk⊈kEck fo|kHkou] okjk.klhA
- 6- /oll; kyksd] 0; k[; kŒ ∨kpk; 2 fo'os'ojA
- 7- ∨kulno/kūj jokijikn f}onhj e/; inšk ∨dknehj HkkikyA
- 8- V. Raghavan, Some Concepts of Alamkāraśāstra.
- 9- P.C. Lahiri, Concepts of Rīti and Guņa.
- 10- V. Raghavan, The Number of Rasas.
- 11- S.K. De, Sanskrit Poetics.

 $\star\star\star$ 

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

#### COURSE CODE : SKT- SC-404-D , d lafoéei =le~%p li ul@ad l@kt lip

Paper- XIX : Champukavyam Kavyadarshashcha

L	Credits
4	4

i **vHÄR%**80 **v HJjde¥/HÄüHÄR%**20 **le;%3 glji%**(3 Hours)

Co. 404-D-I: ?kVds fLeu~ pEivdk0; L; ifjp; ivo2da 0; QifÙkijka xbFkIEC) ka

'ykcd0;k[;ka Nk=k% lef/kxPNfUr A

Co. 404-D-II: V = pEindk0; s xn; ka kkuka 0; k[; ka fon; kfFku%  $VFkh\Theta$ ; su IE; xoPNfUr

A

Co. 404-D-III: V = uypEindk0; L; iFkekPNoklekykpukRedRos fon; kfFkU%

foKkrkj% HkofUr A

Co. 404-D-IV: ?Wds fLeu~ Nk=k% nf. Mu% dk0; kn'kš lekxr% dk0; &xn; &

 $dFkk\&vk[;kf;dky{k.k% | E;Difjfprk% tk;Urs A$ 

?kVde&1%f=foØeHkê%uypEi%iFke% mPNøk1%  $\mu$ 16 vol%?kVde&2%uypEi%iFke% mPNøk1%  $\mu$ dk0; I kSBofunik kinolda I i i av (0; k[; kA)16 vol%?kVde&3%uypEi%iFke% mPNøk1%  $\mu$ vkykpukRedk% i i uk%A16 vol%?kVde&4%n.Mhdk0; kn'k%iFke% i fjPNn%%dk0; xqkku~ R; DRok%  $\mu$ 16 vol%?kVde&4%n.Mhdk0; kn'k%iFke% i fjPNn%%dk0; xqkku~ R; DRok%  $\mu$ 16 vol%

f**vii . ; %**#

(d) ç'ui=ls i ×p (5) v fuok, liZaç'ul% Hio'', fUA r=k çHeç'us 34/d prQ/; xri HBÖØeelkU R p Polj% (4) fod Yijfgrl% (v fuok, liBa I £(Hrkùjç'ul% çnH; U£A v U;s ç'ul% Øe' RQHe81)rh, &rih, &prijiZ34/d & E:1/4%/Hio'', fUA

([) Olf; Hed ç' usiq50% v al%a ly ipulied ç' usiqp 100% v al%a6fYi d %HosA

(x) pr#/**34/1 KJ r %i >pe%ç' u%i kÑ r elè; esi , o i ek/ ş%/ (;i Fik i olik v Äigitu%Hio"; fr A v (;i s ç' ul%i kÑ r @juh@kÄX/Hikilelè; ekulad sili , d si elè; esi i ek/ k q' iD) U%i** 

### ç'ui #fuekZkfof/%

- 1- itui=L; fuektka l & Ñrek/; eu HkorA
- 2- it ui =s i xp (5) ∨fuok; k‰ it uk‰ Hkfo"; fUrA
- 3- iłukuke~ **v dłuła**p foHkktue~ v/kksyf[kr: isk Hkfo"; frµ
  - I.c is the set of the set o
  - II. f}rh; % i*t* u% ¼iFke?kVdkfJr% $_{\mu}$  dk0; lkSBofunitki no2da li*t* a 'ykd}; a 0; k[; krq ; FkkfufnžVxtlFkkr~ 'ykd=; a inkL; rk $_{\mu}$
  - III. r`rh; % i*t* u% ¼f}rh; ?kVdkfJr%4µ dk0; lk\$Bofunð ki voða x | kå k}; a 0; k[; krq ; FkkfufnžVxt/Fkkr~ x | kå k=; a inkL; rá

  - v. i×pe% iłu% ¼prţk2kVdkfJr%4µ lił a dkfjdk}; a lłÑrek/; eu 0; k[; krq ; FkkfufnžVxbFkkr~ dkfjdk=; a inkL; r\$

∨Fkok

; FkkfufnZVxUFkIEc) e~ vkykpukRede~, da it ua lek/kkrą itu}; a inkL; r& %16vadk%/2 vu( kfl rxUFkk%

- 1- uypEi∳ lEikñ jkeukFk onkyndkj] lkfgR; Hk.Mkj] l∲kÔ cktkj] ejBA
- 2- uypEi) p.Miky&Ñr la.Ñr0;k[;k ,oa fgUnh :ikUrjdkj MkW dSyklifr f=ikBh] pk{kEck la.Ñr lhjht ∨kWQl] okjk.klhA
- 3- uypEi) IEikñ iješojnhu ik.Ms] okjk.klhA

TY SYLLABUS M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

4- dk0; kn'k] |Eikñ /keBnukFk xψr] fnYyhA
5- dk0; kn'k] |Eikñ JhdkUr ik.Ms] |kfgR; Hk.Mkj] |ϕkÔ cktkj] eġBA
6- dk0; kn'k] f'koukjk; .k 'kkL=h }kjk jfpr ił kfnuh fgUnh0; k[; kl fgr] ifjey idk'ku] fnYyhA
★★★

#### COURSE CODE : SKT- SC-405-D foldei : te ~% / fud d l@axlfr d l@ap

Paper- XX : Adhunikakavyam Gitikavyam Cha

L	Credits
4	4

**i viiä 10%**80 **v Hofj d eV/ HÄüHÄ10%**20 **I e; %3 gljil%** (3 Hours)

Co. 405-D-I: ?kVds fLeu~ Nk=k% ukVds 0; &i fÜki jka 0; k[; ka | ef/kxPNfUrA

Co. 405-D-II: V= ukVds lekxrkuka liDrhuka lkn/kj.kka 0; k[; ka tkufUrA

Co. 405-D-III: VfLeu~ ?kVds Nk=k% ukVdI Ecn/kku~ vkykpukRedku~ i1 uku~

IE; xfHktkufUr A

Co. 405-D-IV:  $\nabla$ fLeu~ ?kVds Nk=k% e?kn**w** kfHk/kL; [k.Mdk0; L; l **k** $\tilde{N}$ r& 0; k[;; k mnc**n**/kk% tk; Urs A

?kVde&1% cyHkniil knxkLokeh] d.kkTHktkR; e~ukVde~ $\mu$  liil a'ykd0; k[; kA16 volk%?kVde&2% d.kkTHktkR; e~ukVde~ $\mu$  liil al fDr0; k[; kA16 volk%?kVde&3% d.kkTHktkR; e~ukVde~ $\mu$  vkykpukRed% it u%A16 volk%?kVde&4% dkfynkl%] e?knre} mikje?k%  $\mu$  'ykdk% 28&55 %l LNrek/; eu%A16 volk%

fMi.;%¥

(d)  $c^{\mu}$ ui = ks i × p (5) v fuok HZ  $c^{\mu}$ ul% HIo"; fUA r=k  $c^{\mu}$  Flec'us 34/d pr 4/f; xri HBÔðeel (J R p Rolj % (4) fod ¥i j fgr 1% (v fuok; HZ I te(Hr kij;  $c^{\mu}$ ul%  $c^{\mu}$ , V Us  $c^{\mu}$ ul% Øe' Ráfie 81) r h, 8 pr HZ AU 81 E: 1/2% HIo"; fUA

([) Olf; Hed ç' usiq50% v al%a ly ipulied ç' usiqp 100% v al%aOSfYi d %HosA

(x) pr@**XAULUr%i >pe%ç' u%i L**Ñrelè; eta , o i ek ş%v UFiki olik v Äğilu%Hio"; frAv Us ç' ul%i LÑr@JUH@lÄXHikilelè; etaled ulfi , d ta elè; eta i ek k of ID UA

#### ç'ui #fuekZkfof/%

1- itui=L; fuektka l & Nrek/; eu HkorA

2- it ui =s i →p (5) ∨fuok; k‰ it uk% Hkfo"; fUrA

- 3- i*t* ukuke~ **v dlala**p foHkktue~ v/kk§yf[kr: isk Hkfo"; frµ
  - I. **çfle%ç' u%µ v; a(çfle% ç' u%3Vd pr ¢/; xr i HBÔðeelf.) R. HosA v fLeu~ç' usp Rij%** (4) fod V j fgr k% (v fuok lijs i tálir kijç' uk%çnil; USA  $(4x4=16v \ddot{A}k\%)$
  - II. frh; % it u% ¼i Fke?kVdkfJr‰µ dk0; l kSBofunk ki kota lita 'ykd}; a 0; k[; krq ; FkkfufnžVxbFkkr~ 'ykd=; a inkL; rk %2X8=16∨xdk‰
  - III. rrh; % it u% ¼f}rh; ?kVdkfJr%/µ lit a lítDr}; a 0; k[; krq ; FkkfufnžVxbFkkr~ lítDr=; a

     inkL; rfA

     ½2X8=16∨tdk%/2
  - IV. pr[k% it u% %rrh; ?kVdkfJr%4µ; FkkfufnžVukVda ukVddkja p vkfJR; ; FkpNe~, da it ua lek/kkrę~vkykpukReda it u}; a inkL; rA %16vtdk%/2
  - V.  $i \times pe\%$  i t u% %  $prfk2kVdkfJr% u dk0; IkSBofunkki to 2da IikI a 'ykd}; a IkE <math>\tilde{r}ek/; eu$ 0; k[; krq; Fkkfufn2VxbFkkr~ 'ykd=; a inkL; rk % 2X8=16vtdk%

∨u¢ kfl rxIJFkk%

- 1- d.kktHktkr; e~ukVd] cyHkniilkn xktokeh] okKnork idk'ku] cjyhA
- 2- e§knur] dkfynkl] l×thouh] pfj=of/kuh] Hkkockú/kuh rFkk fo|kúruh Vhdklfgr] pk{[kEck l½Ñr l½Fkku] okjk.klhA
- 3- e9kmur] I Ei kñ , eñ ∨kjñ clky} ekurhyky cukj I hnkl] fnYyhA
- 4- es?knur] lathouh Vholklfgr] fu.k?, lkxj isl] etijcbA
- 5- eŷknwr ¼mùkjeŷk½] ^lathouh* Vhdklfgr] ^foe'kž lfgr fgUnh 0;k[;kdkjµ MkWi jktśoj çlkn feJ] ∨{k;oV çdk'ku] bykgkckn ¼mñçñ¼A

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

#### **፟፟** 🕁 🕁

### COURSE CODE : SKT- SC-406-D <u>VIVA-VOCE</u> (eliş ki hi ji (ii)

i viii Maximum Marks): 50

Credits: 2

# fMi.kh%,eññ (lktÑre)-&prepz=lt; i BBÔðel ektr%/vukujarìh,prepz=k,k%/v/kra i BBÔðee-vkUR; Nock kalktÑrekè; en,ektifkkvk,ksf;";r&

**Note:-** Viva-Voce of the students, based on the syllabus covered in their  $3^{rd}$  and  $4^{th}$  Semester courses, will be conducted through Sanskrit medium after the completion of the syllabus of M.A. Sanskrit, Fourth Semester.

s in

10(258)

M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System) (w.e.f. Session 2021-2022)

**Option** (V)

### ox**2**/Ä* / e**ZLii**ke%

Group-E (Dharmatantrāgamah)

COURSE CODE : SKT- SC-402-E

Paper-XVII : Śaivāgamah

L	Credits	
4	4	

i v**HÄR%**80 v HJfjdeH/HÄülÄR%20

le; %3 gisk (3 Hours)

skt-sc-402-e-1 dkg.MU; ÑrHk"; kyksdsu ik'kqirl⊯k.kke~∨k|% ∨/; k; }; L; ∨/;; ua 'koon'kuL;

ikphureijajke~;kxfof/kapin'k2,frA

skt-sc-402-e-2 ik'kirl#L; rrh;r% i×pek/;k;i;Dra v/;;ua ik'kir&/keL;] drD;kdrD;;k%

fl); kfxu%] dbY; L; ] Hkxor% uke/ks kuke~ bR; knhuka Kkua nnkfrA

skt-sc-402-E-3 ol k (rfojfpr&f'kol ⊯s i Fke&f}rh; & ∨/; k; ; k% f'ko&'kDR; k% Lo: i )

'kkEHko&'kkäkik;kuka pifriknue~∨fLr A

skt-sc-402-e-4 ol kterfojfpr&f'kol #s rrh; k/; k; s vk.kokik; kuka dbY; L; p o.kue~ vfLr

;L; ∨/;;uu ikphu'kôjijEijk;k% Kkua ikl;rA

<b>31/d e8û%i k lişt i de~(1)</b> ]v è k <b>iSiµ2 (d iSNi;i Ñr Hik; iy id s)</b> A	16 VÄK%
<b>31/d e&amp;ü%i k lişr i de~(2)</b> ]vè; k <b>k%3µ5 (d li\$Ni;i îr Hit; iy id s)</b> A	16 VÄK%
<b>34.kl e&amp;ý% lol ule~(1)] ' liffib' liD lisk; l\$({lsj lt Ñr Ģl[; ; ly ld u) A</b>	16 VÄK%
<b>3Vd e&amp;p% loi ule~(2)] v k lolisk %(1 &amp;Ñr el</b> è; e <b>si) A</b>	16 VÄK%

fMi . ; %¥

10(259)

(d) ç'ui=ls i ×p (5) v fuok, HZ ç'uk% Hio"; ful A r=k çHeç'us 34 kd p r 64/; xr i HBÔ Øeek(J R p Folj% (4) fod Yijfgr 1% (v fuok, HZ lik), l £(Hr kkijç'ul% çnH; U£A v Us ç'ul% Øe' 1% çHe&f}r h, & pr f#Z34 kd I E: /4% Hio"; ful A

(x) profilikuli KUr%i »pe%ç'u%i ktÑrelè;esu,olek/ş%v/Çifiklokki v Äögbu%Hio";frAv Çis ç'uk%i ktÑr@guh@kä Xihikilelè;ekukadishi ,dsu elè;esu lek/krafik). USA

### ç'ui #fueliZifof/%

#### 1. ç'ui **=11; fuelžiai tiÑrelè; eu HosA**

2. ç'ui = s i > (5) v fuok iZç'uk/Hio", fUA

- 3. ç'ulule~v Älulep foHit ue~v / lisyf[ k: i sk Hio"; frµ
  - II.  $cfle%c'u%\mu v; a(cfle%c'u%3Vd pr \u03c4/; xr i HBÔðeek/J R HosA v fleu~c'usp Rolj%$  $(4) fod Y jfgr k%(v fuok lijs l t(ilr kijc'u%cril; U4) (4x4=16v \u03c4k%)$
  - III. f)rh%ç'u%(çHe3NdiLJr%μ; Hitufn2Ai BÔðee~vLJR, daç'ualekkqç'u); a çnil; rsλ (16v ÄK)
  - IV. rì h % ç' u% (f) r h 3 kli kJ r % μ ; Hitufri Al IBÔðee~ v kJ R i HBkal}; a l çi Äã Ģi k; k q i HBkald; açri k; r A (2x8/46v ÄK).
  - IV. pr #Zç'u%(rrh, 3\ll IJr%μ; Hium2/IBÔðee~vIJR fucUkledaç'u}; a lekkq ç'uprü/aç(; rA (2x8%/6vÄK)).
  - V. i ×pe%çⁱ u%(pr##Mtl EJr%μ; Hitufn21 BÖØee~v EJR; i HBla}; al tÑrelè; et l çi Äã QE; kej HBlakk; açnil; r\$
     (2×8%/6v ÄR);

#### vubjeirx**sse**%

- 1. i klipri de)- Jidi ISM;Hit; i fgre)- fgluin v uq̃ v ipķ Zp,Qi lǐ. k f=losi) ' ISHijrh' lisçfr"Elue)- oljik it lj 2009.
- 2. x. klijdi; Hit oliç. kri; jiki/ki it fgri; i Elő i ki/lő nyiy], fi ki/ki i is b/l; eliçibi.
- 3. Śiva Sūtras, The Yoga of Supreme Identity, with Kṣemarāja's *Vimarśini,* Tr. & Notes by Jaidev Singh, Motilal Banarsidass, Delhi, 2000.
- 4. Śiva Sūtras, The Supreme Awakening, with the Comm. of Ksemarāja, Revealed by Swami Lakshmanjoo, Munshiram Manoharlal, Delhi, 2007.
- 5. dikelji 'lõn'ilij cyft lulifki f. Ni] jil'V; i läÑr i lifliu i fji j] t lejv2005.
- 6. dkelj floß; ola dheyv v o/ j. k] uot lou jlrhdj ethlijle eulgiyly] m\yli 2002.
- 7. Kashmir Shaivism The Secret Supreme, Swami Lakshmanjoo, Ishwar Ashram Trust, Srinagar, 2003.
- 8. Introduction to Kashmir Shaivism, Swami Tejomayananda, Gurudeva Siddha Peeth, Ganeshpuri, 1975.

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10(260)

#### COURSE CODE : SKT- SC-403-E V "Vint lei de~%r Lieli ut HLie~

Paper-XVIII : Tantra-spandaśāstram

L	Credits
4	4

i **vHÄR%**80 **v HJfjdeH/HÄüHÄR%**20 **I e; %3 gljik%** (3 Hours)

SKT-SC-403-E-1 foKkuHkgorU=L; V/;;usu ;kxL; /kkj.kkuka Lo: ia Kk;rs A

skt-sc-403-e-2 foKkuHkjorU=L; if³ä0; k[;k fo"k;L; l k[e&v/;;ukFk±ij;fr A

SKT-SC-403-E-3 LiUndkfjdk 'Kon'kul; rU=ijajk; k% eqùoiwk% xUFk% vfLr ; u LiUnL;

egkennk; k% p Kkua ikl; rs A

skt-sc-403-e-4 LiUndkfjdk; K% dkfjdk0; k[;k oLrfu"By{ku&dKskya o/k2 fr A

<b>31/d e&amp;û%fokkuHj\$br Lleµ 1µ50 / lj. 18%(   blÑr elè; es)</b> A	16 VÄK%
<b>3Vd e&amp;ü%foKluHj3r Lle</b> µ 51µ 112 / lj. <b>IRA</b>	16 VÄK%
<b>3Vd e 8ý%li Ud líj d líj çFlefu%j UPA</b>	16 VÄK%
<b>31/d e&amp;þ%li Uid líj d líj: () r h fu%j UPA</b>	16 VÄK%

fMi . ; %¥

(d) ç'ui = s i ×p (5) v fuok, HZ ç'uk% Hio'', ful A r=k çHeç'us 34 /d p r 4/; xri HBÔ Øeek/J R p Rolj% (4) fod ¥jfgr k% (v fuok, KK% I & (krikijç'uk% çnkl; UsA v ↓s ç'uk% Øe'k% çHe&f)r h, & pri HZ 34 /d I E: /4K/Hio'', ful A

([) Ol; Hed c' usq 50% v at% v ly lpulled c' usqp 100% v at%o6fY d %HosA

(x) çHe3AktikUr%f}rh,%ç'u%ibtÑrelè; esa, olek/ş%v/ÿHkloblikvÄbjöv/Hkov;frAv ÿs ç'uk%ibtÑr@guh@käXkhkblelè; ekuladishti, disielè; esalek/krafkD)U\$A M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

### ç'ui #fueliZifof/%

- 1. ç'ui **=1.; fuelžiai kivirelė; eu HosA**
- 2. ¢' ui = i > (5) v fuok i z v uk/Hio", fuA
- 3. ¢ ulule~v Älialep foHit ue~v / liyf[ k: i sk Hio"; frµ
  - I. **çHe%ç'u%\muv; a(çHe% ç'u%3Vd pr \mu/; xr i HBÔðeel/J R HosA v fLeu~ç'usp Rij%** (4) fod Y jfgr R% (v fuok His I ff.Hr Rit c'u%crll; USA (4x4=16v ÄR%
  - II. f)rh%ç'u%(çfle3Mt)fJr%μ; flifufn2/iBÔðee~v fJR, daç'ual hÑrelè; eu i ek k q ç'u); açnil; r 4. (16ν Äl%)
  - III. rì h % ç' u% (f) r h 3 kt l ½ r % μ ; Hituín 24 l BÔðee~ v ½ R i HBkak); a l çl Äã Ϙlξ; k q i HBkak, açnil; r A (2×8%46v ÄK).
  - IV. pr ##26 ç' u% (rì h) 34.d EJ r %μ; Hitufri 24 IBÔðee~ v EJ R
     fuc U Hed a ç' u); a l ek kr q

     ç' upr ψ/, aç{; r A
     (2×8%46v ÄR%)
  - V. i >pe% çⁱ u% (pr ##Atl EJr%µ; #EufrAl HBÔðee~ v EJR; i HEIkal}; a l çl Äã ĢE; k q
     i HEIkalk; açmil; r A
     (2×8%46v ÄB%)

#### vubjeirx**iiii**e%

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- 2. **foldulips)** Comm. by Swami Lakshmanjoo, Intro. & Part Trans. By Bettina Baumer, Indica Books, Varanasi, 2002.
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- 7. dkelj floi}; ola dheyv vo/j.lk] uot lou jlrish eqilije eulgiyly] fnVylj 2002.

* **

#### COURSE CODE : SKT- SC-404-E , d lafoalai =le~% l60Slor Lle~

Paper-XIX : Śaivavaisnavatantram

L	Credits
4	4

i v#####%80 v ##fjde#/#######%20 I e; %8 glj#%(3 Hours)

skt-sc-404-e-1 ekfyuhfot; kikjrU=a xUFk%  $\vee$ f'Kon'kUL; f=dijajk; k% ifjp; a nnkfr A

SKT-SC-404-E-2 y{ehrU=a ik×pjk=&oS.ko&l ink; L; xUFk%  $\vee$ fLr ;= nohy{E; k% mikluk fo | rA

skt-sc-404-e-3 rU=1 kj% Hkkjrh; rU=ijijk; k% 'kon'kuL; egùoiwk% xUFk% vfLr A

skt-sc-404-e-4 rU=1 kjL; 1 il xif³0; k[;k oLrfu"By§ku&dKskya o/k} fr A

<b>3Vd e&amp;û%elfyuliot ; kij</b> r <b>Lie]- 1µ2</b>	16 VÄK%
<b>3V:d e&amp;ü%y{eir Lie} 1µ2 (  JiÑr eiè; es)</b> A	16 VÄK%
<b>3 kd e&amp;ý‰r Lilt ij%(1)]1µ</b> 5 v líÉde~A	16 VÄK%
<b>3. kd e &amp; p%r Lit ij%(2)] 6µ 11 v litÉd e~A</b>	16 VÄK%
fNii.; %#	

(d) ç'ui=ls i ×p (ý) v fuok, HZ-ç'ul%-Hio'', fUAr=k çHeç'us 34/d prü/; xri HBÔØeeH/JR; p Fablj% (4) fod Yijfgrk% (v fuok, HJ)- I £(Hrkùj; ç'ul% çnH; UsA v Us ç'ul% Øe'k% çHe&1)rh, &rrh, &prijHZA/d I E://#%/Hio'', fUA

([) Of; Hed c'usiq 50% v al% v by ipulied c'usiqp 100% v al% o 8 f Y d % Hos A

(x) f)rh, 34.d KJr%r h, %ç'u%l klÑrelè; esu ,ol ek/ş%v ÜHkloklak v Äğıfu%Hio"; frAv Üşç'uk% I klÑr@juh@käXihikilelè; ekulad sifi ,dsu elè; esu i ek/krafib) UA

ç'ui #fuekZkfof/%

1. ç'ui **=11; fuelZiel ±Ñrelè; eu HosA** 

2. ç'ui =s i >p (5) v fuok lizç'ul%Hio"; fuA

- 3. **ç'ulule~v Älulap follit ue~v / liyf[ k: i sk Hio**", frµ
  - I.  $c_{R} = c_{R} 
  - II. j)rh,%ç'u%(çHe3Ad KJr%μ; Hitufn2/ IBÔðee~v KJR, daç'ual ek kqç'u); açnik; rA (16ν ÄK%
  - III. rìh% ç'u% (f)rh 3kti LJr%μ ; Hiluínž/ iBÔðee~ v LJR i Heikil; a i tiÑrelè; eu i çi Ää Qil; k qi Heikik; açnil; r A (2×8%46v Äič).
  - IV. pr#Zç'u%(rrh 3kd KJr%μ; Hitufn2/ IBÔðee~v KJR fuc V Hed aç'u); al ek k qç'uprψ/, a

     ç{; rfl

     (2×8%46v ÄK)
  - V. i ×pe%ç'u%(pr##Md KJr%μ ; Hitufn24 HBÔðee~v KJR i HBkd); al çi Äã Ģiţ; k qi HBkdk; a çnil; r A (2×8%46v ÄK)

### TY SYLLABUS M. A. Sanskrit, Semesters-III & IV (Choice Based Credit System)

(w.e.f. Session 2021-2022)

#### vubjelirx##%

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- 2. ruttij]vfHuoxohn Ñr]vuõjgebolailik peõor fiZolijk htsi biÑr i biHuojolijk httij 1986
- 3. rult [j] v fHuoxolq Ñr] I Előeñeñ eqilujile ' El-lip ok ila çolik kaj fmVy fj. 1982.
- 4. ruttij] Hacu 1] v fHuoxolri befojfor] Hbc;ñijegla feJ] pl[SkičkijHjurhçdikku] oljik bl [} 2008
- 5. ruttij Hacu 2] v fHuoxolq i befoj for ] Hat; ñi jegla fe J] poljski ckli ji Hijrhçdi kluji olijk bi fj. 2006
- 6 Studies on the Tantras, Ramkrishna Mission Institute of Culture, Calcutta, 1989.
- 7. iv#ZļçR;fHKQLjlesoj>Llvu~qdeysk>Llojk kl. [1984
- 8. v bacel foor ]-d ey sk>l‡t bf. Milk c6p) ] objik bl bl

#### **

COURSE CODE : SKT- SC-405-E

#### **fo'alei :te~%' lkDr Lr lete~**

Paper-XX : Śāktastotram

i **viiä i?⁄**60

v Həfj d ety HÄülÄR/20

le; %3 gisk% (3 Hours)

SKT-SC-405-E-1 yfyrkLrojra bR; fLeu~ xUFks yfyrkno; K% Lrfr fo rf

SKT-SC-404-E-2 yfyrkLrojr&xUFkL; V/;; us Lr(rxUFkkuka ifjp;% ikl; rs A

SKT-SC-404-E-3 i×plroh bR; fleu~ xUFks i×plväšką f=iġkn9; k% Lrąr fo rs A

SKT-SC-404-E-4 i×pLrohxUFkL; V/;; usu dtMfyuh; ksL; ifjp;% ikl; rs A

<b>31/d e&amp;û%y fyr lLroj Re~(1)]1µ 108 i   KuA</b>	16 VÄK%
<b>31/d e&amp;ü%y fyr llroj libe~(2)] 109µ214</b> i líuA	16 VÄK%
<b>31/d e&amp;ý%i ×plroh (1)]çFielro};e~(  ЫÑrelè;es)</b> A	16 VÄK%
<b>3V.d e&amp;p%i &gt;pLroh(2)] v of KVeA</b>	16 VÄK%

f**Mi .** ; %¥

L

4

Credits

4

(d) ç'ui=ls i ×p (ý) v fuok li‰ç'ul%Hio"; fulAr=k çFleç'us 34/d pr 4/; xri HBÔðeelí.J R p Folj% (4) fod Yijfgr 1% (v fuok, li‰ I £(Hr kùjç'ul% çnH.; UsA v Us ç'ul% Øe' 1% çFle&1)rh, &rih, &priplicav.til E: 1/4%Hio"; fulA

([)) Qf(; lied ç' ušiq 50% v zł% v ly lpulied ç' ušiqp 100% v zł% o 6 fYi d % HosA

### (x) rìh, 30.41 KUr% pr**ij22.ç'u% l k**Ñrelè; esi, olek/ş% v UFRkioBakv Äğıfu% Hio"; frA v Usç'uk% I kNr69.uk@ KÄXH-Kilelè; ekuladısılı i, dısi elè; esil ek/krefik) USA

#### ç'ui #fuekZkfof/%

#### 1. ç'ui **=11; fuelZlai ±Ñrelè; eu HosA**

2. ç'ui = s i > p (5) v fuok iZç'uk/Hio", fUA

3. ç'ulule~v Älulep foHit ue~v / léy f[ k: i sk Hio"; frµ

- I. çHe%ç'u%μv; a(çHe% ç'u%3Vd pr ψ/; xri HBÔðeel(J R) HosA v fLeu~ç'usp Holj%(þ)

   fod Yi jfgr k%(v fuok lijs I f(lir ki); ç'u%çnii; UA

   (4×4%46v ÄK);
- II. ĵ)rḥ%ç'u%(çHe¾di ĽJr¾μ; Hituín≱i lBÔðee~v ĽJŖ, daç'ual eK kqç'u); açniL; r& (16v ÄK%
- III. rìh %ç'u%(f)rh 3kli ĽJr%μ ; Hituínž/ BÔðee~v ĽJŖ i Hital}; al çi ÄãĢlį; kqi Hitald; a çnil; r& (2×8%46v Äl%)
- IV. pr**HZ**ç'u%(rìh) 7441 líJr%µ; Hlíufn241 lBÔðee~vlíJR; I líÑrelè; ens fuc Vilked a ç'u}; a I el/k eg: uprl4/aç(; rá) (2×8%46v Äl%)
- V. i xpe%ç'u%(priţiikul iL)r%μ ; Hitufn2/ IBÔðee~v iL) R i IBlai}; al çi Äã Ģiţ; k qi IBlaid; a çnil; r A (2×8%46v Äl%)

vulqtarx**iii**tt%

- 1. yfyr Hzroj Ree]- napezietapfojfpre]- IEL ñ cyft WHRkif. Ni] Jij. kolji d Wein ILAÑr fo| EL Hejt Ferlv
- 2. i×plrofj b2bj v b/e VLV j Jhukj (d kelj)A
- 3. dikelj' Kin likogili klički Eliã cyft Ulikki f. NJ jiľ V/I klíri klikej-t lehr

#### ф

### COURSE CODE : <u>SKT-</u> SC-406-E <u>VIVA-VOCE</u> (elis id hi j k(ii)

i wii ki (Maximum Marks): 50

Credits: 2

# fMi.h%,eññ (l LiÑre)-&pro1472-11; i LBÔðel ellr%,vubujarrh,pro1472-1,k%,v/bra i LBÔðee-vul JR, Nock bel LiÑrelè;eu ellişki hijkjikvk, bsf;";rsA

**Note:-** Viva-Voce of the students, based on the syllabus covered in their  $3^{rd}$  and  $4^{th}$  Semester courses, will be conducted through Sanskrit medium after the completion of the syllabus of M.A. Sanskrit, Fourth Semester.

### **Programme Outcomes (PO's) of Post Graduate CBCS Programmes/Courses**

### in the Faculty of Indic Studies, Kurukshetra University, Kurukshetra

PO 1. Scientific & Logical knowledge of ancient Indian wisdom.

- PO 2. Enhancing knowledge of Indian art & cultural traditions.
- PO 3. Knowledge of Vedic, medieval & modern Philosophies.
- PO 4. Inculcation of nationalism and other moral values.
- PO 5. Enhancing mental relaxation and peace by adopting prayer, chanting, yoga and meditation.
- PO 6. Preservation of Indian arts & heritage by using modern technology.
- PO 7. To impart knowledge of different sanskaras & philosophies.
- PO 8. Imparting knowledge of folk traditions in different disciplines of the faculty.
- PO 9. Developing aesthetics, creativity & skills like singing, painting, dancing.
- Po 10. Improving the emotional intelligence through Geeta.

### PSOs of M.A. Sanskrit, Pali & Prakrit

- 6- on clage.kxlik] mifuôn} on kaka rFkk Hkkjrh; nólu ds  $\vee$ /;; u }kjk of nd /ke] l ladfr , oa n"klu dk Kku
- 7- Ladr LkfgR; , oadk0; "kkL= dsv/; ; u kjk Hkkjrh; eskk , oa dk0; dyk dk Kku
- 8- Ladr 0; kdj.k ds v/; ; u }kjk Hkk'kk] Hkk'kk foKku , oa Hkk'kk dk\$ky dk fodkl
- 9- I kfgfR; d vfHk#fp] 0; kogkfjd Kku] "kkL=kDr I Łdkj , oau\$rd e¥; ka ds vUrfuðsk }kjk 0; fDrRo fodkI
- 10- ; ks, , oa  $\vee k/$ ; kfRedrk dh i pfRr }kjk LoLFk thou i ) fr , oa I nkpkj i f"k{k.k

# CO, PO, MAPPING MATRIX SEMESTER III

### Paper-XI

SKT-HC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
301										
Paper										
CO.301.1	3	3	2	3	1	3	1	3	2	0
CO.301.2	3	3	2	3	1	3	1	3	2	0
CO.301.3	3	3	2	3	1	3	1	3	2	0
CO.301.4	3	3	2	3	1	3	1	3	2	0
AVG	3	3	2	3	1	3	1	3	2	0

#### Paper-XII Group A Veda

SKT-SC- A-302	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.A 302.1	3	2.5	3	3	2	1	3	2	1	0
CO.A 302.2	3	2.5	3	3	1	1	3	2	1	0
CO.A 302.3	3	2.5	3	3	1	1	3	2	1	0
CO.A 302.4	3	2.5	3	3	2	1	3	2	1	0
AVG	3	2.5	3	3	1.5	1	3	2	1	0

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
B-302										
CO.B	3	1	2	1	1	2.5	2	1	1	0
302.1										
CO.B	3	1	2	1	1	2.5	2	1	1	0
302.2										
CO.B	3	1	2	1	1	2.5	2	1	1	0
302.3										
CO.B	3	1	2	1	1	2.5	2	1	1	0
302.4										
AVG	3	1	2	1	1	2.5	2	1	1	0

#### Paper-XII Group B Vyakarana

## Paper-XII Group C Darshan

SKT-SC- C-302	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.C 302.1	3	1	2	2	1	1	3	1	1	0
CO.C 302.2	3	1	2	2	1	1	3	1	1	0
CO.C 302.3	3	1	2	2	1	1	3	1	1	0
CO.C 302.4	3	1	2	2	1	1	3	1	1	0
AVG	3	1	2	2	1	1	3	1	1	0

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
D-302										
CO.D	2	3	1	2	0	2	2	3	2	0
302.1										
CO.D	2	3	1	2	0	2	2	3	2	0
302.2										
CO.D	2	3	1	2	0	2	2	3	2	0
302.3										
CO.D	2	3	1	2	0	2	2	3	2	0
302.4										
AVG	2	3	1	2	0	2	2	3	2	0

# Paper-XII Group D Sahitya

# Paper-XII Group E Dharmatantragam

SKT-SC-E-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
302										
CO.E 302.1	2	3	3	2	3	2	2	1	2	0
CO.E 302.2	2	3	3	2	3	2	2	1	2	0
CO.E 302.3	2	3	3	2	3	2	2	1	2	0
CO.E 302.4	2	3	3	2	3	2	2	1	2	0
AVG	2	3	3	2	3	2	2	1	2	0

			- aper		- oup	I veau				
SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
A-303										
CO.A	3	2	2	3	1	1	3	0	1	0
303.1										
CO.A	3	2	2	3	1	1	3	0	1	0
303.2										
CO.A	3	2	3	3	1	1	3	0	1	0
303.3										
CO.A	3	2	3	3	1	1	3	0	1	0
303.4										
AVG	3	2	2.5	3	1	1	3	0	1	0

Paper-XIII Group A Veda

### Paper-XIII Group B Vyakarana

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
B-303										
CO.B	3	1	2	1	0	2	1	0	1	0
303.1										
CO.B	3	1	2	1	0	2	1	0	1	0
303.2										
CO.B	3	1	2	1	0	2	1	0	1	0
303.3										
CO.B	3	1	2	1	0	2	1	0	1	0
303.4										
AVG	3	1	2	1	0	2	1	0	1	0

SKT-SC- C-303	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.C	3	2	3	2	1	1	3	0	1	0
303.1										
CO.C	3	2	3	2	1	1	3	0	1	0
303.2										
CO.C	3	2	3	2	1	1	3	0	1	0
303.3										
CO.C	3	2	3	2	1	1	3	0	1	0
303.4										
AVG	3	2	3	2	1	1	3	0	1	0

## Paper-XIII Group C Darshan

# Paper-XIII Group D Sahitya

SKT-SC- D-303	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.D 303.1	2	3	1	3	2	1	1	3	2	0
CO.D 303.2	2	3	1	3	2	1	1	3	2	0
CO.D 303.3	2	3	1	3	2	1	1	3	2	0
CO.D 303.4	2	3	1	3	2	1	1	3	2	0
AVG	2	3	1	3	2	1	1	3	2	0

SKT-SC-E-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
303										
CO.E 303.1	2	3	3	2	2	1	2	2	1	0
CO.E 303.2	2	3	3	2	2	1	2	2	1	0
CO.E 303.3	2	3	3	2	2	1	2	2	1	0
CO.E 303.4	2	3	3	2	2	1	2	2	1	0
AVG	2	3	3	2	2	1	2	2	1	0

## Paper-XIII Group E Dharmatantragam

			I aper-		Toup	i vua				
SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
A-304										
CO.A	3	2	3	2	1	1	3	2	1	0
304.1										
CO.A	3	2	3	2	1	1	3	2	1	0
304.2										
CO.A	3	2	3	2	1	1	3	2	1	0
304.3										
CO.A	3	2	3	2	1	1	3	2	1	0
304.4										
AVG	3	2	3	2	1	1	3	2	1	0

#### **Paper-XIV Group A Veda**

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
B-304										
CO.B	3	1	1	1.5	1	1	2	1	0	0
304.1										
CO.B	3	1	2	1.5	1	1	2	1	0	0
304.2										
CO.B	3	1	2	1.5	1	1	2	1	0	0
304.3										
CO.B	3	1	1	1.5	1	1	2	1	0	0
304.4										
AVG	3	1	1.5	1.5	1	1	2	1	0	0

#### Paper-XIV Group B Vyakarana

# Paper-XIV Group C Darshan

SKT-SC- C-304	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.C 304.1	3	2	3	2	2	0	1	2	1	0
CO.C 304.2	3	2	3	2	2	0	1	2	1	0
CO.C 304.3	3	2	3	2	2	0	1	2	1	0
CO.C 304.4	3	2	3	2	2	0	1	2	1	0
AVG	3	2	3	2	2	0	1	2	1	0

SKT-SC- D-304	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
D-304										
CO.D	2	3	2	3	1	1	2	2	2	0
304.1										
CO.D	2	3	2	3	1	1	2	2	2	0
304.2										
CO.D	2	3	2	3	1	1	2	2	2	0
304.3										
CO.D	2	3	2	3	1	1	2	2	2	0
304.4										
AVG	2	3	2	3	1	1	2	2	2	0

# Paper-XIV Group D Sahitya

# Paper-XIV Group E Dharmatantragam

SKT-SC-E- 304	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.E 304.1	3	3	2	2	2	2	2	0	2	3
CO.E 304.2	3	3	2	2	2	2	2	0	2	3
CO.E 304.3	3	3	2	2	2	1	3	0	2	3
CO.E 304.4	3	3	2	2	2	1	3	0	2	3
AVG	3	3	2	2	2	1.5	2.5	0	2	3

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
A-305										
CO.A	3	3	3	3	2	1	3	2	2	0
305.1										
CO.A	3	3	3	3	1	1	3	2	2	0
305.2										
CO.A	3	3	3	3	2	1	3	2	2	0
305.3										
CO.A	3	3	3	3	1	1	3	2	2	0
305.4										
AVG	3	3	3	3	1.5	1	3	2	2	0

Paper-XV Group A Veda

### Paper-XV Group B Vyakarana

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
B-305										
CO.B	2	1	2	2	1	2.5	3	2	1	0
305.1										
CO.B	2	1	2	2	1	2.5	3	2	1	0
305.2										
CO.B	2	1	2	2	1	2.5	3	2	1	0
305.3										
CO.B	2	1	2	2	1	2.5	3	2	1	0
305.4										
AVG	2	1	2	2	1	2.5	3	2	1	0

SKT-SC- C-305	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.C	3	3	2	3	1	2	3	2	1	0
305.1										
CO.C	3	3	2	3	1	2	3	2	1	0
305.2										
CO.C	3	3	2	3	1	2	3	2	1	0
305.3										
CO.C	3	3	2	3	1	2	3	2	1	0
305.4										
AVG	3	3	2	3	1	2	3	2	1	0

## Paper-XIV Group C Darshan

# Paper-XIV Group D Sahitya

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
D-305										
CO.D	3	3	1	2	0	2	2	3	2	0
305.1										
CO.D	3	3	1	2	0	2	2	3	2	0
305.2										
CO.D	3	3	2	2	1	2	2	3	2	0
305.3										
CO.D	3	3	2	2	1	2	2	3	2	0
305.4										
AVG	3	3	1.5	2	0.5	2	2	3	2	0

SKT-SC-E-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
305										
CO.E 305.1	3	3	2	2	2	1	2	0	2	3
CO.E 305.2	3	3	2	2	2	1	2	0	2	3
CO.E 305.3	3	3	2	2	2	1	2	0	2	3
CO.E 305.4	3	3	2	2	2	1	2	0	2	3
AVG	3	3	2	2	2	1	2	0	2	3

Paper-XIV Group E Dharmatantragam

#### CO, PO, MAPPING MATRIX SEMESTER IV Paper-XVI

				1 4	per -2x	V I				
SKT-HC- 401	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
Paper										
CO.401.1	3	3	2	3	1	3	1	3	2	0
CO.401.2	3	3	2	3	1	3	1	3	2	0
CO.401.3	3	3	2	3	1	3	1	3	2	0
CO.401.4	3	3	2	3	1	3	1	3	2	0
AVG	3	3	2	3	1	3	1	3	2	0

#### Paper-XVII Group A Veda

SKT-SC- A-402	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.A	3	2.5	3	3	2	1	3	2	1	0
402.1										
CO.A	3	2.5	3	3	2	1	3	2	1	0
402.2										
CO.A	3	2.5	2	3	2	2	3	2	1	0
402.3										
CO.A	3	2.5	2	3	2	2	3	2	1	0
402.4										
AVG	3	2.5	2.5	3	2	1.5	3	2	1	0

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
B-402										
CO.B	3	1	2	1	2	2.5	2	1	1	0
402.1										
CO.B	3	1	2	1	2	2.5	2	1	1	0
402.2										
CO.B	3	2	2	1	2	2.5	2	1	1	0
402.3										
CO.B	3	2	2	1	2	2.5	2	1	1	0
402.4										
AVG	3	1.5	2	1	2	2.5	2	1	1	0

#### Paper-XVII Group B Vyakarana

# Paper-XVII Group C Darshan

SKT-SC- C-402	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.C 402.1	3	2	3	2	3	3	2	2	2	2
CO.C 402.2	3	2	3	2	3	3	2	2	2	2
CO.C 402.3	3	2	3	2	2	3	2	2	2	2
CO.C 402.4	3	2	3	2	2	3	2	2	2	2
AVG	3	2	3	2	2.5	3	2	2	2	2

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
D-402										
CO.D	3	2	2	3	2	2	3	3	1	0
402.1										
CO.D	3	2	2	3	2	2	3	3	1	0
402.2										
CO.D	3	2	2	3	2	2	3	3	1	0
402.3										
CO.D	3	2	2	3	2	2	3	3	1	0
402.4										
AVG	3	2	2	3	2	2	3	3	1	0

## Paper-XVII Group D Sahitya

# Paper-XII Group E Dharmatantragam

SKT-SC-E- 402	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.E 402.1	3	3	2	3	2	2	3	2	1	0
CO.E 402.2	3	3	2	3	2	2	3	2	1	0
CO.E 402.3	3	3	2	3	2	2	3	2	1	1
CO.E 402.4	3	3	2	3	2	2	3	2	1	1
AVG	3	3	2	3	2	2	3	2	1	0.5

					<u> </u>					
SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
A-403										
CO.A	3	2	3	2	2	1	2	1	1	0
403.1										
CO.A	3	2	3	2	2	1	2	1	1	0
403.2										
CO.A	3	2	3	2	2	1	2	1	2	0
403.3										
CO.A	3	2	3	2	2	1	2	1	2	0
403.4										
AVG	3	2	3	2	2	1	2	1	1.5	0

Paper-XVIII Group A Veda

### Paper-XVIII Group B Vyakarana

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
В-403										
CO.B	2	3	3	2	1	2	1	1	2	0
403.1										
CO.B	2	3	3	2	1	2	1	1	2	0
403.2										
CO.B	2	3	3	2	1	2	1	1	2	0
403.3										
CO.B	2	3	3	2	1	2	1	1	2	0
403.4										
AVG	2	3	3	2	1	2	1	1	2	0

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
C-403										
CO.C	3	2	3	3	2	3	2	2	2	2
403.1										
CO.C	3	2	3	3	2	3	2	2	1	2
403.2										
CO.C	3	2	3	3	2	3	2	2	2	2
403.3										
CO.C	3	2	3	3	2	3	2	2	1	2
403.4										
AVG	3	2	3	3	2	3	2	2	1.5	2

## Paper-XVIII Group C Darshan

# Paper-XVIII Group D Sahitya

SKT-SC- D-403	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.D 403.1	3	2	3	2	1	1	2	1	2	0
CO.D 403.2	3	2	3	2	1	1	2	1	2	0
CO.D 403.3	3	2	3	2	1	1	2	1	2	0
CO.D 403.4	3	2	3	2	1	1	2	1	2	0
AVG	3	2	3	2	1	1	2	1	2	0

SKT-SC-E-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
403										
CO.E 403.1	3	3	3	2	2	1	1	2	2	2
CO.E 403.2	3	3	3	2	2	1	1	2	2	2
CO.E 403.3	3	3	3	2	2	1	1	2	2	2
CO.E 403.4	3	3	3	2	2	1	1	2	2	2
AVG	3	3	3	2	2	1	1	2	2	2

## Paper-XVIII Group E Dharmatantragam

			I uper		Toup 1	I vouu				
SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
A-404										
CO.A	3	3	2	3	2	2	1	2	1.5	1
404.1										
CO.A	3	3	2	3	2	2	1	2	1.5	1
404.2										
CO.A	3	2	2	3	2	2	1	2	1.5	1
404.3										
CO.A	3	2	2	3	2	2	1	2	1.5	1
404.4										
AVG	3	2.5	2	3	2	2	1	2	1.5	1

#### **Paper-XIX Group A Veda**

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
B-404										
CO.B	2	2	3	2	1	3	2	2	2	0
404.1										
CO.B	2	2	3	2	1	3	2	2	2	0
404.2										
CO.B	2	2	3	2	1	3	2	2	2	0
404.3										
CO.B	2	2	3	2	1	3	2	2	2	0
404.4										
AVG	2	2	3	2	1	3	2	2	2	0

#### Paper-XIX Group B Vyakarana

# Paper-XIX Group C Darshan

SKT-SC- C-404	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.C	3	2	1	2	3	3	2	1	2	1
404.1										
CO.C	3	2	1	2	3	3	2	1	2	1
404.2										
CO.C	3	2	1	2	3	3	2	1	2	1
404.3										
CO.C	3	2	1	2	3	3	2	1	2	1
404.4										
AVG	3	2	1	2	3	3	2	1	2	1

SKT-SC- D-404	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
2 101										
CO.D	3	2	2.5	3	2	1	2	2	1	0
404.1										
CO.D	3	2	2.5	3	2	1	2	2	1	0
404.2										
CO.D	3	2	2	3	2	1	2	2	1	0
404.3										
CO.D	3	2	2	3	2	1	2	2	1	0
404.4										
AVG	3	2	2.25	3	2	1	2	2	1	0

# Paper-XIX Group D Sahitya

# Paper-XIX Group E Dharmatantragam

SKT-SC-E- 404	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.E 404.1	3	3	3	3	2	1	2	2	1	0
CO.E 404.2	3	3	3	3	2	1	2	2	1	0
CO.E 304.3	3	3	2	3	2	1	2	2	1	2
CO.E 304.4	3	3	2	3	2	1	2	2	1	2
AVG	3	3	2.5	3	2	1	2	2	1	1

SKT-SC- A-405	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.A 405.1	3	2	3	2	2	2	3	1	1	0
CO.A 405.2	3	2	3	2	1	2	3	1	1	0
CO.A 405.3	3	2	3	2	1	2	3	1	1	0
CO.A 405.4	3	2	3	2	2	2	3	1	1	0
AVG	3	2	3	2	1.5	2	3	1	1	0

Paper-XX Group A Veda

### Paper-XX Group B Vyakarana

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
B-405										
CO.B	2	2	3	2	2	3	2	1	1	0
405.1										
CO.B	2	2	3	2	2	3	2	1	1	0
405.2										
CO.B	2	2	3	2	2	3	2	1	1	0
405.3										
CO.B	2	2	3	2	2	3	2	1	1	0
405.4										
AVG	2	2	3	2	2	3	2	1	1	0

SKT-SC- C-405	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO.C 405.1	3	2.5	3	2	1	1	3	2	2	1
CO.C 405.2	3	2.5	3	2	1	1	2	2	2	1
CO.C 405.3	3	2.5	3	2	1	1	3	2	2	1
CO.C 405.4	3	2.5	3	2	1	1	2	2	2	1
AVG	3	2.5	3	2	1	1	2.5	2	2	1

# Paper-XX Group C Darshan

# Paper-XX Group D Sahitya

SKT-SC-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
D-404										
CO.D	3	2	3	1	2	1	2	1	1	0
405.1										
CO.D	3	2	3	1	2	1	2	1	1	0
405.2										
CO.D	3	2	3	1	2	1	2	1	1	0
405.3										
CO.D	3	2	3	1	2	1	2	1	1	0
405.4										
AVG	3	2	3	1	2	1	2	1	1	0
SKT-SC-E-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
------------	------	------	------	------	------	------	------	------	------	-------
404										
CO.E 405.1	3	2	3	3	2	3	3	1	1	1
CO.E 405.2	3	2	3	3	2	3	3	1	1	1
CO.E 405.3	3	2	3	3	2	3	3	1	1	1
CO.E 405.4	3	2	3	3	2	3	3	1	1	1
AVG	3	2	3	3	2	3	3	1	1	1

# Paper-XX Group E Dharmatantragam

#### CO, PO, PSO MAPPING MATRIX SEMESTER III Paper-XI

Paper	PO	PSO	PSO	PSO	PSO	PSO									
1	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
SKT-HC- 301	3	3	2	3	1	3	1	3	2	0	3	3	2	3	1

#### Paper-XII

Paper	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
SKT-SC-	3	2.5	3	3	1.5	1	3	2	1	0	3	3	2	3	2.5
302-A															
SKT-SC-	3	1	2	1	1	2.5	2	1	1	0	1	2	3	2	0
302-В															
SKT-SC-	3	1	2	2	1	1	3	1	1	0	3	0	1	1	2
302-C															
SKT-SC-	2	3	1	2	0	2	2	3	2	0	0	3	1	3	0
302-D															
SKT-SC-	2	3	3	2	3	2	2	1	2	0	2	2.5	0	3	1
302-Е															

#### SEMESTER III

Paper-XIII

Paper	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
SKT-SC-	3	2	2.5	3	1	1	3	0	1	0	3	3	1	3	2
303-A															
SKT-SC-	3	1	2	1	0	2	1	0	1	2	1	2	3	2	0
303-В															
SKT-SC-	3	2	3	2	1	1	3	0	1	0	3	1	1	2	2
303-C															
SKT-SC-	2	3	1	3	2	1	1	3	2	0	1	3	1	3	0
303-D															
SKT-SC-	2	3	3	2	2	1	2	2	1	0	3	2	0	2	3
303-Е															
							]	Paper	-XIV	7					
7															
Paper	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO	PSO
Paper	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
Paper SKT-SC-	PO 1 3	PO 2 2	PO 3 3	PO 4 2	PO 5 1	PO 6 1	PO 7 3	PO 8 2	PO 9 1	PO 10 0	PSO 1 3	PSO 2 2	PSO 3 2.5	PSO 4 3	PSO 5 3
Paper SKT-SC- 304-A	PO 1 3	PO 2 2	PO 3 3	PO 4 2	PO 5 1	PO 6 1	PO 7 3	PO 8 2	PO 9 1	PO 10 0	PSO 1 3	PSO 2 2	PSO 3 2.5	PSO 4 3	PSO 5 3
Paper SKT-SC- 304-A SKT-SC-	PO 1 3 3	PO 2 2 1	PO 3 3 1.5	PO 4 2 1.5	PO 5 1	PO 6 1 1	PO 7 3 2	PO 8 2 1	PO 9 1 0	PO 10 0	PSO 1 3 1	PSO 2 2 0	PSO 3 2.5 3	PSO 4 3 2	PSO 5 3 0
Paper SKT-SC- 304-A SKT-SC- 304-B	PO 1 3 3	PO 2 2 1	PO 3 3 1.5	PO 4 2 1.5	PO 5 1	PO 6 1 1	PO 7 3 2	PO 8 2 1	PO 9 1 0	PO 10 0	PSO 1 3 1	PSO 2 2 0	PSO 3 2.5 3	PSO 4 3 2	PSO 5 3 0
Paper SKT-SC- 304-A SKT-SC- 304-B SKT-SC-	PO 1 3 3 3	PO 2 2 1 2	PO 3 3 1.5 3	PO 4 2 1.5 2	PO 5 1 1 2	PO 6 1 1 0	PO 7 3 2 1	PO 8 2 1 2	PO 9 1 0 3	PO 10 0 0	PSO 1 3 1 3	PSO 2 2 0 0	PSO 3 2.5 3 1	PSO 4 3 2 2	PSO 5 3 0 2.5
Paper SKT-SC- 304-A SKT-SC- 304-B SKT-SC- 304-C	PO 1 3 3 3	PO 2 2 1 2	PO 3 3 1.5 3	PO 4 2 1.5 2	PO 5 1 1 2	PO 6 1 1 0	PO 7 3 2 1	PO 8 2 1 2	PO 9 1 0 3	PO 10 0 0	PSO 1 3 1 3	PSO 2 2 0 0	PSO 3 2.5 3 1	PSO 4 3 2 2	PSO 5 3 0 2.5
Paper SKT-SC- 304-A SKT-SC- 304-B SKT-SC- 304-C SKT-SC-	PO 1 3 3 2	PO 2 2 1 2 3	PO 3 3 1.5 3 2	PO 4 2 1.5 2 3	PO 5 1 1 2 1	PO 6 1 1 0 1	PO 7 3 2 1 2	PO 8 2 1 2 2 2	PO 9 1 0 3 2	PO 10 0 0 0	PSO 1 3 1 3 1	PSO 2 2 0 0 3	PSO 3 2.5 3 1	PSO 4 3 2 2 3	PSO 5 3 0 2.5 0
Paper SKT-SC- 304-A SKT-SC- 304-B SKT-SC- 304-C SKT-SC- 304-D	PO 1 3 3 2	PO 2 2 1 2 3	PO 3 3 1.5 3 2	PO 4 2 1.5 2 3	PO 5 1 2 1	PO 6 1 1 0 1	PO 7 3 2 1 2	PO 8 2 1 2 2 2	PO 9 1 0 3 2	PO 10 0 0 0	PSO 1 3 1 3 1	PSO 2 2 0 0 3	PSO 3 2.5 3 1	PSO 4 3 2 2 3	PSO 5 3 0 2.5 0
Paper SKT-SC- 304-A SKT-SC- 304-B SKT-SC- 304-C SKT-SC- 304-D SKT-SC-	PO 1 3 3 2 3	PO 2 2 1 2 3 3	PO 3 3 1.5 3 2 2	PO 4 2 1.5 2 3 2	PO 5 1 1 2 1 2	PO 6 1 1 0 1 1.5	PO 7 3 2 1 2 2 2 2.5	PO 8 2 1 2 2 0	PO 9 1 0 3 2 2	PO 10 0 0 0 3	PSO 1 3 1 3 1 3	PSO 2 2 0 0 3 1	PSO 3 2.5 3 1 1 1	PSO 4 3 2 2 3 2	PSO 5 3 0 2.5 0 3

#### SEMESTER III

Paper-XV

Paper	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
SKT-SC-	3	3	3	3	1.5	1	3	2	2	0	1	1	3	2	0
305-A															
SKT-SC-	2	1	2	2	1	2.5	3	2	1	0	1	1	3	2	0
305-В															
SKT-SC-	3	3	2	3	1	2	3	2	1	0	3	12	1	2	3
305-C															
SKT-SC-	3	3	1.5	2	0.5	2	2	3	2	0	0	3	1	3	0
305-D															
SKT-SC-	3	3	2	2	2	1	2	0	2	3	3	1	0	2	3
305-Е															

#### CO, PO, PSO MAPPING MATRIX SEMESTER IV Paper-XVI

Paper	PO	PSO	PSO	PSO	PSO	PSO									
-	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
SKT-HC- 401	3	3	2	3	1	3	1	3	2	0	3	3	2	3	1

#### Paper-XVII

Paper	PO	PO	PO	PO	PO	PO	РО	PO	PO	РО	PSO	PSO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
SKT-SC-	3	2.5	2.5	3	2	1.5	3	2	1	0	3	3	1	3	2
402-A															
SKT-SC-	3	1.5	2	1	2	2.5	2	1	1	0	1	0	3	1	0
402-B															
SKT-SC-	3	2	3	2	2.5	3	2	2	2	2	3	0	1	1	3
402-C															
SKT-SC-	3	2	2	3	2	2	3	3	1	0	1	3	1	3	0
402-D															
SKT-SC-	3	3	2	3	2	2	3	2	1	0.5	2	1	1	3	3
402-Е															

#### SEMESTER IV

Paper-XVIII

								1							
Paper	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
SKT-SC-	3	2	3	2	2	1	2	1	1.5	0	3	2	1	3	2
403-A															
SKT-SC-	2	3	3	2	1	2	1	1	2	0	1	0	3	2	1
403-В															
SKT-SC-	3	2	3	3	2	3	2	2	1.5	02	3	0	1	2	3
403-C															
SKT-SC-	3	2	3	2	1	1	2	1	2	0	1	3	1	3	0
403-D															
SKT-SC-	3	3	3	2	2	1	1	2	2	2	3	1	1	3	3
403-Е															
							F	Paper	-XIX	K					
Paper	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
SKT-SC-	3	2.5	2	3	2	2	1	2	1.5	1	3	1	1	2.5	2
404-A															
SKT-SC-	2	2	3	2	1	3	2	2	2	0	1	1	3	1	1
404-B															
SKT-SC-	3	2	1	2	3	3	2	1	2	1	3	1	1	2	3
404-C															
SKT-SC-	3	2	2.25	3	2	1	2	2	1	0	1	3	1	3	0
404-D															
SKT-SC-	3	3	2.5	3	2	1	2	2	1	1	2	1	1	3	3
404-E														1	

#### SEMESTER IV

Paper-XX

Paper	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
SKT-SC-	3	2	3	2	1.5	2	3	1	1	0	3	1	1	3	2
405-A															
SKT-SC-	2	2	3	2	2	3	2	1	1	0	1	1	3	2	1
405-B															
SKT-SC-	3	2.5	3	2	1	1	2.5	2	2	1	3	1	1	1	3
405-C															
SKT-SC-	3	2	3	1	2	1	2	1	1	0	1	3	1	3	0
405-D															
SKT-SC-	3	2	3	3	2	3	3	1	1	1	3	2	0	2	2
405-Е															

#### CO, PSO MAPPING MATRIX SEMESTER III Paper-XI

SKT-HC-301	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.301.1	3	3	2	3	1
CO.301.2	3	3	2	3	1
CO.301.3	3	3	2	3	1
CO.301.4	3	3	2	3	1
AVG	3	3	2	3	1

#### Paper-XII Group-A Veda

SKT-SC-302-A	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.302.1	3	3	2	3	2.5
CO.302.2	3	3	2	3	2.5
CO.302.3	3	3	2	3	2.5
CO.302.4	3	3	2	3	2.5
AVG	3	3	2	3	2.5

#### Paper-XIII Group-A Veda

SKT-SC-303-A	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.303.1	3	3	1	3	2
CO.303.2	3	3	1	3	2
CO.303.3	3	3	1	3	2
CO.303.4	3	3	1	3	2
AVG	3	3	1	3	2

#### Paper-XIV Group-A Veda

SKT-SC-304-A	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.304.1	3	2	2.5	3	3
CO.304.2	3	2	2.5	3	3
CO.304.3	3	2	2.5	3	3
CO.304.4	3	2	2.5	3	3
AVG	3	2	2.5	3	3

#### Paper-XV Group-A Veda

SKT-SC-305-A	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.305.1	1	1	3	2	0
CO.305.2	1	1	3	2	0
CO.305.3	1	1	3	2	0
CO.305.4	1	1	3	2	0
AVG	1	1	3	2	0

#### Paper-XII Group-B Grammar

SKT-SC-302-B	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.302.1	1	2	3	2	0
CO.302.2	1	2	3	2	0
CO.302.3	1	2	3	2	0
CO.302.4	1	2	3	2	0
AVG	1	2	3	2	0

#### Paper-XIII Group-B Grammar

SKT-SC-303-B	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.303.1	1	2	3	2	0
CO.303.2	1	2	3	2	0
CO.303.3	1	2	3	2	0
CO.303.4	1	2	3	2	0
AVG	1	2	3	2	0

#### Paper-XIV Group-B Grammar

SKT-SC-304-B	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.304.1	1	0	3	2	0
CO.304.2	1	0	3	2	0
CO.304.3	1	0	3	2	0
CO.304.4	1	0	3	2	0
AVG	1	0	3	2	0

#### Paper-XV Group-B Grammar

SKT-SC-305-B	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.305.1	1	1	3	2	0
CO.305.2	1	1	3	2	0
CO.305.3	1	1	3	2	0
CO.305.4	1	1	3	2	0
AVG	1	1	3	2	0

#### Paper-XII Group-C Philosophy

SKT-SC-302-C	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.302.1	3	0	1	1	2
CO.302.2	3	0	1	1	2
CO.302.3	3	0	1	1	2
CO.302.4	3	0	1	1	2
AVG	3	0	1	1	2

#### Paper-XIII Group-C Philosophy

SKT-SC-303-C	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.303.1	3	1	1	2	2
CO.303.2	3	1	1	2	2
CO.303.3	3	1	1	2	2
CO.303.4	3	1	1	2	2
AVG	3	1	1	2	2

#### **Paper-XIV Group- C Philosophy**

SKT-SC-304-C	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.304.1	3	0	1	2	2.5
CO.304.2	3	0	1	2	2.5
CO.304.3	3	0	1	2	2.5
CO.304.4	3	0	1	2	2.5
AVG	3	0	1	2	2.5

#### Paper-XV Group-C Philosophy

SKT-SC-305-C	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.305.1	3	2	1	2	3
CO.305.2	3	2	1	2	3
CO.305.3	3	2	1	2	3
CO.305.4	3	2	1	2	3
AVG	3	2	1	2	3

#### **Paper-XII Group-D Literature**

SKT-SC-302-D	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.302.1	0	3	1	3	0
CO.302.2	0	3	1	3	0
CO.302.3	0	3	1	3	0
CO.302.4	0	3	1	3	0
AVG	0	3	1	3	0

#### Paper-XIII Group- D Literature

- "F'							
SKT-SC-303-D	PSO I	PSO 2	PSO 3	PSO4	PSO5		
CO.303.1	1	2	1	3	0		
CO.303.2	1	2	1	3	0		
CO.303.3	1	2	1	3	0		
CO.303.4	1	2	1	3	0		
AVG	1	2	1	3	0		

#### **Paper-XIV Group- D Literature**

SKT-SC-304-D	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.304.1	1	3	1	3	0
CO.304.2	1	3	1	3	0
CO.304.3	1	3	1	3	0
CO.304.4	1	3	1	3	0
AVG	1	3	1	3	0

#### Paper-XV Group- D Literature

SKT-SC-305-D	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.305.1	0	3	1	3	0
CO.305.2	0	3	2	3	0
CO.305.3	0	3	1	3	0
CO.305.4	0	3	0	3	0
AVG	0	3	1	3	0

#### Paper-XII Group-E Dharmatantragama

SKT-SC-302-E	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.302.1	2	2	0	3	1
CO.302.2	2	2	0	3	1
CO.302.3	2	3	0	3	1
CO.302.4	2	3	0	3	1
AVG	2	2.5	0	3	1

#### Paper-XIII Group- E Dharmatantragamah

SKT-SC-303-E	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.303.1	3	2	0	2	3
CO.303.2	3	2	0	2	3
CO.303.3	3	2	0	2	3
CO.303.4	3	2	0	2	3
AVG	3	2	0	2	3

#### Paper-XIV Group- E Dharmatantragamah

SKT-SC-304-E	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.304.1	3	1	1	2	3
CO.304.2	3	1	1	2	3
CO.304.3	3	1	1	2	3
CO.304.4	3	1	1	2	3
AVG	3	1	1	2	3

#### Paper-XV Group- E Dharmatantragamah

SKT-SC-305-E	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.305.1	3	1	0	2	3
CO.305.2	3	1	0	2	3
CO.305.3	3	1	0	2	3
CO.305.4	3	1	0	2	3
AVG	3	1	0	2	3

# CO, PSO MAPPING MATRIX SEMESTER IV

#### Paper-XVI

SKT-HC-401	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.401.1	3	3	2	3	1
CO.401.2	3	3	2	3	1
CO.401.3	3	3	2	3	1
CO.401.4	3	3	2	3	1
AVG	3	3	2	3	1

#### Paper-XVII Group-A Veda

SKT-SC-402-A	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.402.1	3	3	1	3	2
CO.402.2	3	3	1	3	2
CO.402.3	3	3	1	3	2
CO.402.4	3	3	1	3	2
AVG	3	3	1	3	2

#### Paper-XVII Group-B Grammar

SKT-SC-402-B	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.402.1	1	0	3	1	0
CO.402.2	1	0	3	1	0
CO.402.3	1	0	3	1	0
CO.402.4	1	0	3	1	0
AVG	1	0	3	1	0

#### Paper-XVII Group-C Philosophy

SKT-SC-402-C	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.402.1	3	0	1	1	3
CO.402.2	3	0	1	1	3
CO.402.3	3	0	1	1	3
CO.402.4	3	0	1	1	3
AVG	3	0	1	1	3

#### Paper-XVII Group-D Literature

SKT-SC-402-D	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.402.1	1	3	1	3	0
CO.402.2	1	3	1	3	0
CO.402.3	1	3	1	3	0
CO.402.4	1	3	1	3	0
AVG	1	3	1	3	0

#### Paper-XVII Group-E Dharmatantragamah

SKT-SC-402-E	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.402.1	1	3	1	3	0
CO.402.2	1	3	1	3	0
CO.402.3	1	3	1	3	0
CO.402.4	1	3	1	3	0
AVG	1	3	1	3	0

#### Paper-XVIII Group-A Veda

SKT-SC-403-A	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.403.1	3	2	1	3	2
CO.403.2	3	2	1	3	2
CO.403.3	3	2	1	3	2
CO.403.4	3	2	1	3	2
AVG	3	2	1	3	2

#### Paper-XVIII Group-B Grammar

SKT-SC-403-B	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.403.1	1	0	3	2	1
CO.403.2	1	0	3	2	1
CO.403.3	1	0	3	2	1
CO.403.4	1	0	3	2	1
AVG	1	0	3	2	1

#### Paper-XVIII Group-C Philosophy

SKT-SC-403-C	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.403.1	3	0	1	2	3
CO.403.2	3	0	1	2	3
CO.403.3	3	0	1	2	3
CO.403.4	3	0	1	2	3
AVG	3	0	1	2	3

#### Paper-XVIII Group-D Literature

SKT-SC-403-D	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.403.1	1	3	1	3	0
CO.403.2	1	3	1	3	0
CO.403.3	1	3	1	3	0
CO.403.4	1	3	1	3	0
AVG	1	3	1	3	0

#### Paper-XVIII Group-E Dharmatantragamah

SKT-SC-403-E	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.403.1	3	1	1	3	3
CO.403.2	3	1	1	3	3
CO.403.3	3	1	1	3	3
CO.403.4	3	1	1	3	3
AVG	3	1	1	3	3

#### Paper-XIX Group-A Veda

SKT-SC-404-A	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.404.1	3	1	1	2.5	2
CO.404.2	3	1	1	2.5	2
CO.404.3	3	1	1	2.5	2
CO.404.4	3	1	1	2.5	2
AVG	3	1	1	2.5	2

#### Paper-XIX Group-B Grammar

SKT-SC-404-B	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.404.1	1	1	3	1	1
CO.404.2	1	1	3	1	1
CO.404.3	1	1	3	1	1
CO.404.4	1	1	3	1	1
AVG	1	1	3	1	1

#### Paper-XIX Group-C Philosophy

		1	1 1	•	
SKT-SC-404-C	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.404.1	3	1	1	2	3
CO.404.2	3	1	1	2	3
CO.404.3	3	1	1	2	3
CO.404.4	3	1	1	2	3
AVG	3	1	1	2	3

#### **Paper-XIX Group-D Literature**

SKT-SC-404-D	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.404.1	1	3	1	3	0
CO.404.2	1	3	1	3	0
CO.404.3	1	3	1	3	0
CO.404.4	1	3	1	3	0
AVG	1	3	1	3	0

#### Paper-XIX Group-E Dharmatantragamah

SKT-SC-404-E	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.404.1	2	1	1	3	3
CO.404.2	2	1	1	3	3
CO.404.3	2	1	1	3	3
CO.404.4	2	1	1	3	3
AVG	2	1	1	3	3

#### Paper-XX Group-A Veda

SKT-SC-405-A	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.405.1	3	1	1	3	2
CO.405.2	3	1	1	3	2
CO.405.3	3	1	1	3	2
CO.405.4	3	1	1	3	2
AVG	3	1	1	3	2

#### Paper-XX Group-B Grammar

SKT-SC-405-B	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.405.1	1	1	3	2	1
CO.405.2	1	1	3	2	1
CO.405.3	1	1	3	2	1
CO.405.4	1	1	3	2	1
AVG	1	1	3	2	1

#### Paper-XX Group-C Philosophy

SKT-SC-405-C	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.405.1	3	1	1	1	3
CO.405.2	3	1	1	1	3
CO.405.3	3	1	1	1	3
CO.405.4	3	1	1	1	3
AVG	3	1	1	1	3

#### **Paper-XX Group-D Literature**

SKT-SC-405-D	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.405.1	1	3	1	3	0
CO.405.2	1	3	1	3	0
CO.405.3	1	3	1	3	0
CO.405.4	1	3	1	3	0
AVG	1	3	1	3	0

	<b>_</b> _			0	
SKT-SC-405-E	PSO I	PSO 2	PSO 3	PSO4	PSO5
CO.405.1	3	2	0	2	2
CO.405.2	3	2	0	2	2
CO.405.3	3	2	0	2	2
CO.405.4	3	2	0	2	2
AVG	3	2	0	2	2

#### Paper-XX Group-E Dharmatantragamah

# Kurukshetra University, Kurukshetra (Established by the State Legislature Act XII of 1956) ('A+' Grade, NAAC Accredited)



# Scheme of Examinations & Syllabus of M.Tech. Applied Geology (5 Year Integrated Course) I to X semester

Under

Choice Based Credit System (CBCS) Learning Outcomes-based Curriculum Framework (LOCF) w.e.f. Session 2020-21 in phased manner

#### **OUTCOME BASED SYLLABUS**

#### M.Tech. APPLIED GEOLOGY COURSE DURATION OF COURSE - 5 YEARS

#### VISION

To be globally acknowledged as a distinguished center 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.

#### DEPARTMENT VISION AND MISSION

#### VISION

To be acknowledged as a distinguished centre for Geoscience education.

#### MISSION

**M1:**To provide quality education to aspiring young minds for improving their skills, inculcating values, creating leadership qualities and enhancing research with innovative methods.

M2:To produce young geoscientists capable of being utilized in the areas of new technological design, environment, ethics, and sustainable technologies.

M3:To develop Teaching-Learning methods which can produce socially committed professional human beings who can contribute effectively in Nation building and represent the Country Internationally.

#### Mapping of University Vision and Mission to Department Vision and Mission

University Vision and Mission	Department Vision
	and Mission
To be globally acknowledged as a distinguished center of academic	Yes
excellence.	
To prepare a class of proficient scholars and professionals with	Yes
ingrained human values and commitment to expand the frontiers of	
knowledge for the advancement of society.	

#### **Programme Outcomes (POs) with Post Graduate Attributes**

Programme outcomes are attributes of the post graduates from the programme that are indicative of the post graduates' ability and competence to work after being a qualified Geologist upon completion of post graduation. Programme outcomes are statements that describe what students are expected to know or do by the time of post graduation, they must relate to knowledge and skills that the students acquire from the programme. The achievement of all outcomes indicates that the student is well prepared to achieve the programme educational

objectives down the road. The department of geology has the following eleven PO's. The course syllabi and the overall curriculum have been designed to achieve these outcomes:

#### Programme OUTCOMES (POs):

Programme Outcomes (POs) for Post Graduate programmes (CBCS) in the Faculty of Sciences, Kurukshetra University, Kurukshetra

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge
		gamed during course of study
PO2	Research	Capability to ask relevant/appropriate questions for identifying,
	Aptitude	formulating and analyzing the research problems and to draw
	-	conclusion from the analysis
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	Capable to learn and work effectively as an individual, and as a
	Team Work	member Or leader in diverse teams, in multidisciplinary settings.
<b>PO6</b>	Investigation of	Ability of critical thinking, analytical reasoning and research
	Problems	based knowledge including design of experiments, analysis and
		interpretation of data to provide conclusions
<b>PO7</b>	Modern Tool	Ability to use and learn techniques, skills and modern tools for
	usage	scientific practices
<b>PO8</b>	Science and	Ability to apply reasoning to assess the different issues related to
	Society	Society and the consequent responsibilities relevant to the
	5	professional scientific practices
PO9	Life-Long	Aptitude to apply knowledge and skills that are necessary for
	Learning	narticinating in learning activities throughout life
<b>PO10</b>	Ethics	Canability to identity and apply athical issues related to one's
1010	Etilles	Capability to identity and appry etilical issues related to one's
		work, avoid unethical behavior such as fabrication of data,
		committing plagiarism and unbiased truthful actions in all aspects
		of work
PO11	Project	Ability to demonstrate knowledge and understanding of the
	Management	scientific principles and apply these to manage projects

#### Programme Specific Outcomes (PSO's):

**PSO1:** Basic understanding of fundamental concepts of geology and applying it on the various natural processes occurring on and inside the earth as a whole system.

**PSO2:** Clearly formulate and solve real life challenges with respect to human environment interactions.

**PSO3:** Applications of fundamental principles of geology in finding out various minerals and other natural resources for the betterment of human society.

**PSO4:** Acquisition of skills to effectively communicate the knowledge of geology to the society for safeguarding the physical environment.

Scheme of examinations & Syllabus of M.Tech Applied Geology (5 Year integrated course) Under CBCS-LOCF Pattern Semester - I to II w.e.f 2020-21 in phased manner

#### **Course Code and Definition**

#### for

#### **First Year Scheme**

Course Code	Definitions
BS	Basic Science
ES	Engineering Science
HM	Humanities and Social Sciences
	including Management

S.No Course		Subject	L:T:P	Hours/	Credits	Examinat	ion Schedu	ıle (Marks)		Duration
	No./ Code			Week		Major Test	Minor Test	Practical	Total	of exam (Hours)
1A	BS-111	Applied Physics	3:1:0	4	4	75	25	0	100	3
1B	BS-101	Chemistry	3:1:0	4	4	75	25	0	100	3
2A	ES-105	Programming for Problem Solving	3:0:0	3	3	75	25	0	100	3
2B	HM-101	English	2:0:0	2	2	75	25	0	100	3
3	BS-131	Applied Mathematics-I	3:1:0	4	4	75	25	0	100	3
4A	ES-109	Engineering Graphics & Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111L	Manufacturing Processes Workshop	0:0:3	3	1.5	-	40	60	100	3
5A	BS-141	Biology	2:1:0	3	3	75	25	0	100	3
5B	ES-101	Basic Electrical Engineering	4:1:0	5	5	75	25	0	100	3
6A	BS-113L	Applied Physics Lab	0:0:3	3	1.5		20	30	50	3
6B	BS-103L	Chemistry Lab	0:0:3	3	1.5		20	30	50	3
7A	ES-107L	Programming for Problem Solving Lab	0:0:2	2	1		20	30	50	3
7B	ES-103L	Basic Electrical Engineering Lab	0:0:2	2	1		20	30	50	3
8A	ES-113L	Engineering Graphics & Design Practice	0:0:3	3	1.5		20	30	50	3
8B	HM-103L	Language Lab	0:0:2	2	1		20	30	50	3
		Total	12:5:8/	25/25	21.0/	375/	185/	90/	650A/	
			12:3:10		20.0	300	200	150	650B	

Scheme of Examinations of M.Tech. Applied Geology under CBCS-LOCF (I to X Sem.) w.e.f. 2020-21 in phased manner (Semester - I)

Note: A branch will study either the subjects corresponding to Sr. No. Marked A or corresponding to Sr. No. Marked B in one particular semester. The Induction Program (Three weeks duration) is a part of scheme of first year in Ist semester for all branches.

S.	Course	Subject	L:T:P	Hours/	Credits	Examinatio	on Schedule	(Marks)		Duration
No.	No./ Code			Week		Major Test	Minor Test	Practical	Total	of exam (Hours)
1A	BS-111	Applied Physics	3:1:0	4	4	75	25	0	100	3
1 <b>B</b>	BS-101	Chemistry	3:1:0	4	4	75	25	0	100	3
2A	ES-105	Programming for Problem Solving	3:0:0	3	3	75	25	0	100	3
2B	HM-101	English	2:0:0	2	2	75	25	0	100	3
3	BS-132	Applied Mathematics-II	3:1:0	4	4	75	25	0	100	3
4A	ES-109	Engineering Graphics & Design	1:2:0	3	3	75	25	0	100	3
4B	ES-111L	Manufacturing Processes Workshop	0:0:3	3	1.5	-	40	60	100	3
5A	BS-141	Biology	2:1:0	3	3	75	25	0	100	3
5B	ES-101	Basic Electrical Engineering	4:1:0	5	5	75	25	0	100	3
6A	BS-113L	Applied Physics Lab	0:0:3	3	1.5		20	30	50	3
6B	BS-103L	Chemistry Lab	0:0:3	3	1.5		20	30	50	3
7A	ES-107L	Programming for Problem Solving Lab	0:0:2	2	1		20	30	50	3
7B	ES-103L	Basic Electrical Engineering Lab	0:0:2	2	1		20	30	50	3
8A	ES-113L	Engineering Graphics & Design Practice	0:0:3	3	1.5		20	30	50	3
8B	HM-103L	Language Lab	0:0:2	2	1		20	30	50	3
		Total	12:5:8/	25/	21.0/	375/	185/200	90/150	650A/	
			12:3:10	25	20.0	300			650B	

### SCHEME OF STUDIES/EXAMINATIONS (Semester -II)

Note: (1) A branch will study either the subjects corresponding to Sr. No. Marked A or corresponding to Sr. No. Marked B in one particular semester.

(2) All students have to undertake the industrial training for 4 to 6 weeks after 2nd semester which will be evaluated in 3rd semester.

BS-111		Applied Physics									
L	Т	Ρ	Credit	Major Test	Minor Test	Total	Time				
3	1	-	4	75	25	100	3h				
Purpos	To introduc	e the bas	ics of physi	cs to the st	udents for a	applicatio	ns in the Engineering				
е	field.										
	Со	urse Outo	comes								
CO 1	Introduce th	e fundar	nentals of in	terference	and diffract	tion and th	neir applications.				
CO 2	To make the students aware of the importance of polarization and Laser in technology.										
CO 3	Application	s of optic	al fiber and	ultrasonics	s in various	fields.					
CO 4	Introduce th	e nuclea	r radiations	and its bio	logical effe	cts.					

### Unit - I

**Interference:** Principle of Superposition, Conditions for interference, Division of wave-front: Fresnel's Biprism and Applications, Division of amplitude: Wedge-shaped film, Newton's rings, Michelson Interferometer and Applications.

**Diffraction:** Types of diffraction, Fraunhofer diffraction at a single slit, Plane transmission diffraction grating: theory, secondary maxima and minima, width of principal maxima, absent spectra, overlapping of spectral lines, determination of wavelength; Dispersive power and resolving power of diffraction grating.

# Unit – II

**Polarization:** Polarization of transverse waves, Plane of polarization, Polarization by reflection, Double refraction, Nicol Prism, Quarter and half wave plate, Specific Rotation, Laurent 's half shade polarimeter, Biquartzpolarimeter.

**Laser:** Introduction, Stimulated Absorption, Spontaneous and Stimulated Emission; Einstein's Coefficients and its derivation, Population Inversion, Direct and Indirect pumping, Pumping schemes, Main components of Laser, He-Ne Laser, Semiconductor Laser, Characteristics of Laser, Applications of Laser.

# Unit – III

**Optical Fiber:** Introduction, Principle of propagation of light waves in optical fibers: total internal reflection, acceptance angle, numerical aperture, V- number; Modes of propagation, Types of optical fibers: single mode fiber, multimode fibers; Fiber optics communication system, Advantages of optical fiber communication, Applications of optical fibers.

**Ultrasonics:** Ultrasonic waves, Properties of ultrasonic waves, Production of ultrasonic waves: Magnetostriction and Piezoelectric methods, Detection of ultrasonic waves, Measurement of velocity of ultrasonic waves, Applications of ultrasonic waves.

# Unit – IV

**Nuclear radiations and its Biological Effects:** Classification of nuclear radiations, Interaction of charged particle (light and heavy) and gamma radiations with matter (basic concepts), Dosimetric units, Relative Biological Effectiveness (RBE), Typical doses from commons sources in the environment, Biological Effects, Maximum Permissible Dose, (MPD), Shielding, Radiation safety in the nuclear radiation laboratory. **Biomaterials:** Introduction, Classification of biomaterials, Applications.

# **Suggested Books:**

- 1. Applied Physics for Engineers, Wiley India Pvt. Ltd.
- 2. Concepts of Modern Physics (5th edition), Tata McGraw-Hill Publishing Company Limited.
- 3. A Textbook of Optics, S. Chand & Company Ltd.
- 4. Techniques for Nuclear and Particle Physics Experiments: A How-to Approach, Springer-Verlag.
- 5. Introduction to Nuclear and Particle Physics, PHI Learning Private Limited.
- 6. Biomaterials: The intersection of Biology and Materials Science, Pearson, New Delhi.

# Note: The paper setter will set the paper as per the question paper templates provide.

BS-1131	_	Α	pplied Physics	Lab					
L	T P		T P Credit Practical		Minor Test	Total	Time		
		3	1.5	30	20	50	3h		
Purpose	e Give the	knowle	dge of basic pr	acticals of Phy	sics in Eng	ineering.			
	Οοι	urse Out	comes						
CO1	To make th	ne stude	nts familiar witl	n the experime	nts related	with optic	s.		
CO2	CO2 To give the knowledge of handling of the experiments related with resistance using different methods.								

#### Note: Students will be required to perform at least 10 experiments out of the following list.

1.	To verify Newton's formula and hence to find the focal length of the given convex lens.
2.	To find the frequency of A.C. mains by using a Sonometer and horseshoe magnet.
3.	To find the resistance of a galvanometer by post office box.
4.	To find low resistance by Carrey-Foster bridge.
5.	To find the value of high resistance by substitution method.
б.	To compare the capacitances of two capacitors by De-Sauty's bridge and hence to find the
dielectric co	nstant of a medium.
7.	To convert a galvanometer into an ammeter of desired range and verify the same.
8.	To find the wavelength of monochromatic light by Newton's ring experiment.
9.	To find the wavelength of sodium light by Michelson's interferometer.
10.	To find the resolving power of a telescope.
11.	To find the wavelength of sodium light using Fresnel bi-prism.
12.	To find the wavelength of various colours of white light with the help of plane transmission diffraction
grating.	
13.	To find the specific rotation of sugar solution by using a Polarimeter.

# **Suggested Books:**

- 1. C.L.Arora, B. Sc. Practical Physics, S. Chand.
- 2. B.L. Worshnop and H, T, Flint, Advanced Practical Physics, KPH.
- 3. S.L. Gupta & V. Kumar, Practical Physics, Pragati Prakashan.
- 1. C.L.Arora, B. Sc. Practical Physics, S. Chand.
- 2. B.L. Worshnop and H, T, Flint, Advanced Practical Physics, KPH.
- 3. S.L. Gupta & V. Kumar, Practical Physics, PragatiPrakashan.

BS-101		Chem	istry							
L	Т	Р	Credit	Major Test	Minor Test	Total	Time			
3	1	-	4	75	25	100	3h			
Purpose	To familiarize the students with basic and applied concept in chemistry									
CO1	An ins	ight into the a	tomic and	molecular	structure					
CO2	Analy	ical technique	es used in i	dentification	on of molec	ules				
CO3	To un	To understand Periodic properties								
CO4	To understand the spatial arrangement of molecules									

#### UNIT - I

#### Atomic and molecular structure (10 lectures)

Molecular orbitals of diatomic molecules (N2, O2, CO) Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and energy level diagrams of [Co(NH3)6], [Ni(CO)4], [PtCl2(NH3)2] and magnetic properties of metal complexes. Band structure of solids and the role of doping on band structures.

#### UNIT - II

#### Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy (basic concept). Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Basic concepts of Nuclear magnetic resonance and magnetic resonance imaging, Diffraction and scattering.

#### UNIT - III

#### Use of free energy in chemical equilibria (4 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

#### **Periodic properties (4 Lectures)**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries (H2O, NH3, PCl5, SF6, CCl4, Pt(NH3)2Cl2

#### UNIT - IV

#### **Stereochemistry (6 lectures)**

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. **Organic reactions and synthesis of a drug molecule (4 lectures)** 

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule(paracetamol and Aspirin)

#### **Suggested Books:**

- 1) University chemistry, by B. M. Mahan, Pearson Education
- 2) Chemistry: Principles and Applications, byM. J. SienkoandR. A. Plane
- 3) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
- 4) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan
- 5) Physical Chemistry, by P. W. Atkins

#### Note: The paper setter will set the paper as per the question paper templates provided

BS- 103L	Chemistry Lab						
L	Т	Р	Credit	Practica I	Minor Test	Total	Time
-	-	3	1.5	30	20	50	3h

#### LIST OF EXPERIMENTS

- To Determine the surface tension of a given liquid 1.
- To determine the relative viscosity of a given liquid using Ostwald's viscometer 2.
- 3. To identify the number of components present in a given organic mixture by thin layer chromatography
- To determine the alkalinity of a given water sample 4.
- Determination of the strength of a given HCl solution by titrating it with standard NaOH solution 5. using conductometer
- 6. Synthesis of a drug (paracetamol/Aspirin)
- 7. Determination of chloride content of a given water sample
- To determine the calcium & magnesium or temporary & permanent hardness of a given water 8. sample by EDTA method
- 9. To determine the total iron content present in a given iron ore solution by redox titration
- Determination of the partition coefficient of a substance between two immiscible liquids 10.
- To find out the content of sodium, potassium in a given salt solution by Flame Photometer 11.
- 12. To find out the  $\lambda$ max and concentration of unknown solution by a spectrophotometer
- To find out the flash point and fire point of the given oil sample by Pensky Martin apparatus 13.
- To determine the amount of dissolved oxygen present in a given water sample 14.
- To find out the pour point and cloud point of a lubricating oil 15.
- Determination of the strength of a given HCl solution by titrating it with standard NaOH solution using 16. pH meter

Using Redwood Viscometer find out the viscosity of an oil sample 17.

# Note: At Least 9 experiments to be performed from the list.

ES-105	Programming for Problem Solving							
L	Т	Ρ	Credit	Major	Minor	Total	Time	
				Test	Test			
3	-	-	3	75	25	100	3h	
Purpose	To familiarize the students with the basics of Computer System and C							
	Programming							
Course Outcomes								
CO 1	Describe the overview of Computer System and Levels of Programming							
	Languages.							
CO 2	Learn to translate the algorithms to programs (in C language).							
CO 3	Learn description and applications of conditional branching, iteration and recursion.							
CO 4	To use arrays, pointers and structures to formulate algorithms and programs.							

#### UNIT – I

Overview of Computers: Block diagram and its description, Number systems, Arithmetic of number systems, Computer Hardware: Printers, Keyboard and Mouse, Storage Devices.

Introduction to programming language: Different levels of PL: High Level language, Assembly language, Machine language; Introduction to Compiler, Interpreter, Debugger, Linker, Loader, Assembler.

Problem Analysis: Problem solving techniques, Algorithms and Flowchart representation.

### UNIT – II

Overview of C: Elements of C, Data types; Storage classes in C; Operators: Arithmetic, relational, logical,

bitwise, unary, assignment and conditional operators, precedence & associativity of operators.

Input/output: Unformatted & formatted I/O function in C.

Control statements: if statement, switch statement; Repetition: for, while, and do-while loop; break, continue, goto statements.

# UNIT – III

Arrays: Definition, types, initialization, processing an array, String handling.

Functions: Definition, prototype, parameters passing techniques, recursion, built-in functions, passing arrays to functions, returning arrays from functions.

# $\mathbf{UNIT} - \mathbf{IV}$

Pointers: Declaration, operations on pointers, pointers and arrays, dynamic memory allocation, pointers and functions, pointers and strings.

Structure & Union: Definition, processing, passing structures to functions, use of

union. Data files: Opening and closing a file, I/O operations on files.

# **Suggested Books:**

- 1. Brian W. Kernighan Dennis Ritchie, "C Programming Language" Pearson Education India.
- 2. Subrata Saha, Subhodip Mukherjee: Basic Computation & Programming with 'C'-Cambridge
- University Press. 3. Ajay Mittal, "Programming in C A Practical Approach", Pearson.
- 4.E Balagurusamy : Programming in ANSI C, TMH Education.
- 5. Pradip Dey and Manas Ghose, "Computer Fundamental and Programming in C", Oxford Pub.
- 6.ForouzanBehrouz, "Computer Science: A Structured Programming Approach Using C", Cengage Learning.
- 7. Ashok Kamthane, "Programming in C, 3e", Pearson Education India..
- 8. Yashwant Kanetker, "Let us C", BPB Publications.
- 9.A K Sharma, "Fundamentals of Computers & Programming" DhanpatRai Publications
- 10. Rajaraman V., "Computer Basic and C Programming", Prentice Hall of India Learning.

# Note: The paper setter will set the paper as per the question paper templates provided.

ES- 107L	Programming for Problem Solving Lab							
L	Т	Р	Credit	Practica I	Minor Test	Total	Time	
-	-	2	1	30	20	50	3h	
Purpos	To Introduce students with problem solving using C Programming language							
е								
Course Outcomes								
CO 1	To formulate the algorithms for simple problems							
CO 2	Implementation of arrays and functions.							
CO 3	Implementation of pointers and user defined data types.							
CO 4	Write individual and group reports: present objectives, describe test procedures and results.							

#### LIST OF PROGRAMS

- 1. Write a program to find the sum of individual digits of a positive integer.
- 2. Write a program to generate the first n terms of the Fibonacci sequence.
- 3. Write a program to generate all the prime numbers between 1 and n, where n is the input value given by the user.
- 4. Write a program to find the roots of a quadratic equation.
- 5. Write a function to generate Pascal's triangle.
- 6. Write a program for addition of Two Matrices
- 7. Write a program for calculating transpose of a matrix.
- 8. Write a program for Matrix multiplication by checking compatibility
- 9. Write programs to find the factorial of a given integer by using both recursive and non-recursive

#### functions.

- 10. Write a function that uses functions to perform the count of lines, words and characters in a given text.
- 11. Write a program to explores the use of structures, union and other user defined variables
- 12. Write a program to print the element of array using pointers
- 13. Write a program to implement call by reference
- 14. Write a program to print the elements of a structure using pointers
- 15. Write a program to read a string and write it in reverse order
- 16. Write a program to concatenate two strings
- 17. Write a program to check that the input string is a palindrome or not.
- 18. Write a program which copies one file to another.
- 19. Write a program to reverse the first n characters in a file.

# Note: At least 10 programs are to be performed & executed from the above list.
HM-101		English										
L	Т	Р	Credit	Major Test	Minor Test	Total	Time					
2	-	-	2	75	25	100	3h					
	Co	urse Ou	tcomes				·					
CO 1	Building	Building up the vocabulary										
CO 2	Students	Students will acquire basic proficiency in English including writing skills										

UNIT-1

# **Vocabulary Building**

1.1 The concept of Word Formation

- 1.2 Root words from foreign languages and their use in English
- 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to farm derivatives.
- 1.4 Synonyms, antonyms, and standard abbreviations.

# **Basic Writing Skills**

- 2.1 Sentence Structures
- 2.2 Use of phrases and clauses in sentences
- 2.3 Importance of proper punctuation
- 2.4 Creating coherence
- 2.5 Organizing principles of paragraphs in documents
- 2.6 Techniques for writing precisely

### UNIT- 3

# **Identifying Common Errors in** Writing

- 3.1 Subject-verb agreement
- 3.2 Noun-pronoun agreement
- 3.3 Misplaced modifiers
- 3.4 Articles
- 3.5 Prepositions
- 3.6 Redundancies
- 3.7 Clichés

# UNIT-4

# Nature and Style of sensible Writing

- 4.1 Describing
- 4.2 Defining
- 4.3 Classifying
- 4.4 Providing examples or evidence

- 4.5 Writing introduction and conclusion
- 4.6 Comprehension
- 4.7 Précis Writing
- 4.8 Essay Writing

## **Suggested Books:**

(i) Practical English Usage. Michael Swan. OUP.1995.

# UNIT-2

(ii) Remedial English Grammar. F.T. Wood.

Macmillan.2007 (iii)On Writing Well. William Zinsser.

- (iii) Harper Resource Book. 2001
- (iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
- (v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- (vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

# Note: The paper setter will set the paper as per the question paper templates provided.

HM-103L	Language Lab									
L	Т	Р	Credit	Practical	Minor Test	Tota I	Time			
-	-	2	1	30	20	50	3h			

### OBJECTIVES

- 1. Listening Comprehension
- 2. Pronunciation, Intonation, Stress and Rhythm
- 3. Common Everyday Situations: Conversations and Dialogues
- 4. Communication at Workplace
- 5. Interviews
- 6. Formal Presentations

BS-131			APPLIED	MATHEMA	ATICS-I							
L	Т	Р	Credit	Major	Minor	Total	Time					
				Test	Test							
3	1	-	4	75	25	100	3 h					
Purpose	The	objective of	of this cours	se is to fami	liarize the pro-	ospective B	iotechnology Engineers					
_	with techniques in Limit, Continuity, Differential & Integral Calculus and Complex											
	Numbers. It aims to equip the students with standard concepts and tools at a beginner to											
	intern	mediate an	d then at ad	vanced level	that will serv	ve them wel	l towards tackling more					
	advanced level of mathematics and											
	applications that they would find useful in their disciplines. More precisely, the											
	objec	tives are a	is under:									
		Course (	Outcomes									
CO1	To intro	oduce the i	idea of sets, 1	relations, fun	ctions, trigon	ometric fund	ctions, inverse					
	trigono	metric fun	ctions, these	concepts are	e prerequisite	to learn the	concepts of					
	differer	ntiation and	d integration									
CO 2	To intro	oduce the (	Complex nui	nbers which	is fundamenta	al to solve a	ny kind of quadratic					
	equatio	ns, Limit i	s precondition	on to underst	and the conce	pt of rate of	change and derivative.					
CO 3	To deve	elop the es	sential tool of	of Continuity	and Differen	tiability nee	ded in evaluating higher					
	order d	erivatives	of functions.									
CO 4	To intro	oduce the t	cools of Inde	finite and De	finite integral	ls of function	ns in a comprehensive					
	manner	that are us	sed in variou	s techniques	dealing engir	neering prob	lems.					
T-I					(1	12 hrs)						

### UNIT-I

## Sets, Relations, Functions

**Sets and its types:** Operations on sets, complement of a set, Cartesian Product of sets, relations, functions, types of functions, **Trigonometric functions:** Introduction, Angles, Trigonometric functions, Trigonometric functions: Introduction, Sets and difference of two angles, Trigonometric equations, **Inverse Trigonometric functions:** Introduction, basic concepts and its properties.

UNIT-II

(12 hrs)

## **Pre-Calculus**

**Complex Numbers:** Introduction, Algebra of Complex Numbers, Modulus and the conjugate of a complex number, quadratic equations, **Limits and Derivatives:** Introduction, Limits, Limits of Trigonometric Functions, Derivatives (single variable). (12 hrs)

# **Differential Calculus**

**Continuity and Differentiability**: Introduction, Continuity, Differentiability, Exponential and Logarithmic functions, Logarithmic differentiation, Derivatives of functions in parametric forms, second order derivatives, **Application of Derivatives (single variable)**: Increasing and decreasing functions, Maxima and Minima.

#### UNIT-IV

(12 hrs)Integral Calculus

**Integrals:** Introduction, Integration as an Inverse process of Differentiation, Method of Integration, Integration by Partial Fractions, Integration by Parts, **Definite Integrals**: Fundamental theorem of Calculus, Evaluation of Definite Integrals by Substitution, properties of

# Definite Integrals. Suggested Books:

- 1. G. B. Thomas, R. L. Finney: Calculus and Analytic Geometry, Pearson Education.
- 2. Mathematics Textbook for Class 11th& 12th by NCERT.
- 3. Howard Anton: Calculus, Wiley Publication.
- 4. E. Kreyszig: Advanced Engineering Mathematics, Wiley India.

Note: The paper setter will set the paper as per the question paper templates provided.

Course code	ES-1	ES-109									
Coursetitle	Eng	Engineering Graphics & Design									
Scheme and Credits		т	Р	Credit s	Major Test	Minor Test	Tota I	Tim e			
	1 2 0 3 75 25 100							3h			

#### **Course Outcomes**

Objective	- To expose students to the basics of Engineering Drawing , graphics and
Projection	IS.
CO-1	To learn about construction of various types of curves and scales.
CO-2	To learn about orthographic projections of points, lines and planes.
CO-3	To Learn about the sectional views and development of Right regular solids
CO-4	To Learn about the construction of Isometric Projections and conversion of Isometric views to Orthographic views and vice-versa.

### UNIT - I

#### IntroductiontoEngineeringDrawing:

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

### UNIT - II

#### **Orthographic Projections:**

Principles of Orthographic Projections-Conventions-Projections of Points and lines inclined to both planes; Projections of planes inclined to one principalPlane.

## **Projections of Regular Solids:**

Solid with axis inclinedtoboththePlanes;

### UNIT - III

#### Sections and Sectional Viewsof Right Regular Solids:

Sectional views of simple right regular solids like prism, pyramid, Cylinder and Cone. Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone;

### UNIT - IV

#### **Isometric Projections:**

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions:

### **Suggested Books:**

- 1. Engineering Graphics using AUTOCAD 2000: T. Jeyapoovan, Vikas Publishing House.
- 2. Engineering Drawing: Plane and Solid Geometry: N.D. Bhatt and V.M.Panchal, Charotar Publishing House.
- 3. Engineering Drawing: Amar Pathak, Dreamtech Press, New Delhi.
- 4. Thomas E.French, Charles J.Vierck, Robert J.Foster, "Engineering drawing and graphic technology",

McGraw Hill International Editions.

- 5. Engineering Graphics and Drafting: P.S. Gill, Millennium Edition, S.K. Katariaand Sons.
- 6. A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum.
- 7. A.Yarwood, Introduction to AutoCAD 2017, Published by CRC Press.
- 8. O. Ostrowsky, Engineering Drawing with CAD applications, Butterworth Heinemann, 1999.

9. BSI, Technical production documentation (TPD) – specification for defining, specifying and graphically reporting products, BS8888, 2002.

10. CorrespondingsetofCADSoftwareTheoryandUserManuals.

# Note: The paper setter will set the paper as per the question paper templates provided.

Course code	ES-1	ES-113L									
Course title	Engineering Graphics & Design Practice										
Scheme and Credits	L	Т	Ρ	Credi ts	Practica I	Minor Test	Tot al	Time			
	-	-	3	1.5	30	20	50	3h			
Pre-requisites(if any)	-										

Aim: To eng	make student practice on ineering exposure to the visual aspects	graphic s	and	design softwares and provide						
of engineering design.										
CO-1	To give an overview of the user interface	To give an overview of the user interface and toolboxes in a CAD software.								
CO-2	To understand how to customize settings	of CAD soft	tware	and produce CAD drawing.						
CO-3	To practice performing various functions in CAD softwares.									
CO-4	O-4 To Learn about solid modelling and demonstration of a simple team design project.									

### Module 1: Overview of Computer Graphics:

Listing the computer technologies that impact on graphical communication, Demonstrating Knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus(Button Bars), The Command Line(where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

## Module2: Customization & CAD Drawing:

Setup of the drawing page and the printer ,including scale settings, Setting up of units and drawing limits ;ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

# **Module3:** Annotations, layering & other functions:

Applying dimensions to objects ,applying annotations to drawings ;Setting up and use of Layers ,layers to create drawings ,Create ,edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen);Printing documents to paper using the print command ;orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation ,Computer-aided design(CAD) software modeling of parts and assemblies .Parametric and non-parametric solid, surface, and wire frame models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises .Dimensioning guidelines ,tolerancing techniques; dimensioning and scale multi views of dwelling;

# Module4: Demonstration of a simple team design project:

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows ,doors ,and fixtures such as WC, bath ,sink ,shower ,etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modeling (BIM).

### Suggested Books(ES-113L):

Chris McMahon and Jimmie Browne, CAD/CAM – Principle Practice and Manufacturing 1. Management, Addison Wesley England, Second Edition, 2000. Chougule N.K.; CAD/CAM /CAE, Scitech Publications India Pvt. Ltd. 2. Vikram Sharma; Computer Aided Design and Manufacturing, S.K. Kataria and Sons. 3. Rogers, D.F. and Adams, A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 4. 1989 5. Ibrahim Zeid, CAD/CAM theory and Practice, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1992. M.P. Groover, Automation, Productions systems and Computer-Integrated Manufacturing by Prentice -6. Hall. 7. A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum. A.Yarwood, Introduction to AutoCAD 2017, Published by CRC Press. 8. O. Ostrowsky, Engineering Drawing with CAD applications, Butterworth Heinemann, 1999. 9. BSI, Technical production documentation (TPD) - specification for defining, specifying and 10. graphically reporting products, BS8888, 2002. (Corresponding set of)CAD Software Theory and User Manuals 11. Ibrahim Zeid, Mastering CAD/CAM, Tata McGraw Hill Publishing Co. Ltd., New Delhi. 12. P. Radhakrishnan, S. Subramanayan and V.Raju, CAD/CAM/CIM, New Age International (P) 13. Ltd., New Delhi. Groover M.P. and Zimmers E. W., CAD/CAM: Computer Aided Design and Manufacturing, 14. Prentice Hall International, New Delhi, 1992. 15. Dr. Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers, New Delhi, Second Edition, 2000.

16. Thomas E.French, Charles J.Vierck, Robert J.Foster, "Engineering drawing and graphic technology", McGraw Hill International Editions.

Course code	ES-111L										
Course title	Manu	Manufacturing Processes Workshop									
Scheme and Credits	L	Т	Р	Credit s	Practic al	Minor Test	Total	Time			
	0	0	3	1.5	60	40	100	3h			
Pre- requisites (if any)											

Aim: To make students gain a hands on work experience in a typical manufacturing industry environment.

CO-1	To familiarize with different manufacturing methods in industries and work on
	CNC machines.
CO-2	To learn working in Fitting shop and Electrical and Electronics shops,
CO-3	To practice working on Carpentry and Plastic moulding/glass cutting jobs.
CO-4	To gain hands on practice experience on Metal casting and Welding jobs.

# Manufacturing Processes Workshop Contents

- 1. Manufacturing Methods-casting, forming, machining ,joining, advanced manufacturing methods
- 2. CNC machining, Additive manufacturing
- 3. Fitting operations & power tools
- 4. Electrical & Electronics
- 5. Carpentry
- 6. Plastic moulding ,glass cutting
- 7. Metalcasting
- 8. Welding(arc welding & gas welding), brazing

# **Suggested Books:**

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 7th edition, Pearson Education India Edition.

2. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., " Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

3. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I", Pearson Education, 2008.

4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998

5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw-Hill House, 2017.

BS-141	Biology										
L	Т	Р	Cred	Major	Minor	Total	Time				
			it	Test	Test						
2	1	-	3	75	25	100	3h				
Purpos	To familiarize the students with the basics of Biotechnology										
е											
Course C	Outcome	S									
CO1	Introduo	ction to e	ssentials o	of life and m	acromolecule	s essential for	growth and				
	Develop	oment					-				
CO2	Defining	g the basi	ic concept	s of cell div	ision, genes a	nd Immune sys	stem				
CO3	Introdu	ction of b	asic Conce	ept of Therr	no Genetic En	gg. & Biochem	istry				
CO4	Introduction of basic Concept of Microbiology & Role of Biology in Different Fields										

#### Unit – I

**Introduction to living world:** Concept and definition of Biology; Importance of biology in major discoveries of life Characteristic features of living organisms; Cell ultra -structure and functions of cell organelles like nucleus, mitochondria, chloroplast, ribosomes and endoplasmic reticulum; Difference between prokaryotic and eukaryotic cell; Difference between animal and plant cell.

**Classification of organisms**: Classify the organisms on the basis of (a) Cellularity;- Unicellular and Multicellular organisms. (b) Energy and Carbon Utilization:- Autotrophs, Heterotrophs and Lithotrophs (c) Habitat (d) Ammonia excretion: - ammonotelic, 23ricotelic and ureotelic. (e) Habitat- aquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life

#### Unit-II

**Introduction to Biomolecules:** Definition, general classification and important functions of carbohydrates, lipids, proteins, nucleic acids (DNA & RNA: Structure and forms). Hierarchy in protein structure : Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

**Enzymes as biocatalysts:** General characteristics, nomenclature and classification of Enzymes. Effect of temperature, Ph, enzyme and substrate concentrations on the activity of enzymes. Elementary concept of and coenzymes. Mechanism of enzyme action. Enzyme kinetics and kinetic parameters (Km and Vmax)

#### Unit-III

Genetics:-Mendel's laws of inheritance. Variation and speciation. Concepts of recessiveness and dominance.

Geneti

c Disorders: Single gene disorders in humans. **Human traits**: Genetics of blood groups, diabetes type I & II. **Cell Division**:- Mitosis and its utility to living systems. Meiosis and its genetic significance. Evidence of nucleic acids as a genetic material. Central Dogma of molecular biology

**4.** Role of immune system in health and disease : Brief introduction to morphology and pathogenicity of bacteria, fungi, virus, protozoa beneficial and harmful for human beings.

#### Unit-IV

**Metabolism:-**Concept of Exothermic and endothermic reactions. Concept of standard free energy and Spontaneity in biological reactions. Catabolism (Glycolysis and Krebs cycle) and synthesis of glucose (Photosynthesis: - Light and Dark Reaction) of glucose. ATP as Energy Currency of the cell

Microbiology: Concept of species and strains, sterilization and media compositions, growth kinetics.

Role of Biology :Role of Biology in Agriculture, Medicine, Forensic science,<br/>- electromechanical systems ( Bio -MEMS) and Sensors (Biosensors).Bioinformatics, Nanotechnology, Micro

#### **Text Book:**

- 1. Introduction to Biotechnology, By Deswal & Deswal, Dhanpat Rai Publications N.A
- 2. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2014.
- 3. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
- D. L. Nelson and M. M. Cox, "Principles of Biochemistry", W.H. Freeman and Company, 2012.
- 4.G. S. Stent and R. Calendar, "Molecular Genetics", Freeman and company, 1978.

### Note: The paper setter will set the paper as per the question paper templates provided

### **Suggested Books:**

- 1. Molecular Biology of Cell, 4th ed. Alberts, Bruce et al. Garland Science Publishing, New York.
- 2. Microbiology. Pelczar Jr., M.J.; Chan, E.C.S. and Krieg, N.R. Tata McGraw Hill, New Delhi.

3. Lehninger: Principles of Biochemistry, 3rd edition, by David L. Nelson and M.M. Cox. Maxmillan/ Worth publishers.

- 4. Genetics by Snusted & Simmons.
- 5. Molecular Biotechnology: Principles Application of Recombinant DNA. Glick, B. R. and Pasternak, J. J. ASM press Washington DC.

6. Kuby's Immunology, Goldsby, R A, Kindt, T.J, Osborne, B.A. (2003) W. H. Freeman and company, New York.

7. Recombinant DNA 2nd Edition. Watson, James D. and Gilman, M. (2001) W.H Freeman and Company, NewYork.

8. Essentials of Molecular Biology 4thed, Malacinski, G. M. (2003) Jones &Bartlet Publishers, Boston.

ES-101	BASIC ELECTRICAL ENGINEERING															
L	Т	Р	Credit	Major Test	Minor Test	Total	Time(H rs)									
4	1	-	5	75	25	100	3									
Purpos	To familiarize the students with the basics of Electrical															
е	Engineering															
	Cou	rse Outcoi	nes													
CO1	Deals with	steady sta	ate circui	t analysis subje	ct to DC.											
CO 2	Deals with	AC funda	mentals a	& steady state c	ircuit response s	subject t	o AC.									
CO 3	Deals with	introducte	ory Balar	ced Three Phas	e System analy	sis and	Single									
	Phase Transformer.															
CO 4	Explains the	ne Basics	of Electri	cal Machines &	<b>Electrical install</b>	ations	Explains the Basics of Electrical Machines & Electrical installations									

### Unit-I

**D.C. circuits**: Ohm's Law, junction, node, circuit elements classification: Linear & nonlinear, active & passive, lumped & distributed, unilateral & bilateral with examples. KVL, KCL, Loop and node-voltage analysis of resistive circuits. Star- Delta transformation for resistors. **Network Theorems:** Superposition, Thevenin's, Norton's and Maximum power transfer theorems in a resistive network.

## **Unit-II**

**AC Fundamentals:** Mathematical representation of various wave functions. Sinusoidal periodic signal, instantaneous and peak values, polar & rectangular form of representation of impedances and phasor quantities. Addition & subtraction of two or more phasor sinusoidal quantities using component resolution method.RMS and average values of various waveforms.

**A.C. Circuits**: Behavior of various components fed by A.C. source (steady state response of pureR, pure L, pure C, RL, RC, RLC series with waveforms of instantaneous voltage, current & power on simultaneous time axis scale and corresponding phasor diagrams), power factor, active, reactive & apparent power. Frequency response of Series & Parallel RLC ckts. including resonance, Q factor, cut-off frequency & bandwidth. Generation of alternating emf.

## Unit-III

**Balanced Three Phase Systems:** Generation of alternating 3- phase emf). 3-phase balanced circuits, voltage and current relations in star and delta connections. Measurement of 3-phase power by two wattmeter methods for various types of star & delta connected balanced loads.

**Single Phase Transformer** (qualitative analysis only): Concept of magnetic circuits.Relation between MMF & Reluctance.Hysteresis & Eddy current phenomenon. Principle, construction & emf equationPhasor diagram at ideal, no load and on load conditions. Losses & Efficiency, regulation. OC & SC test, equivalent circuit, concept of auto transformer.

### Unit-IV

**Electrical Machines** (qualitative analysis only): Construction and working of a dc machine with commutator action, speed control of dc shunt motor. Generation of rotating magnetic fields, Construction and working of a three -phase induction motor, Significance of torque-slip characteristic. Basics of Single-phase induction motor, capacitor start capacitor run Single-phase induction motor working. Basic construction and working of synchronous generator and motor.

**Electrical Installations (LT Switchgear):** Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing.

# **Suggested Books:**

- 1. Basic Electrical Engg: A complete Solution by Vijay Kumar Garg, Wiley India Ltd.
- 2. Electrical Engg. Fundamentals by Rajendra Prasad, PHI Pub.
- 3. Basic Electrical Engg. by S.K. Sahdev, Pearson Education
- 4. Electrical Engg. Fundamentals: by Bobrow, Oxford Univ. Press
- 5. Basic Electrical Engg. By Del Toro.
- 6. Saxena & Dasgupta: Fundamentals of Electrical Engg (Cambridge University Press).

# Note: The paper setter will set the paper as per the question paper templates provided.

ES- 103L	BASIC ELECTRICAL ENGINEERING LAB										
L	Т	Pract	Cred	Minor	(Practic	Т	Time (Hrs)				
-	-	ical	it 1	Test	al)	ot	3				
		2		20	30	al					
						50					
Purpo	o To familiarize the students with the Electrical Technology Practicals										
se											
	Cours	e Outcon	nes								
CO1	Understand I	basic con	cepts of	Network theo	orems						
CO 2	Deals with st	eady stat	e frequer	ncy response	of RLC circ	uit para	ameters				
	solution tech	niques				-					
CO 3	Deals with in	troductor	y Single	Phase Trans	former pract	icals					
CO 4	Explains the constructional features and practicals of various types of										
	<b>Electrical Ma</b>	chines									

### LIST OF EXPERIMENTS

1. To verify KVL and KCL.

2. To verify Superposition theorem on a linear circuit with at least one voltage & one current source.

3. To verify Thevenin's Theorem on a linear circuit with at least one voltage & one current source.

4. To verify Norton's Theorem on a linear circuit with at least one voltage & one current source.

5. To study frequency response of a series R-L-C circuit on CRO and

determine resonant frequency & Q- factor for various Values of R, L, and C.

6. To study frequency response of a parallel R-L-C circuit on CRO and

determine resonant frequency & Q - Factor for various values of R, L, and C.

7. To perform O.C. and S.C. tests on a single phase transformer.

8. To perform direct load test on a single phase transformer and plot efficiency v/s load characteristic.

9. To perform speed control of the DC shunt motor.

10. To perform starting & reversal of direction of a three phase induction motor.

11. Measurement of power in a 3 phase balanced system by two wattmeter methods.

12. Study of Cut sections of DC Machines, Induction Motor

13. To study components of various LT Switchgears

# Note: At least 9 out of the listed experiments to be performed during the semester.

Course	Course Title	Hours / Week	External	Internal	Total	Credits	Duration
No.			Assessment	Assessment			of exam
GT-301	Introduction to	4	100	50	150	4	3 Hrs
	Geosciences						
GT-302	Physical	4	100	50	150	4	3 Hrs
	Geology						
GT-303	Structural	4	100	50	150	4	3 Hrs
	Geology						
GT-304	Crystallograph	4	100	50	150	4	3 Hrs
	y and						
	Mineralogy						
GT-305	Surveying	4	100	50	150	4	3 Hrs
GT-306	Practical based	12	75	25	100	6	3 Hrs
	on GT-301,						
	GT-302 and						
	GT-304						
GT-307	Practical based	12	75	25	100	6	3 Hrs
	on GT-303 and						
	GT-305						
	Total		650	300	950	32	

M.Tech. Applied Geology (5-Year Integrated Course) 3rd semester

M.Tech. Applied Geology (5-Year Integrated Course) 4th semester

Course	Course Title	Hours/Week	External	Internal	Total	Credit	Duration
No.			Assessment	Assessment		s	of exam
GT-401	Geomorphology	4	100	50	150	4	3 Hrs
GT-402	Geochemistry-I	4	100	50	150	4	3 Hrs
GT-403	Basic Petrology	4	100	50	150	4	3 Hrs
GT-404	Energy Mineral	4	100	50	150	4	3 Hrs
	Resources of India						
GT-405	Computational and	4	100	50	150	4	3 Hrs
	Statistical Methods						
	in Geology						
GT-406	Practical based on	12	75	25	100	6	3 Hrs
	GT-402 and GT-						
	403						
GT-407	Practical based on	12	75	25	100	6	3 Hrs
	GT-401, GT-404						
	and GT-405						
	Total		650	300	950	32	

Course	Course Title	Hours/Week	External	Internal	Tota	Credit	Duration
No.			Assessment	Assessment	1	S	of exam
GT-501	Palaeontology	4	100	50	150	4	3 Hrs
	-I						
GT-502	Plate	4	100	50	150	4	3 Hrs
	Tectonics						
GT-503	Igneous	4	100	50	150	4	3 Hrs
	Petrology						
GT-504	Sedimentolog	4	100	50	150	4	3 Hrs
	у						
GT-505	Geophysical	4	100	50	150	4	3 Hrs
	Prospecting						
GT-506	Practical:	12	75	25	100	6	3 Hrs
	Based on GT-						
	501; GT-503						
GT-507	Practical:	12	75	25	100	6	3 Hrs
	Based on GT-						
	502, GT-504,						
	GT-505						
GT-508	Field	5 to 7 days	100	50	150	4	-
	Training-I						
	Total		750	350	1100	36	

M.Tech. Applied Geology (5-Year Integrated Course) 5th semester

### M.Tech. Applied Geology (5-Year Integrated Course) 6th semester

Course	Course	Hours/Wee	External	Internal	Total	Credits	Duration of
No.	Title	k	Assessment	Assessment			exam
GT-601	Stratigraphy	4	100	50	150	4	3 Hrs
GT-602	Structural	4	100	50	150	4	3 Hrs
	Geology-II						
GT-603	Metamorphi	4	100	50	150	4	3 Hrs
	c Petrology						
GT-604	Applied	4	100	50	150	4	3 Hrs
	Geochemist						
	ry						
GT-605	Economic	4	100	50	150	4	3 Hrs
	and Ore						
	Geology						
GT-606	Practical :	12	75	25	100	6	3 Hrs
	Based on						
	GT-601,						
	GT-602						
GT-607	Practical :	12	75	25	100	6	3 Hrs
	Based on						
	GT-603,						
	GT-604,						
	GT-605						
	Total		650	300	950	32	

Course	Course Title	Hours/Week	External	Internal	Tota	Credits	Duration
No.			Assessment	Assessme	1		of exam
				nt			
GT-701	Remote Sensing	4	100	50	150	4	3 Hrs
	Technology						
GT-702	Mineral	4	100	50	150	4	3 Hrs
	Exploration						
GT-703	Micropalaeontolo	4	100	50	150	4	3 Hrs
	gy and						
	Palynology						
GT-704	Hydrogeology	4	100	50	150	4	3 Hrs
GT-705	Petroleum	4	100	50	150	4	3 Hrs
	Geology						
GT-706	Practical: Based	12	75	25	100	6	3 Hrs
	on GT-701 and						
	GT – 702						
GT-707	Practical: Based	12	75	25	100	6	3 Hrs
	on GT-703, GT-						
	704 and GT- 705						
GT-708	Field Training –	5 to 7 days	100	50	150	4	-
	II						
	Total		750	350	1100	36	

### M.Tech. Applied Geology (5-Year Integrated Course) 7th semester

#### M.Tech. Applied Geology (5-Year Integrated Course) 8th semester

Course	Course Title	Hours/W	External	Internal	Total	Credits	Duration
No.		eek	Assessment	Assessment			of exam
GT-801	Environmental	4	100	50	150	4	3 Hrs
	Geoscience						
GT-802	Coal Geology and	4	100	50	150	4	3 Hrs
	Technology						
GT-803	Mining Geology	4	100	50	150	4	3 Hrs
GT-804	GIS Technology	4	100	50	150	4	3 Hrs
GT-805	Engineering	4	100	50	150	4	3 Hrs
	Geology						
GT-806	Practical: Based	12	75	25	100	6	3 Hrs
	on GT-801 and						
	GT - 804						
GT-807	Practical: Based	12	75	25	100	6	3 Hrs
	on GT-802, GT-						
	803 and GT- 805						
GT-808	Geoscience and	2	35	15	50	2	3 Hrs
(OE-	Society*						
205)							
	Total		685	315	1000	34	

To be opted by the students of other Departments in the science faculty.

Course	Course Title	Hours/	External	Internal	Total	Credits	Duration
No.		Week	Assessment	Assessment			of exam
GT-901	Well Logging	4	100	50	150	4	3 Hrs
GT-902	Advanced	4	100	50	150	4	3 Hrs
	Stratigraphy,						
	Palaeogeography						
	and Paleoecology						
GT-903	Organizational	4	100	50	150	4	3 Hrs
	Behavior and						
	Business						
	Management						
	Electi	ves: Any tv	vo of following	four theory su	bjects		
GT-904	Geohazards and	4	100	50	150	4	3 Hrs
	Disaster						
	Management						
GT-905	Geoscientific	4	100	50	150	4	3 Hrs
	Instrumentation						
	and Analytical						
	Techniques						
GT-906	Oceanography and	4	100	50	150	4	3 Hrs
	Marine Geology						
GT-907	Meteorology	4	100	50	150	4	3 Hrs
GT-908	Practical: Based on	12	75	25	100	6	3 Hrs
	GT-901, GT-902						
	and GT-903						
GT-909	Practical: Based on	12	75	25	100	6	3 Hrs
	two elective						
	subjects opted						
GT-910	Natural Hazards [*]	2	35	15	50	2	3 Hrs
(OE-							
305)							
	Total		685	315	1000	34	

M.Tech. Applied Geology (5-Year Integrated Course) 9th semester

To be opted by the students of other Departments in the science faculty.

#### M.Tech. Applied Geology (5-Year Integrated Course) 10th semester

Course No.	Course Title	Total	Credits	Duration of Exam
GT-1001	Project work	150	4	-
GT-1002	Dissertation	150	4	-
GT-1003	Viva voce	150	4	-
_	Total	450	12	

	INTRODUCTION TO GEOSCIENCES (GT-301)							
Lecture	Credit	Assessment method	External Assessment	Internal Assessment	Total	Exam Duration		
4	4	Theory	100	50	150	3 hrs.		
COURSE OBJECTIVE								
To provi	de an ove	rview of Earth	Sciences includ	ling earth proces	sses, resour	ces and geo-hazards.		
			COURSE O	UTCOMES				
1. Studen	1. Students will get knowledge about Geology as a discipline and its branches. Earth and solar							
system and development of geology as a subject.								
2. Students will learn about minerals, rocks, groundwater and fossil fuels along with tectonics								
and morphological context of major catastrophic events of geological significance.								
3. Studer	3. Students will learn about the history of life on earth, study of ecological spheres and their							

3. Students will learn about the history of life on earth, study of ecological spheres and their relationship with earth's surface.

4. Students will get knowledge about various tools and technologies and their application in earth sciences.

### **DETAILS OF COURSE:**

Unit	Content
1	Geology as an interdisciplinary science. Branches of Geology and their basic
	understanding. Earth's place in the solar system, physical features on its surface, other
	basic features (mass, shape, size, density, etc.). Physical and historical geology.
	Development of Geology: catastrophism, The birth of modern Geology.
2	Basic understanding of minerals, rocks and its types, gemstones, groundwater,
	hydrocarbons and coal. Basic understanding of volcanoes, earthquakes, tsunamis, glaciers,
	landslides, mudflows, avalanches and droughts.
3	Geological time scale. physiographic and geological sub-divisions of India. Evolution of
	life on earth through ages. Physical and chemical properties of earth's spheres:
	hydrosphere, atmosphere and biosphere. Distribution of land and water on earth's surface.
4	Introduction to remote sensing, GIS, GPS and their applications in earth sciences. Mineral
	exploration and its different stages. Basic understanding of geophysical and geological
	methods of exploration.

Sr. No.	Name of Books/Authors
1	Understanding the earth, Press, F. and Siever, R., W.H. Freeman & Co.
2	An Introduction to Physical Geology, Tarbuck, Lutgens, Tasa, Eleventh Edition,
	Pearson Publication.
3	Fundamentals of Geophysics, Lowrie, W., Cambridge University Press.
4	An Introduction to the Rock-Forming Minerals, Deer, W.A., Howie, R.A. and Zussman,
	J., ELBS.
5	Rutley's Elements of Mineralogy, Read, H.H., Springer.
6	A Textbook of Geology, Mukerjee, P.K., World Press.

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Mapping of	Course	<b>Outcomes</b>	to Programme	Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-301.1	3	3	3	3	2	3	2	2	3	3	2
GT-301.2	3	3	3	3	2	3	2	2	3	3	2
GT-301.3	3	3	3	3	2	3	2	2	3	3	2
GT-301.4	3	3	3	3	2	3	2	2	3	3	2
Average	3	3	3	3	2	3	2	2	3	3	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-301.1	3	3	3	3
GT-301.2	3	2	2	2
GT-301.3	3	3	2	3
GT-301.4	3	2	3	2
Average	3	2.5	2.5	2.5

PHYSICAL GEOLOGY (GT-302)										
Lecture	re Credit Assessment External Internal Total Exam Du									
		method	Assessment	Assessment						
4	4         4         Theory         100         50         150         3 hrs.									
COURSE OBJECTIVE										
To provi	de basic u	inderstanding of	general geology	and physical g	eology.					
			COURSE OU	<b>FCOMES</b>						
1.Student	s will get	knowledge abou	t internal struct	ure and atmosp	heric layer	s of Earth.				
2. Studen	ts will lea	rn about various	theories of orig	in of Earth alo	ng with his	storical development				
to the idea of plate tectonics and the concept of plate boundaries.										
3. Studen	ts will get	t to know about	causes, effects a	and tectonic dev	velopments	s of earthquakes and				

volcanism.

4. Students will learn about concepts of groundwater and a brief introduction to a vast field of mass movements.

### **DETAILS OF COURSE:**

Unit	Content										
1	Introduction to physical Geology. Internal structure of Earth: crust, mantle, core and										
	their constitution; atmosphere: layers and composition of atmosphere.										
2	Different hypotheses of earth's origin. Continental drift and seafloor spreading										
	theories, introduction to plate tectonics, types of plate boundaries, ocean basin										
	features.										
3	Earthquakes: terminology, classification, effects of earthquakes, earthquake intensity										
	scale, focus, epicenter, cause of earthquakes. Volcanoes: type of volcanoes,										
	terminology and products of volcanoes.										
4	Introduction to groundwater: types of water, occurrence of groundwater, aquifer and										
	their types. Introduction to mass movements: types of mass movements. Weathering										
	and its types, erosion. Soil and its type.										

Sr.	Name of Books/Authors
No.	
1	Physical Geology, Holmes, A., Ronal, Wiley Publication.
2	Essentials of Geology, Marshak, S., John Wiley & Sons.
3	Understanding the Earth, Press, F. and Siever, R., W. H. Freeman.
4	Earth: Geologic Principles and Histories, Chernicoff, S., Fox,. H.A. and Tanner, L.H.,
	Houghton Mifflin.
5	Physical Geology, Moore, J.S. and Wicander, R., Brooks-Cole.
6	Textbook of Physical Geology, Mahapatra, G.B., CBS Publication.

### Mapping of Course Outcomes to Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-302.1	3	3	3	3	3	3	3	3	3	3	3
GT-302.2	3	3	3	2	3	3	2	2	3	3	3
GT-302.3	3	3	3	3	3	2	3	3	2	3	2
GT-302.4	3	3	3	3	3	3	2	2	3	2	3
Average	3	3	3	2.75	3	2.75	2.5	2.5	2.75	2.75	2.75

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-302.1	3	3	3	3
GT-302.2	3	2	3	2
GT-302.3	3	2	2	3
GT-302.4	3	3	3	3
Average	3	2.5	2.75	2.75

STRUCTURAL GEOLOGY (GT-303)										
Lecture	ture Credit Assessment External Internal Total Exam Duration									
	method Assessment Assessment									
4	4         4         Theory         100         50         150         3 hrs.									
COURSE OBJECTIVE										
To disseminate the knowledge about the concept of geologic structure in rocks.										
COURSE OUTCOMES										
1. Studen	ts will ge	t knowledge ab	out unconform	ities and basem	ent-cove	er relationships.				
2. Studen	ts will le	arn about morj	phology, classif	ication and me	chanism	of folding and its				
relationsh	ip with o	ther geological	structures.							
3. Students will get knowledge about faults, joints and their tectonic significance.										
4. Studer	nts will l	earn about ba	sic concepts, d	evelopment ar	nd petrol	ogical features of				
tectonites										

### **DETAILS OF COURSE:**

Unit	Content
1	Introduction to structural geology and its importance in geology. Concept of
	unconformity: definition of unconformity and its types, recognition of
	unconformities and its geological significance. Primary and secondary structures.
2	Folds: introduction, morphology of folds, geometric and genetic classifications of
	folds, Mechanism and causes of folding. Recognition of folds in the field.
3	Faults: introduction, morphology of faults, geometric and genetic classifications of
	faults. Joints: definition, types and classification. Tectonic significance of joints and
	faults.
4	Concept of foliation and cleavage: mechanism of development, foliations in gneisses
	and mylonitic zones. Concept of lineation: basic terminology, lineations related to
	plastic deformation, lineations in the brittle regime.

Sr. No.	Name of Books/Authors
1	Folding and Fracturing of Rocks, Ramsay, J.G., McGraw-Hill.
2	An Outline of Structural Geology, Hobbs, M B.E., Means, W.D. and Williams,
	P.F., Hobbs, M B.E., Means, W.D. and Williams, P.F., John Wiley & Sons.
3	Structural Geology: An Introduction to Geometrical Techniques, Ragan, D.M.,
	,John Wiley & son.
4	Fundamentals of Structural Geology, Pollard, D.D. and Fletcher, R.C., Cambridge
	University Press.
5	Structural Geology, Billings, M.P., Prentice Hall India.
6	Structural Geology, Haakon Fossen, Cambridge University Press.

### Mapping of Course Outcomes to Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-303.1	3	2	3	3	2	3	2	3	3	3	2
GT-303.2	3	2	3	2	2	2	3	2	3	2	2
GT-303.3	3	2	3	2	3	2	3	3	3	2	2
GT-303.4	3	2	3	3	2	2	3	2	3	3	2
Average	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-303.1	3	2	3	3
GT-303.2	3	3	2	3
GT-303.3	3	3	2	3
GT-303.4	3	2	3	2
Average	3	2.5	2.5	2.75

CRYSTALLOGRAPHY AND MINERALOGY (GT-304)										
Lecture	Credit	Assessment	External	ternal Internal Total Exam						
		method	Assessment	Assessment		Duration				
4	4	Theory	100	50	150	3 hrs.				
	COURSE OBJECTIVE									
To introd	uce the bas	sic concepts of cr	ystallography ar	nd mineralogy.						
		C	COURSE OUT	COMES						
1.Student	s will get l	nowledge about	various groups o	of minerals and	their phys	ical properties.				
2.Student	s will ge	t knowledge ab	out basic cond	cepts of optication	al mineral	logy and optical				
classificat	classification of minerals.									
3.Student	3.Students will learn about basic concepts of crystallography.									
4.Student	s will get t	o know about mi	croscopic variat	ions in crystals	and analyt	ical methods.				

### **DETAILS OF COURSE:**

Unit	Content
1	Mineral, definition, different groups of minerals: silicates, carbonates, sulphates, oxides
	and other mineral groups, physical properties of minerals, branches of mineralogy.
2	Principles of optical mineralogy: petrological microscope, nicol prism polarizer, optical
	properties of isotropic and anisotropic minerals in polarized light, optic figures, optical
	sign, uniaxial and biaxial minerals.
3	Crystal: definition, form, unit cell, element of symmetry, parameter and indices, lattice
	concept, holohedral symmetry classes, crystal systems.
4	Crystal defects, polymorphism, isomorphism, pseudomorphism, and twinning, magnetic
	properties of minerals, silicate structures, brief introduction to analytical methods in
	mineral science.

Sr. No.	Name of Books/Authors								
1	Rutley's Elements of Mineralogy, Read, H.H., Twenty-Sixth Edition, George Allen &								
	Unwin Publishers Ltd – 1970.								
2	A Handbook of minerals, Crystals, Rocks and Ores, Parmod, A.O., New India								
	Publishing Agency – 2009.								
3	Modern Crystallography 1: Fundamentals of Crystals, Symmetry, and Methods of								
	Structural Crystallography (Modern Crystallography), Vainshtein, B.K., Springer.								
4	Dana's Manual of Mineralogy, Klein, C., Cornelius, S.H., and Dana, J.D., John Wiley								
	& Sons.								
5	An Introduction to the Rock-Forming Minerals, Deer, W.A., Howie, R.A. and								
	Zussman, J., ELBS.								
6	Crystallography and Crystal Chemistry, Bloss, F.D., Mineralogical Society of America.								

### Mapping of Course Outcomes to Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-304.1	3	2	3	3	2	3	2	3	3	3	2
GT-304.2	3	2	3	2	2	3	3	2	3	2	2
GT-304.3	3	3	3	3	3	2	3	3	3	2	2
GT-304.4	3	2	3	3	2	2	3	2	3	3	2
Average	3	2.25	3	2.75	2.25	2.5	2.75	2.5	3	2.5	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-304.1	3	2	3	3
GT-304.2	3	3	3	3
GT-304.3	3	3	2	3
GT-304.4	3	2	3	2
Average	3	2.5	2.75	2.75

SURVEYING (GT-305)									
Lecture	Credit	Assessment	External	Internal	Total	Exam Duration			
		method	Assessment	Assessment					
4	4	Theory	100	50	150	3 hrs.			
		C	COURSE OBJ	ECTIVE					
To impar	rt basic	understanding of	different typ	bes of survey	methods,	their working and			
significan	ce.								
		C	COURSE OUT	COMES					
1.Students	s will get	knowledge about	basic concepts	of table survey	ving.				
2.Students will learn various methods of distance measurements and levelling.									
3.Students	s will lear	n about concepts	of bearing and	compasses.					
4.Students	s will lear	n methods of cont	touring and the	odolite surveyi	ng				

### **DETAILS OF COURSE:**

Unit	Content
1	Fundamental of surveying: definition, principles of surveying, types of surveying, uses of
	surveying. Plain table surveying: instruments of plane table, working operations,
	methods of plane table surveying - radiation method, intersection method, traversing
	method, re-section method, merits and demerits of plane table.
2	Measurement of distances: direct measurement, instruments for measuring distance,
	errors in chaining and tape corrections. Levelling: principles of levelling, different terms
	of levelling, types of levels and staff, temporary adjustment of levels.
3	Bearings: whole circle bearing (W.C.B), quadrantal bearing, reduced bearing, fore
	bearing and back bearing, instruments of measurement of bearing- prismatic compass
	and surveyor's compass, errors in compass (Prismatic or Surveyor's). Total station
	method: principal and working.
4	Contouring: methods of contouring, interpolation of contours, characteristics of contours.
	Theodolite surveying: instrumentation and working. Tacheometric surveying:
	introduction, instrument used in tacheometry, principle of tacheometry, methods of
	tacheometry.

Sr. No.	Name of Books/Authors
1	Surveying Vol.I, B.C.Punmia, McGraw Hill.
2	Surveying Vol.I, T.P.Kanitkar, Pune Vidyarthi Griha Prakashan.
3	Surveying Vol.2, B.C. Punmia, McGraw Hill.
4	Surveying Vol.2, T.P. Kanitkar, Pune Vidyarthi Griha Prakashan.

### Mapping of Course Outcomes to Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-305.1	3	3	3	3	3	3	2	3	3	3	2
GT-305.2	3	2	3	2	2	2	3	2	3	2	2
GT-305.3	3	2	3	2	3	2	3	3	2	2	2
GT-305.4	3	2	2	3	2	2	3	2	3	2	2
Average	3	2.25	2.75	2.5	2.75	2.25	2.75	2.5	2.75	2.25	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-305.1	3	2	3	3
GT-305.2	3	3	2	3
GT-305.3	3	3	2	3
GT-305.4	2	2	3	2
Average	2.75	2.5	2.5	2.75

PRACTICAL (GT-306)								
		(Based on	GT-301,GT-	302 & GT-30	04)			
Lecture	ture Credit Assessment External Internal Total Exam duration Method Assessment Assessment							
12	6	Practical	75	25	100	3 Hrs.		
		C	OURSE OBJE	ECTIVE				
To impart	knowled	ge and skills for	identification	of minerals in	hand sp	ecimens and under		
microscop	e.							
COURSE OUTCOME								
Students a	acquire kn	owledge about pr	rocedure of min	neral identificat	tion based	upon macroscopic		
and micro	scopic stu	dy.						

### LIST OF PRACTICALS:

- Study of crystal forms in different crystal systems.
- Identification of hand specimens using physical properties.
- Study of properties of minerals under microscope in polarized light.
- Identification of Minerals using X-ray diffraction.
- Determination of hardness, specific gravity, of Minerals and classification on that basis.

PRACTICAL (GT-307) (Based on GT-303 & GT-305)									
Lecture	LectureCreditAssessmentExternalInternalTotalExam durationMethodAssessmentAssessmentAssessmentAssessmentAssessmentAssessment								
12	6	Practical	75	25	100	3 Hrs.			
		C	OURSE OBJI	ECTIVE					
To impart	To impart knowledge and skills surveying methods and study, drawing structures maps.								
	COURSE OUTCOME								
Students a	cquire know	wledge of survey	ing methods an	d study, drawii	ng structur	res maps.			

### LIST OF PRACTICALS:

• Performing surveys using different methods and techniques, such as: plane table, compass survey, dumpy level, theodolite, total station etc.

• Interpretation and calculations based on data collected by various Survey techniques.

• Contour, stratum contour, dip and strike problem; Completion of outcrop pattern.

Geological maps-cross-section through different types of structures and geological history, Identification of folds and faults in models and geological structures in hand specimens.

GEOMORPHOLOGY (GT-401)									
Lecture	Credit	Credit Assessment External Internal Total Exam Du							
		method	Assessment	Assessment					
4	4	Theory	100	50	150	3 hrs.			
		(	COURSE OBJ	ECTIVE					
To introdu	uce the diff	ferent types of la	ndforms and th	eir related proc	cesses.				
COURSE OUTCOMES									
1.Student	s will get	knowledge ab	out basic con	cepts of geom	orpholog	y and denudational			
processes	•								
2.Students will learn basic concepts of river and aeolian geomorphology and landforms									
associated with them.									
3.Students will get to know basic concepts of coastal and glacial geomorphology and associated									
landforms.									

4.Students will get knowledge about tectonic geomorphology and applied geomorphology.

### **DETAILS OF COURSE:**

Unit	Contents
1	Introduction: development, scope, geomorphic concepts. Landforms: role of lithology,
	endogenous and exogenous forces responsible, climatic and tectonic factors. Denudational
	processes: weathering and its types, erosion, transportation, weathering products and soils
	profiles, types, duricrusts, desert varnish, mass wasting processes and its classification.
2	Fluvial Geomorphology: stream and river processes. Drainage basin: drainage pattern,
	network characteristics, processes of transport, channel geometry, erosional and
	depositional features. Desert Geomorphology: deserts and global wind patterns, erosion,
	transportation and depositional processes of wind.
3	Glacial Geomorphology: formation of glacier ice from snow, morphological and thermal
	classification of glaciers, glacial landforms. Coastal geomorphology: ocean waves,
	currents and swash, longshore and rip currents, littoral drift, marine erosional and
	depositional landforms.
4	Tectonic Geomorphology: geomorphic indicators of tectonic activity and use of
	geomorphic elements such as drainage patterns, fluvial terraces, paleosols and alluvial
	fans in neo-tectonic interpretation. Applied Geomorphology: applications in various fields
	of earth sciences viz. mineral prospecting, geohydrology, civil engineering and
	environmental studies; geomorphology and GIS. Geomorphology of India: geomorphic
	features and zones

Sr. No.	Name of Books/Authors
1	Physical Geology, Holmes, A., Ronald Press.
2	Principles of Geomorphology, Thornbury, W.D., Balkema Publishing House.
3	Fundamentals of Geomorphology, Huggett, R., Routledge Press.
4	Cenozoic Geomorphology, Bloom, A., Eastern Economy Publishers.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-401.1	3	2	3	3	2	3	2	3	3	3	3
GT-401.2	3	3	3	2	2	2	3	3	3	2	2
GT-401.3	3	2	3	3	3	2	3	3	3	2	3
GT-401.4	3	3	3	3	2	2	3	2	3	3	2
Average	3	2.5	3	2.75	2.25	2.25	2.75	2.75	3	2.5	2.5

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-401.1	3	2	3	3
GT-401.2	3	3	2	3
GT-401.3	3	3	3	3
GT-401.4	3	2	3	3
Average	3	2.5	2.75	3

GEOCHEMISTRY (GT-402)								
Lecture	Credit	Assessment method	External Assessment	Internal Assessment	ternal Total essment			
4	4	Theory	100	50	150	3 hrs.		
		CO	URSE OBJEC	TIVE		·		
To introdu	ice basic pr	inciples of geoche	mistry					
		CO	URSE OUTCO	MES				
1.Students	s will be abl	e to understand of	bjectives and his	tory of geochem	istry and fur	ndamentals of		
thermodyn	namics.							
2.Students will learn about partitioning in minerals and trace elements.								
3.Students	s will learn a	about the geochem	nistry of radioact	ive elements.				
4.Students	s will get to	know about the g	eochemistry of s	table isotopes.				

### **DETAILS OF COURSE**:

Unit	Content								
1	Objective and history of geochemistry: geochemical classification of elements. Cosmic								
	abundance of elements and stability, fundamentals of thermodynamics, law of								
	thermodynamics, thermodynamics and kinematics.								
2	Principles of ionic substitution in minerals: element partitioning in mineral / rock								
	formation. Physico-chemical factors in sedimentation. Trace elements. Geochemical								
	cycle. Geochemistry of hydrosphere and biosphere.								
3	Geochemistry of uranium, thorium, rubidium and strontium; principles of U-Pb, Rb-Sr,								
	K-Ar, C-14 methods in dating.								
4	Significance of stable isotope geochemistry in geology, isotope fractionation in nature;								
	stable isotopes of oxygen, carbon and hydrogen and their determination.								

Sr. No.	Name of Books/Authors
1	Introduction to Geochemistry, Mason, B. and Moore, C.B., 1991, Wiley Eastern.
2	Introduction to Geochemistry, Krauskopf, K.B., 1967, McGraw Hill.
3	Principles of Isotope Geochemistry, Faure, G., 1986, John Wiley.
4	Geochemistry, Wedepohl, K.H.Holt, Rinehart and Winston Inc. USA.
5	Geochemistry, Brownlow, A.H. Prentice-Hall.
7	Geochemical Thermodynamics, Nordstrom, D.K. and Munoz, J.L, Blackwell.
8	Hand Book of Exploration Geochemistry, Govett, G.J.S., Elsevier.
9	Using Geochemical data, Rollinson, H., Longman Scientific & Technical NY.

### Mapping of Course Outcomes to Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-402.1	3	2	3	3	2	3	2	3	3	3	2
GT-402.2	3	3	3	2	2	2	3	2	3	2	2
GT-402.3	3	2	3	3	3	3	3	3	2	2	2
GT-402.4	3	3	3	3	2	2	3	2	3	3	3
Average	3	2.5	3	2.75	2.25	2.5	2.75	2.5	2.75	2.5	2.25

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-402.1	3	2	3	3
GT-402.2	3	3	3	3
GT-402.3	3	3	2	3
GT-402.4	3	3	3	2
Average	3	2.75	2.75	2.75

BASIC PETROLOGY (GT-403)								
Lecture	Credit	Assessment method	External Assessment	Internal Assessment	Total	Exam Duration		
4	4	Theory	100	50	150	3 hrs.		
COURSE OBJECTIVE								
To provid	e basic kr	nowledge of rock	types, their ori	gin, textures an	d structure	es.		
			COURSE OU	<b>FCOMES</b>				
1.Student	s will get	knowledge abo	out origin, diffe	erentiation of n	nagmas ar	nd various structures		
associated	l with it.							
2.Students will learn about texture, structures, classification and composition of igneous rocks.								
3.Student	s will get	t to know abou	it types and ag	gents of metam	orphism a	and classification of		
metamorp	hic rocks							

4.Students will learn about nature, origin, textures and classification of clastic and non-clastic sedimentary rocks.

### **DETAILS OF COURSE:**

Unit	Content
1	Origin of magmas, differentiation of magma: fractional crystallization, liquid
	immiscibility, magma mixing and assimilation. Bowen's reaction series. Intrusive igneous
	activity: nature of intrusive bodies, tabular intrusive bodies, dikes and sills, massive
	intrusive bodies, batholith, lopolith, laccoliths, phacoliths.
2	Igneous Rocks: definition, classification of igneous rocks, mode of occurrence of igneous
	rocks, texture of igneous rocks, structures of igneous rocks, chemical composition and mineral composition of igneous rocks, IUGS classification of igneous rock. Description
	of certain important igneous rocks.
3	Metamorphic rocks: metamorphism and their types, agents of metamorphism: heat, pressure, differential stress, chemically active fluids. Classification of metamorphic rocks: foliated and non- foliated rocks, texture of metamorphic rocks, structure of metamorphic rocks.
4	Sedimentary rocks: nature and origin of sedimentary rocks, concept of size, size scales. mode of sediment transport. shape and roundness, sphericity. Sedimentary Fabric, porosity, permeability. Classification of sedimentary structures, geometry of sedimentary bodies. Elementary ideas about sandstones, conglomerates, shales, limestones and dolomites. Basic classification of clastic and non- clastic sedimentary rocks.

Sr. No.	Name of Books/Authors
1	Petrology: The Study of Igneous, Sedimentary and Metamorphic Rocks, Raymond, L.A.,
	McGraw Hill College.
2	Igneous and Metamorphic Petrology, Best, M.G., Wiley-Blackwell.
3	Introduction to Metamorphic Petrology, Yardley, B.W.D., Longman Scientific and
	Technical.
4	Sedimentary Petrology, Tucker, H.E., Wiley-Blackwell.
5	Sedimentary Rocks, Pettijohn, F.J., Harper-Collins.
6 Principles of Metamorphic Petrology, Vernon, R.H., and Clarke, G., Cambridge University Press.

#### **Mapping of Course Outcomes to Programme Outcomes**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-403.1	3	3	3	3	2	3	2	3	3	3	2
GT-403.2	2	2	3	2	2	2	3	2	3	2	2
GT-403.3	3	3	3	2	3	2	3	3	3	2	2
GT-403.4	3	2	3	3	2	2	3	2	3	3	2
Average	2.75	2.5	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-403.1	3	2	3	3
GT-403.2	3	3	2	3
GT-403.3	3	3	2	3
GT-403.4	3	2	3	2
Average	3	2.5	2.5	2.75

ENERGY MINERAL RESOURCES OF INDIA (GT-404)							
Lecture	Credit	lit Assessment External Internal Total Exam Duration					
		method	Assessment	Assessment			
4	4	Theory	100	50	150	3 hrs.	
		CO	<b>DURSE OBJE</b>	CTIVE			
To introd	To introduce students with the major energy mineral resources of India.						
COURSE OUTCOMES							
1.Student	s will get	acknowledged	about the en	ergy scenario	, product	ion, demand and	
consumpt	ion of impo	ortant mineral reso	ources in the wo	orld and India.			
2.Students will learn about origin, types, physical and chemical properties of coal and its							
geographical and geological distribution in India.							
3.Students will get to know about origin, migration and entrapment of petroleum along with							
brief over	view on oil	and gas potential	of India.				

4.Students will get acknowledged to concepts of nuclear energy and nuclear energy scenario of India and its future prospects.

## **DETAILS OF COURSE:**

Unit	Content
1	A brief overview of energy mineral resources of India and their contribution to the total
	energy demands of the country, linkage of industrialization with energy consumption,
	sources of renewable and non-renewable energy, suitability of different parts of India for
	harnessing different types of renewable energy. Importance of sustainable energy
	resources in the development of the country.
2	Coal: definition, types, coalification process, rank of coal, properties of coal: moisture,
	ash content, volatile matter, present day peat bogs and swamps, important gondwana and
	tertiary coal fields of India, coal production.
3	Source rock, reservoir rock, traps, migration of oil and gas, characteristics of reservoir
	rocks and cap rock, major oil and gas fields of India, India's oil and gas reserves-position
	in the world and future prospects.
4	Radioactivity and nuclear energy, important atomic minerals, their mode of occurrence
	and association, U and Th deposits of India, production, reserves and future scenario.
	Nuclear power production and its potential in India. Peaceful uses of nuclear energy,
	nuclear environmental hazards.

Sr. No.	Name of Books/Authors
1	Economic mineral deposits, Bateman, A.M., Chapman and Hall.
2	Ore Deposits of India, Gokhale and Rao, Thomson Press, Delhi.
3	India's mineral resources, Krishnaswami S., Oxford & IBH.
4	A Handbook of minerals, Crystals, Rocks and Ores, Parmod, A.O., New India
	Publishing Agency – 2009.
5	Economic Geology - Economic Mineral Deposits of India,, Prasad, U., CBS Publishers

	Ltd.
6	Textbook of coal (Indian Context), Chandra, D., Singh R.M. and Singh. M.P., Tata book
	Agency, Varanasi.
7	Coal and Organic Petrology, Singh, M.P. (Ed), Hindustan Publication Ltd. New Delhi.
8	Introduction to Petroleum Geology, Holson, G.D., Tiratsoo, E.N., Gulf Publication
	Houston, Texas – 1985.
9	Geology of Petroleum, Laverson, A.I., W. H. Freeman and company.
10	Petroleum Geology, North, F.K., Kluwer Academic Publisher.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-404.1	3	2	3	3	2	3	2	3	3	3	3
GT-404.2	3	2	3	2	2	2	3	2	3	2	3
GT-404.3	3	2	3	2	3	2	3	3	3	2	3
GT-404.4	3	2	3	3	3	3	3	2	3	3	3
Average	3	2	3	2.5	2.5	2.5	2.75	2.5	3	2.5	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-404.1	3	2	3	3
GT-404.2	3	3	3	3
GT-404.3	3	3	3	3
GT-404.4	3	3	3	2
Average	3	2.75	3	2.75

CON	COMPUTATIONAL AND STATISTICAL METHODS IN GEOLOGY						
			(GT-40	5)			
Lecture	Credit	Assessment	External	Internal	Total	Exam Duration	
		method	Assessment	Assessment			
4	4	Theory	100	50	150	3 hrs.	
	COURSE OBJECTIVE						
To provid	le basic co	oncepts of con	nputing technic	ues and statis	tical met	hods applicable to	
geological	l problems.						
COURSE OUTCOMES							
1.Students	1.Students will get acknowledged about the role of mathematical techniques in geo-sciences with						
a quick rewind of basic computer concepts.							
2.Students will get to learn various methods of data handling and representation.							
3.Students	s will get	knowledge of	f basic concep	ots of comput	er langua	age and graphical	

representation of data.

4. Students will learn about statistical techniques and their application in geology.

## **DETAILS OF COURSE:**

Unit	Content
1	Role of mathematical and numerical techniques in geo-sciences, qualitative and
	quantitative data in geology; application of computer in general database of geology.
	Computer system hardware: operating system, DOS and its use.
2	Spreadsheets: workbook, worksheet, cell and cell reference, type of data, Functions and
	formulas, cell range and reference in formula; protecting worksheets; sorting and filtering
	data; numerical integration by simpson's method, trapezoidal method. Utility of open
	source and other common softwares in calculating statistical parameters and presenting
	them in graphic manner.
3	Graphs: collection and selection of data, linear and logarithmic scale, linear graphs, 2d and
	3d graphs, bar graphs, scatter plots, pie diagrams etc, use of graphs in geoscience.
	Data types, expressions and statements, interactive statements, input/output statements
	subroutine and functions. Utility of google-earth software in understanding earth features
	and geomorphic-tectonic units, least square fit to the given data.
4	Statistical techniques: mean, mode, median, cumulative frequency distribution, skewness
	& kurtosis, graphical representation on histograms and curves, regression analysis, linear
	regression, correlation and correlation coefficients, application of these methods in
	geology.

Sr. No.	Name of Books/Authors
1	Statistics of Earth science Data, Borradaile, G.J., Springer.
2	Elementary Numerical Analysis, Atkinson, K., Han John, W., John Wiley & Sons.
3	Applied Numerical Methods, Yang, W.Y., Cao, W., Chung, T.S., John Wiley & Sons.

4	Numerical Recipes: The Art of Scientific Computing, Press, W.H., Teukolsky, S.A.,
	Vellerling, W.T., Flannery, B.P., Cambridge University Press.
5	Statistics and Data Analysis in Geology, Davis, J.C., 3 rd Ed., John Wiley & Sons.
6	Computer Oriented Numerical Methods, Rajaraman, V., Prentice Hall of India

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-405.1	3	2	3	3	2	3	2	3	3	3	2
GT-405.2	3	3	3	2	2	2	3	2	3	2	2
GT-405.3	3	2	3	2	3	2	3	3	3	2	3
GT-405.4	3	3	3	3	2	3	3	2	3	3	3
Average	3	2.5	3	2.5	2.25	2.5	2.75	2.5	3	2.5	2.5

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-405.1	3	2	3	3
GT-405.2	3	3	2	3
GT-405.3	3	3	2	3
GT-405.4	3	2	3	2
Average	3	2.5	2.5	2.75

<b>PRACTICAL (GT-406)</b> (Based upon GT-402 & GT-403)							
Lecture	Credit	Assessment Method	External Assessment	Internal Assessment	Total	Exam duration	
12	6	Practical	75	25	100	3 Hrs.	
		(	COURSE OBJE	ECTIVE			
To introdu	ice studen	ts about identifica	ation of rock sar	nples based on :	macroscoj	pic and	
microscop	oic propert	ies.					
	COURSE OUTCOME						
Students will get acknowledged about identification of rock samples based on macroscopic and							
microscop	oic propert	ies.					

## LIST OF PRACTICALS:

- Study of different rock types in hand specimens.
- Microscopic study of mineral assemblages of different igneous, metamorphic and sedimentary rocks.
- Exercise based on CIPW norms.

<b>PRACTICAL (GT-407)</b> (Based upon GT-401,GT-404 & GT-405)							
Lecture	Credit	Assessment Method	External Assessment	Internal Assessment	Total	Exam duration	
12	6	Practical	75	25	100	3 Hrs.	
	·	C	COURSE OBJE	ECTIVE			
To introdu	To introduce students to computational and statistical methods application in earth science.						
COURSE OUTCOME							
Students	Students will get acknowledged about computational methods and its use in solving statistical						
and other	problems	in earth science.					

## LIST OF PRACTICALS:

- Spreadsheets for solving mathematical and statistical problems in earth science.
- Spreadsheets used in statistical exercises based on geo-scientific data.
- Creating graphs from tabular data: linear, 2d and 3d.
- Trigonometry: dip, apparent dip, strike, slope and other related problems.
- Exercises based on energy mineral resources of India.
- Exercises based on morphometry of river channels (drainage pattern, stream order, sinuosity)

	PALAEONTOLOGY-I (GT-501)									
Lecture	Credit	Assessment	External	Internal	Total	Exam Duration				
		method	Assessment	Assessment						
4	4	Theory	100	50	150 3 hrs.					
COURSE OBJECTIVE										
To introd	To introduce basic concepts in paleontology: invertebrate, vertebrate and plant fossils.									
			COURSE OU	TCOMES						
1. Studen	ts will get	introduced to the	study of fossils	and evolutional	ry history o	of life.				
2. Studer	nts will g	et acknowledged	with morpholo	ogy and classif	ication of	major vertebrate and				
invertebra	ate fossil s	pecies.								
3. Studen	3. Students will learn about concepts of micropalaeontology and palaeobotany.									
4. Studen	4. Students will get knowledge of palynology and its application in geosciences.									

## **DETAILS OF COURSE:**

Unit	Content						
1	Fundamentals: definition, objectives and scope, nature of fossil record and their uses,						
	classification of animals, their habits and habitats, evolution of life through the ages,						
	migration, dispersal and extinction of life.						
2	Invertebrate paleontology: morphology, classification, evolutionary trends, geological						
	history and geographical distribution of brachiopods, pelecypods, gastropods, cephalopods,						
	trilobita, echinoides, coelenterates and graptolites, vertebrate paleontology- basic concepts,						
	broad classification of groups.						
3	Micropaleontology: introduction, techniques of processing of samples, brief morphology and						
	classification of foraminifera, ostracods, radiolarians and conodonts. Palaeobotany:						
	introduction, gondwana flora.						
4	Basics of palynology and its applications, applied aspects: age determination and correlation,						
	palaeoecological interpretations with case histories, fossils as a tool in petroleum						
	exploration.						

Sr. No.	Name of Books/Authors
1	An Introduction to the Study of Fossil Plants, Walton, J., Adam & Charles Black.
2	Paleontology Invertebrate, Woods, H., CBS Publications.
3	Vertebrate Paleontology, Benton, M.J., Chapman & Hall.
4	Paleontology, Colbert, R.L., John Willey & Sons.
5	Invertebrate Paleontology, Schrock Twenhofel, McGraw Hill.
6	Biostratigraphy: Microfossils & Geological Time, McGowran, B., Cambridge University
	Press.
7	Microfossils, Second Edition, Howard A. Armstrong & Martin D. Brasier, Blackwell
	Publication.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-501.1	3	3	3	3	2	3	2	3	3	3	3
GT-501.2	3	2	3	2	3	2	3	2	3	2	2
GT-501.3	3	3	3	2	3	2	3	3	3	2	3
GT-501.4	3	2	3	3	3	3	3	2	3	3	2
Average	3	2.5	3	2.5	2.75	2.5	2.75	2.5	3	2.5	2.5

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-501.1	3	2	3	3
GT-501.2	3	3	2	3
GT-501.3	3	3	2	3
GT-501.4	3	2	3	2
Average	3	2.5	2.5	2.75

		PLAT	E TECTONI	CS (GT-502)	)			
Lecture	Credit	Assessment	External	Internal	Total	Exam Duration		
		method	Assessment	Assessment				
4	4	Theory	100	50	150	3 hrs.		
	COURSE OBJECTIVE							
To impart	To impart in-depth understanding of types of plate boundaries and different geological processes							
and featur	es at plate	boundaries.						
	COURSE OUTCOMES							
1. St	udents wi	ll get knowledg	ge about plate	tectonics and	their mov	vement along with		
structural	and seismo	ological features						
2. St	udents will	l learn about the	origin and evol	ution of constr	uctive and	d conservative plate		
boundarie	s and struc	tures related to t	hem.					
3. St	3. Students will get a deep insight on destructive plate boundaries and associated features.							
4. St	. Students will get acknowledged to concepts of orogenesis and a detailed description of							
Indian pla	Indian plate with special emphasis on himalayan orogeny.							

# DETAILS OF COURSE:

Unit	Content
1	Introduction to plate tectonics: historical background, evidence of plate motion, plate
	driving force, lithosphere, asthenosphere, types of place boundaries and sense of
	displacements of plates, oceanic and continental types of lithosphere, constituents, major
	structural seismological features of the earth interior.
2	Constructive plate boundaries: origin and evolution, internal and external structure,
	composition; gravity anomaly. Conservative plate boundaries: structure and evolution,
	transforms faults and plate motions, seismicity, palaeomagnetism and its application in
	plate palaeo positions.
3	Destructive plate boundaries: surface manifestations, geophysical and geological
	characteristics: gravity anomaly, sedimentological, metamorphic and magmatic
	characteristics; associated geological features: oceanic trenches, island arc, volcanic arcs,
	accretionary wedges, fore and back arc basin.
4	The Wilson cycle; orogenesis: plate tectonics and mountain building processes, Indian
	plate: configuration and characters of Indian plate margins and palaeo positions of Indian
	plate, Himalayan orogeny and tectonic models.

Sr. No.	Name of Books/Authors
1	Plate Tectonics and Crustal Evolution, Condie, K.C., Butterworth-Heinemann.
2	Understanding the Earth, Brown, G.C., Hawkesworth, C.J. and Wilson, R.C.I. (Eds.),
	Cambridge University Press.
3	Global Tectonics, Kearey, P. and Vine, F.J., Blackwell.
4	Plate Tectonics: How it Works, Cox, A., Hart, R.B., Wiley-Blackwell.
5	Geology of the Himalayas, Gansser, A., John Wiley & Sons.
6	Dynamic Earth: Plates, Plumes and Mantle Convection, Davies, G.F., Cambridge

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University Press.
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COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-502.1	3	2	3	3	2	3	2	3	3	3	3
GT-502.2	3	2	3	2	2	2	3	2	3	2	2
GT-502.3	3	2	3	2	3	3	3	3	2	2	2
GT-502.4	3	2	3	3	2	2	3	2	3	3	3
Average	3	2	3	2.5	2.25	2.5	2.75	2.5	2.75	2.5	2.5

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-502.1	3	2	3	3
GT-502.2	3	3	2	3
GT-502.3	2	3	2	2
GT-502.4	3	2	3	2
Average	2.75	2.5	2.5	2.5

IGNEOUS PETROLOGY (GT-503)											
Lecture	Credit	Assessment	Assessment External Internal Total Exa								
		method	Assessment	Assessment		Duration					
4	4	Theory	100	50	150	3 hrs.					
COURSE OBJECTIVE											
To provide in-depth knowledge of igneous rocks including their fabric, geochemical											
characteristics and petrogenesis.											
COURSE OUTCOMES											
1. St	udents wil	l get detailed kn	owledge about	generation and	differenti	ation of magma.					
2. St	udents wi	ll learn detailed	classification of	of igneous rock	and me	ethods associated					
with it.											
3. St	3. Students will get introduced to vast concepts of phase rule and various phase										
diagrams to understand the crystallization behavior of igneous rocks; Trace elements as											
petrogenetic indicators.											
4. St	udents wi	ll learn about tl	he relationship	of magmatism	with pla	ate tectonics and					

global tectonic processes.

## **DETAILS OF COURSE:**

Unit	Content
1	Generation of magma: magma from partial melting in mantle, magma generation in
	crust, magma differentiation: fractional crystallization, gravitational differentiation,
	liquid immiscibility, magma mixing, assimilation and contamination of magma.
2	Classification and occurrence of igneous rocks: acidic rocks, intermediate rocks,
	basic rocks, ultramafic rocks, alkaline rocks, carbonatites. concept of CIPW norms,
	variation diagrams in igneous petrology.
3	Phase diagrams: binary and ternary phase diagrams, geochemical characteristics of
	igneous rocks as petrogenetic indicators: Rb-Sr Isotope evolution in igneous rocks;
	Sm–Nd systematics as petrogenetic indicators.
4	Magmatism and global tectonic processes: magmatism at constructive plate margin,
	mid oceanic ridges, ocean floor magmatism, magmatism at destructive plate margin,
	subduction zone magmatism, island arc systems, intraplate magmatism: concept and
	continental flood basalts.

Sr. No.	Name of Books/Authors
1	Igneous and Metamorphic Petrology, Best, M.G., Second Edition, Backwell.
2	Igneous Petrogenesis: A Global Tectonic Approach, Willson, M., Unwin-Hyman.
3	An Introduction to Igneous and Metamorphic Petrology, Winter, J., Prentice Hall.
4	Igneous Petrology, Hall, A., John Wiley & Sons.
5	Igneous Rocks and Processes – A Practical Guide, Gill, R., Wiley Blackwell.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-503.1	3	2	3	3	2	3	2	3	3	3	2
GT-503.2	3	2	3	2	2	2	3	2	3	2	3
GT-503.3	3	3	3	3	3	2	3	3	3	2	3
GT-503.4	3	2	3	3	2	2	3	2	3	3	3
Average	3	2.25	3	2.75	2.25	2.25	2.75	2.5	3	2.5	2.75

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-503.1	3	2	3	3
GT-503.2	3	3	2	3
GT-503.3	3	3	3	3
GT-503.4	3	2	3	2
Average	3	2.5	2.75	2.75

SEDIMENTOLOGY (GT-504)										
Lecture	ture Credit Assessment External Internal Total									
		method	Assessment	Assessment		Duration				
4	4	Theory	100	50	150	3 hrs.				
COURSE OBJECTIVE										
To provide in-depth knowledge of sedimentary processes including depositional environments.										
COURSE OUTCOMES										
1. Stu	dents will	get acknowledged	l with detailed	classification,	textures ar	nd structures				
associated	with coarse	grained siliciclasti	c rocks and a va	ast family of sai	ndstones.					
2. Stu	dents will l	earn about classifi	cation, textures	, structures of o	clay bearing	rocks and a				
deep insight on carbonaceous sedimentary rocks.										
3. Students will get knowledge about chemical sedimentation in sea and rocks associated										
with it with	a brief intr	roduction to the tec	chniques of heav	vy mineral sepa	ration and p	alaeo current				

analysis.

4. Students will learn about broad concepts of sedimentary environments and facies.

## **DETAILS OF COURSE**:

Unit	Content
1	Gravels, conglomerates and breccias: composition, texture, structure and classification
	orthoconglomerate paraconglomerate, intra formational conglomerates, diagenesis of
	conglomerates pseudo conglomerates, pseudo breccia sandstones: fabric, structure,
	mineralogy, classification of sandstones, greywackes, matrix problem, soda problem,
	occurrence and geological signifacence, arkose, definition, fabric and composition, lithic
	sandstones and quartz arenites; definition, origin and geological significance.
	Diagenesis of sandstone: cementation, decementation, matrix and cement.
2	Shales, argillites and siltstones: definition, textures, structures. Clay minerals:
	composition and structure, occurrence and origin clay minerals. Diagenesis of shale:
	compaction, diagenetic classification of shales, residual clays; red, balck siliceous and
	calcareous shales, marls, loess and its origin. Limestones and dolomites: shallow and
	deep sea carbonates, fresh water, carbonates. Textures and structures of carbonates.
	Classification of evaporitic and aeolian
3	Chert: definition, origin and classification glauconite, pyrite and barite nodules, oncolites.
	provenance, mineral stability maturity of sediments: compositional and textural. Heavy
	minerals: definition, method of separation and geological significance. Paleocurrent
	analysis and its significance. Lithification and diagenesis.
4	Physico-chemical condition of sedimentation: Nature of depositing medium, depth of
	water, current velocity, salinity and temperature, classification of sedimentary
	environments, Alluvial fans, braided and meandering fluvial systems, lacustrine, eolian
	and glacial deposits, deltas, clastic shelf, continental slope and pelagic sediments:
	tectonic setting and sedimentology. Sedimentary facies. Flysch molasse sedimentary
	basin in plate tectonic settings.

## **SUGGESTED BOOKS:**

Sr. No.	Name of Books/Authors
1	Origin of Sedimentary Rocks, Blatt, H., Middleton, G.V. and Murray, T.G., Prentice
	Hall.
2	Principles of Sedimentology and Stratigraphy, 4 th Ed., Boggs, S., Prentice Hall.
3	Sedimentology and Sedimentary Basins, Leeder, M.R., Prentice Hall.
4	Sedimentary Environments – Processes, Facies and Stratigraphy, Reading, H.G.,
	Wiley-Blackwell.
5.	Sedimentary rocks, Pettijohn, F.J., CBS Publishers.

## Mapping of Course Outcomes to Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-504.1	3	3	3	3	2	3	2	3	3	3	3
GT-504.2	3	2	2	2	2	2	3	2	3	2	3
GT-504.3	3	3	3	2	3	2	3	3	3	2	2
GT-504.4	3	2	3	3	2	3	3	2	3	3	2
Average	3	2.5	2.75	2.5	2.25	2.5	2.75	2.5	3	2.5	2.5

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-504.1	3	2	3	3
GT-504.2	3	3	2	3
GT-504.3	3	3	2	3
GT-504.4	3	2	3	2
Average	3	2.5	2.5	2.75

GEOPHYSICAL PROSPECTING (GT-505)							
Lecture	Credit	Credit Assessment External Internal Total Exam Dur				<b>Exam Duration</b>	
		method	Assessment	Assessment			
4	4	Theory	100	50	150	3 hrs.	
	COURSE OBJECTIVE						
To introd	uce basic	concepts of ge	ophysical metl	hods and their	application	ns in solving geological	
problems.							
			COURSE O	UTCOMES			
1. St	udents wi	ll get introduce	d to geophysic	al methods of	prospectin	g along with a detailed	
study of g	study of gravity methods.						
2. Students will learn about principles, interpretations and applications of magnetic method of							
prospectir	prospecting.						

3. Students will get to know about reflection and refraction of seismic waves and prospecting techniques related to them.

4. Students will get acknowledged to principles and applications of electrical and electromagnetic method of prospecting.

#### **DETAILS OF COURSE:**

Unit	Content
1	Introduction: overview and importance of various geophysical methods in geological
	studies, gravity method: basic principles, gravity anomalies, gravimeters, data acquisition
	procedures, data reduction and processing, interpretation of bouguer anomalies for basic
	geometrical shapes, depth rules, applications.
2	Magnetic method: basic principles, magnetic anomalies, magnetometers, data acquisition
	procedures, data reduction and processing, interpretation of magnetic anomalies for basic
	geometrical shapes, depth rules, applications.
3	Seismic methods: refraction, reflection and attenuation of seismic waves, geophones and
	hydrophones, recording instruments, seismic refraction method, travel time curves for flat
	interfaces, interpretation of refraction profiles, seismic reflection method, CDP shooting,
	elementary ideas about processing and interpretation of seismic reflection data:
	application.
4	Electrical method: apparent resistivity, sounding and profiling, different electrode
	configurations, field procedures, resistivity meters, data interpretation using curve
	matching method, applications. Electromagnetic methods: basic concepts, dip angle
	techniques, measurement of amplitude and phase, various transmitter and receiver loop
	configurations, applications.

Sr. No.	Name of Books/Authors						
1	Applied Geophysics, Telford, W.M., Geldart, L.P. and Sheriff, R.E., Cambridge						
	University Press.						
2	An Introduction to Geophysical Exploration, Blackwell.						
3	Principles of Applied Geophysics, Parasnis, D.S., Kearey, P. Brooks, M. and Hill, I.,						

	Chapman and Hall.
4	Introduction to Geophysical Prospecting, Dobrin, M.B. and Savit, C.H., McGraw-Hill.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-505.1	3	2	3	3	3	3	2	3	3	3	2
GT-505.2	3	3	3	2	2	3	3	2	3	2	2
GT-505.3	3	3	3	2	3	2	3	3	3	2	2
GT-505.4	3	2	3	3	3	2	3	2	3	3	3
Average	3	2.5	3	2.5	2.75	2.5	2.75	2.5	3	2.5	2.25

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-505.1	3	2	3	3
GT-505.2	3	3	2	3
GT-505.3	3	3	2	3
GT-505.4	3	2	3	2
Average	3	2.5	2.5	2.75

PRACTICAL (GT-506) (Based on GT-501 & 503)						
Lecture	Credit	Assessment Method	External Assessment	Internal Assessment	Total	Exam duration
12	6	Practical	75	25	100	3 Hrs.
		(	COURSE OBJI	ECTIVE		
To impart	knowledg	ge of microscopic	interpretation o	f Igneous rocks	and study	of fossils.
COURSE OUTCOME						
Students come to know about the procedure of microscopic study of igneous rock thin sections						
and study	of fossils					

## LIST OF PRACTICALS:

• Megascopic study of important invertebrate, vertebrate and plant fossils, Microscopic

study of important invertebrate and vertebrate fossils and palynomorphs.

- Microscopic studies of acidic, basic and ultramafic igneous rocks.
- Geochemical variation diagram studies.
- CIPW normative calculations based on geochemical data.

	<b>PRACTICAL (GT-507)</b> (Based on GT-502, GT-504 & GT-505)					
Lecture	re Credit Assessment External Internal Total Exam duration Method Assessment Assessment					
12	6	Practical	75	25	100	3 Hrs.
		С	OURSE OBJE	ECTIVE		
To provide	To provide in-depth practical knowledge of sedimentary rocks and geophysical methods.					
COURSE OUTCOMES						
Students will get knowledge about sediments and sedimentary rocks, and geophysical methods.						

## LIST OF PRACTICALS:

- Grain size analysis using sieves and its statistical analysis.
- Determination of roundness of elastic particles using comparison chart method.
- Statistical analysis of orientation data.
- Thin section study of sandstones and limestone.
- Recognition of major clay minerals from x-ray diffractograms.
- Geophysical practicals & exercises.

FIELD TRAINING-I (GT-508)								
	Assessment	Assessment External Internal Total Exam Duration						
Credit	method Assessment Assessment							
4	Field Training	100	50	150				
	COURSE OBJECTIVE							
To impart u	nderstanding of smal	l scale mapping m	ethods, sampling	g in the fie	ld and using			
different too	ls and instruments in	the field.						
COURSE OUTCOME								
Students will get knowledge about methods of Geological mapping, sampling and learn use of								
tools and instruments in the field and learn about preparing field training reports.								

STRATIGRAPHY (GT-601)									
Lecture	Credit	Assessment	ssessment External Internal Total Exam Duration						
		method	nethod Assessment Assessment						
4	4	Theory	100	50	150	3 hrs.			
		0	COURSE OBJ	ECTIVE					
To provid	e basic un	derstanding of p	rinciples of stra	atigraphy, strati	igraphic co	ontacts geological			
time scale	and strati	igraphic sequence	es of India						
	COURSE OUTCOMES								
1. St	udents wil	ll get knowledge	about basic pr	rinciples of stra	atigraphy a	and geological time			
scale.	scale.								
2. St	2. Students will learn about conformable and unconformable contacts in detail and basic								
concepts of correlation.									
3. St	3. Students will get acknowledged with various branches of stratigraphy with special								
emphasis	on sequen	ce stratigraphy.							

4. Students will get detailed knowledge about major stratigraphic systems of India.

## **DETAILS OF COURSE:**

Unit	Content
1	Define stratigraphy: scope of stratigraphy, principles of stratigraphy, Geological time
	scale, purpose, scope and their development.
2	Stratigraphic contacts: conformity, contacts in conformable strata. Unconformity:
	angular unconformity, disconformity, paraconformity, and nonconformity.
	Correlation: scope of correlation, types of correlation-lithological, biological and
	chrono-correlation.
3	Stratigraphic units: classification and nomenclature of units (lithostratigraphy,
	biostratigraphy, chronostratigraphy and geochronology). Facies: transgression and
	regression. Systems tracts: lowstand, transgressive, highstand, falling stage.
4	Broad outline of some of the major stratigraphic sequences of India, Dharwar
	System, Cuddapah System, Vindhyan System, Spiti Group, Salt range, Deccan
	Traps, Kutch area, Gondwana Group, Siwalik System, assam area stratigraphic units
	of India.

Sr. No.	Name of Books/Authors
1	Principles of Stratigraphy, Lemon, R.L., Merrill Publishing.
2	Fundamentals of Historical Geology and Stratigraphy of India, Boggs, S., Jr. Wiley.
3	Fundamentals of Historical Geology and Stratigraphy of India, Kumar, R., New age
	International Publisher.
4	Geology of India and Burma, Krishan, M.S., CBS Publications.
5	Geology of India, Wadia, D.N., Tata Mc-Graw Hill.
6	Geology of India, Vol. I and II, Ramakrishnan, M. and Vaidyanathan, R.,
	Geological Society of India.

Manning of C	ourse Outcomes	o Programma	Outcomes
Mapping of C	Jourse Outcomes	<u>o r rogramme</u>	Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-601.1	3	2	3	3	2	3	2	3	3	3	3
GT-601.2	3	2	3	2	2	2	3	2	3	2	3
GT-601.3	3	2	3	2	3	2	3	3	3	2	3
GT-601.4	3	2	3	3	2	2	3	2	3	3	2
Average	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2.75

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-601.1	3	2	3	3
GT-601.2	3	3	3	3
GT-601.3	3	3	2	3
GT-601.4	3	3	3	2
Average	3	2.75	2.75	2.75

STRUCTURAL GEOLOGY-II (GT-602)											
Lecture	e Credit Assessment External Internal Total										
		method	Assessment	Assessment		Duration					
4	4	Theory	100	50	150	3 hrs.					
	COURSE OBJECTIVE										
To introduce the students to various geological structures and their mechanism of formation.											
	COURSE OUTCOMES										
1. Tł	ne studen	ts can learn about	the stress and	strain analyti	cal technique	es and their					
geologica	l significa	nce.									
2. Th	ne student	s can learn about ge	cometrical analys	sis of various s	tructures and	mechanisms					
of folding	•										
3. Th	ne student	s will get to know ab	out principles ar	nd geological si	gnificance of	shear zones.					
4. Th	ne student	s will learn detailed	descriptions of	tectonites and a	n overview of	f superposed					

folding.

#### **DETAILS OF COURSE**:

Unit	Content
1	Stress: Stress in homogeneous and inhomogeneous media and analytical techniques.
	Strain: homogeneous strain and techniques of strain analysis including fry method, grain
	centre method and Rf / $\Phi$ method, types of strain ellipses and ellipsoids, their properties
	and geological significance.
2	Geometrical analysis of various structures: geometry and analysis of fractures, joints and
	faults, geometry of folds and their classification schemes, mechanism of folding and
	internal strain accumulation.
3	Shear Zones: shear sense indicators, shear zone kinematics. role of fluids and techniques
	of their analysis, geological importance, basic idea on the structure and tectonics of
	Himalaya.
4	Analysis of foliation and lineation in rocks: geometry, mechanics and significance.
	Techniques of structural analysis in areas of superposed folding.

Sr.	Name of Books/Authors
No.	
1	Principles of Structural Geology, Suupe, J., Prentice-Hall.
2	Structural Geology, Twiss, R.J. and Moores, E.M., W.H. Freeman & Co.
3	Structural Geology of rocks and regions, Davis, G.H. and Reynolds, S.J., John Wiley
	& Sons, Inc.
4	Structural Geology: Fundamental and Modern developments, Ghosh, S.K. 1993,
	Pergamon.
5	Techniques of Modern Structural Geology, Volume 3: Applications of Continuum
	Mechanics in Structural Geology (Modern Structural Geology), Ramsay, J.G., Lisle,
	R.J., Academic Press.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-602.1	3	2	3	3	2	3	2	3	3	3	3
GT-602.2	3	2	3	2	2	2	3	2	3	2	3
GT-602.3	3	2	3	2	3	2	3	3	3	2	2
GT-602.4	3	2	3	3	2	2	3	2	3	3	2
Average	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2.5

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-602.1	3	2	3	3
GT-602.2	3	3	2	3
GT-602.3	3	3	2	3
GT-602.4	3	2	3	2
Average	3	2.5	2.5	2.75

METAMORPHIC PETROLOGY (GT-603)											
Lecture	Credit	Assessment	External	Internal	Total	<b>Exam Duration</b>					
		method	Assessment	Assessment							
4	4	Theory	100	50	150	3 hrs.					
COURSE OBJECTIVE											
To provide in-depth knowledge of phase rule, classification of metamorphic rocks and											
metamorp	hic assen	blages.									
COURSE OUTCOMES											
1. St	udents w	ill get knowledg	e about agent	and types o	of metamo	rphism along with					
various cl	assificatio	on schemes of me	tamorphic rock	KS.							
2. St	udents w	vill recall conce	epts of phase	e rule and u	tilize in	understanding the					
recrystalli	zation be	havior of metamo	rphic rocks.								
3. St	udents w	ill learn about	phase diagram	ns and petroge	enetic grid	d for metamorphic					
assemblag	ges.										
4. St	udents wi	ll get knowledge	about mineral	assemblages a	nd chemo	graphic reactions in					

various metamorphic facies.

## **DETAILS OF COURSE:**

Unit	Content										
1	Type of metamorphism and controlling factors, different types of metamorphic rocks,										
	textural and structural classification of metamorphic rocks.										
2	Phase rule, metamorphic reactions and phase equilibria in metamorphic rocks, graphical										
	representation of various mineral assemblages in different P-T conditions,										
	chemographic projections.										
3	Phase diagrams and petrogenetic grid for metamorphic assemblages in various grades										
	of metamorphism thermodynamics of metamorphic reactions, mineral assemblages and										
	metamorphic isograds.										
4	Mineral assemblages and chemographic relation for different parent rock types in										
	zeolite, prehnite, pumpellyite, greenschist, amphibolite, granulite, eclogite, and										
	blueschist facies and sub-facies, mineral paragenesis.										

Sr. No.	Name of Books/Authors
1	Igneous and Metamorphic Petrology, Best, M.G., Blackwell.
2	Petrogenesis of Metamorphic Rocks, Bucher, K., Grapes, R., Springer.
3	Metamorphic Phase Equilibria and Pressure-Temperature-Time Paths, Spear, F.S.,
	Mineralogical Society of America Monograph.
4	An Introduction to Metamorphic Petrology, Yardley, B.W.D., Longman-ELBS.
5	An Introduction to Igneous and Metamorphic Petrology", Winter, J.D., Prentice-Hall.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-603.1	3	3	3	3	2	3	2	3	3	3	2
GT-603.2	3	3	3	2	3	2	3	2	3	2	3
GT-603.3	3	2	3	2	3	2	3	3	3	2	3
GT-603.4	3	2	2	3	2	3	3	2	3	3	3
Average	3	2.5	2.75	2.5	2.5	2.5	2.75	2.5	3	2.5	2.75

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-603.1	3	2	3	3
GT-603.2	3	3	2	3
GT-603.3	3	3	3	3
GT-603.4	3	3	3	2
Average	3	2.75	2.75	2.75

APPLIED GEOCHEMISTRY (GT-604)							
Lecture	Credit	Assessment	External	Internal	Total	Exam	
		method	Assessment	Assessment		Duration	
4	4	Theory	100	50	150	3 hrs.	
		C	OURSE OBJECT	ΓΙVΕ			
To introdu	To introduce geochemistry as a tool for understanding various earth processes.						
	COURSE OUTCOMES						
1. Stu	udents will	get to learn abo	out chemical comp	positions of ea	rth and basic	concepts of	
surface ch	emistry.						
2. Stu	2. Students recall concepts of thermodynamics and chemical equilibrium and learn about						
their applications in geology.							
3. Stu	Students will learn about aqueous solutions and isotope geochemistry.						
4. Stu	udents will	learn about applie	cations of geocher	nistry in explor	ation and vari	ous fields of	

geology.

#### **DETAILS OF COURSE**:

Unit	Content							
1	Chemical composition of earth, distribution of elements in igneous, sedimentary and							
	metamorphic rocks, internal divisions and differentiation of earth. surface chemistry,							
	colloids in igneous, sedimentary and metamorphic conditions.							
2	Chemical equilibrium, equilibrium kinetics, chemical thermodynamics and its							
	applications in geology. Solution and mineral equilibria with its significance in geology.							
3	Aqueous solutions: carbonate equilibria, silicate equilibria. Sedimentation and diagnosis-							
	organic and inorganic geochemistry,, radiogenic and stable isotopes, different isotopic							
	systematics, geochronology.							
4	Analytical techniques for rock, sediments and water compositions. Geochemical							
	techniques for mineral exploration in different geological environments, geochemical							
	surveys and data analysis.							

Sr.	Name of Books/Authors						
No.							
1	Introduction to Geochemistry, Kraushopk, K.B., and Bird, D.K., McGraw-Hill.						
2	Geochemistry: An Introduction, Albarede, F., Cambridge University Press.						
3	Essentials of Geochemistry, Walther, J.V., Jones & Bartlett, Longman Pearson						
	Education.						
4	Modern Analytical Geochemistry, Gill, R., Addison Wesley, Longman Pearson						
	Education.						
5	Treatise of Geochemistry, Holland, H.D. (Ed.), Elsevier.						

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-604.1	3	2	3	3	3	3	2	3	3	3	2
GT-604.2	3	2	3	2	2	2	3	2	3	2	2
GT-604.3	3	2	3	2	3	3	3	3	3	2	2
GT-604.4	3	2	3	3	2	2	3	2	3	3	2
Average	3	2	3	2.5	2.5	2.5	2.75	2.5	3	2.5	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-604.1	3	2	3	3
GT-604.2	3	3	2	3
GT-604.3	3	3	2	3
GT-604.4	3	2	3	2
Average	3	2.5	2.5	2.75

ECONOMIC AND ORE GEOLOGY (GT-605)								
Lecture	Credit	Assessment	External	Internal	Total	<b>Exam Duration</b>		
		method	Assessment	Assessment				
4	4	Theory	100	50	150	3 hrs.		
		C	OURSE OBJE	ECTIVE				
To impar	t basic u	inderstanding of d	lifferent types	of mineral de	posit and	processes of their		
formation	•							
		С	OURSE OUT	COMES				
1. St	udents wi	ill get introduced t	o economic ge	ology and learn	n about ge	eological aspects of		
ore bodies	5.							
2. St	udents w	ill learn about ore	e genesis and r	nineralization a	associated	with various rock		
types and series.								
3. Students will learn about processes of ore formation and their classification as endogenic								
and exogenic processes.								
4. Students will get knowledge of geographical and geological distribution of important								
economic	economic deposits of India.							

### **DETAILS OF COURSE:**

Unit	Content							
1	Introduction: basic terms and definitions, historical background, scope of economic							
	geology, importance of mineral deposits in national economy, ore deposits and ore							
	minerals: classification and structure/texture of ore minerals, morphology of ore bodies.							
2	Ore genesis: physico- chemical conditions of ore formation. Fluid inclusion studies,							
	mineralization associated with ultramafic, mafic and acidic rocks, greenstone belts,							
	komatiites, anorthosites and kimberlites and submarine volcanism. Metamorphic and							
	metamorphosed processes responsible for ore mineral genesis.							
3	Endogenic processes of ore formation: early and late magnetic segregation and injection,							
	immiscible liquid segregation, different types of hydrothermal ore formation, volcanic							
	exhalative process, exogenic processes of ore formation, mechanical accumulation,							
	sedimentary precipitates, residual concentration, oxidation and supergene enrichment.							
4	Geology and distribution of important economic deposits of India: bauxite, iron,							
	manganese, copper, lead, zinc, gold, chromites, diamond, coal and petroleum.							
	Metallogeny and mineral belts: global distribution of minerals in time and space.							

Sr. No.	Name of Books/Authors					
1	Economic Mineral Deposits, Bateman, A.M. and Jensen, M.L., John Wiley & Sons.					
2	The Geology of Ore Deposits, Guilbert, J.M. and Charles F.P. Jr., Waveland.					
3	Ore Geology and Industrial Minerals: An Introduction", Evans, A.M., Blackwell					
	Science, 3rd Ed.					
4	Mineral Resources of India, Bannerjee, D.K., The World Press.					
5	Ore Genesis: A Holistic Approach, Mookherjee, A., Allied Publishers.					

#### Geology of Mineral Deposits, Smirnov, V.I., MIR Publishers.

#### PO2 COs/POs PO1 PO3 PO4 PO5 PO6 PO7 **PO8** PO9 PO10 PO11 GT-605.1 GT-605.2 GT-605.3 GT-605.4 2.25 2.5 2.5 2.25 2.75 2.5 Average

#### **Mapping of Course Outcomes to Programme Outcomes**

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-605.1	3	2	3	3
GT-605.2	3	3	2	2
GT-605.3	3	3	2	3
GT-605.4	2	2	3	2
Average	2.75	2.5	2.5	2.5

PRACTICAL (GT-606) (Based on GT-601 & GT-602)							
Lecture	LectureCreditAssessmentExternalInternalTotalExam durationMethodAssessmentAssessmentAssessmentAssessmentAssessmentAssessment						
12	6	Practical	75	25	100	3 Hrs.	
		С	OURSE OBJE	ECTIVE			
To provide	To provide in-depth practical knowledge of stratigraphy and structural geology.						
COURSE OUTCOME							
Students g	get acknow	ledged about the	practical of stra	tigraphy and st	ructural ge	eology.	

## LIST OF PRACTICALS:

• Techniques of strain analysis: determination of finite strain of deformed objects using long- to short axis, center-to-centre, Fry and Rf/  $\Phi$  methods.

- Determination of finite strain from deformed fossils.
- Dip isogon method of fold analysis.
- Determination of strain in ductile shear zones and analysis of brittle fault zones.
- Structural analysis of folded terrains.
- Practical & exercises on stratigraphy.

<b>PRACTICAL (GT-607)</b> (Based on GT-603, GT-604 & GT-605)						
LectureCreditAssessmentExternalInternalTotalExam durationMethodAssessmentAssessmentAssessmentAssessmentAssessmentAssessment						
12	6	Practical	75	25	100	3 Hrs.
		C	COURSE OBJE	ECTIVE		
To provid	de in-dept	h practical knov	vledge of meta	morphic rocks	, geocher	nical data analysis
technique	s and inter	pretation of mine	ral exploration of	lata.		
COURSE OUTCOME						
Students come to know about the procedure of microscopic study of thin sections and distribution						
of importa	ant minera	l deposits.				

#### LIST OF PRACTICALS:

- Microscopic/petrographic studies of metamorphic rocks.
- Sampling of rocks, sediments and water for geochemical analysis.
- Digestion of rock samples, preparation of solutions for analysis.
- Analysis of major and trace elements in silicate rocks.
- Preparation of standards for geochemical analysis.
- Preparation of various solutions with differing ionic strength.
- Basic principles and demonstration of analytical instruments.
- Exercises on geochemical data interpretation.
- Locating different important mineral deposits on an outline map of India.
- Megascopic study of ore specimens/industrial minerals.
- Microscopic study of important ore minerals.
- Preparation of polished ore specimen.

REMOTE SENSING TECHNOLOGY (GT-701)									
Lecture	cture Credit Assessment External Internal Total Exa								
		method	Assessment	Assessment					
4	4	Theory	100	50	150	3 hrs.			
		С	OURSE OBJE	ECTIVE					
Introduce	Introduce the principles of remote sensing technology and its application in the field of Earth								
Sciences.									
	COURSE OUTCOMES								
1. St	udents wi	ll get introduced to	remote sensing	g technology an	d atmospl	heric interactions.			
2. St	udents wi	ll learn about cha	racteristics and	physical para	meters of	aerial photography			
along with	along with basic concepts of satellite remote sensing.								
3. Students will get acknowledged to satellite programs worldwide and image processing									
and enhar	ncement te	echniques.							
4. St	udents w	ill get to know al	bout application	ons of remote	sensing i	n various fields of			

geology.

## **DETAILS OF COURSE:**

Unit	Content
1	Introduction: development of remote sensing technology, advantages, basic processes of
	remote sensing, basic elements of EM spectrum and atmospheric windows, propagation of
	radiation through the atmosphere and interaction, remote sensing platforms;
2	Aerial photographs: types of aerial photographs, their characteristics, scale, height
	determination and relief displacement, stereoscopes and photo-mosaics. Satellite remote
	sensing: Imagery vs aerial photograph, active and passive sensors, MSS, LISS, CCD and
	thermal scanners.
3	Major Indian satellite programs. Basics of microwave remote sensing. fundamentals of
	digital image processing: characteristics of remote sensing data, pre-processing,
	enhancements, classification. Principles of image interpretation: concept of FCC, visual
	and digital interpretation- interpretation keys.
4	Photo Interpretation in geology: image characteristics of geological structures and various
	rock types, landforms and lineaments. Remote Sensing Applications: natural hazards and
	disaster mitigation, natural resources management and environmental monitoring.

Sr.	Name of Books/Authors
No.	
1	Remote Sensing Geology, 2 nd Edition, Gupta, R. P., Springer-Verlag Berlin Heidelberg,
	New York.
2	Remote Sensing and Image Interpretation, 4th Edition, Lillesand T. M, and Keifer, R.
	W., Wiley, New York.
3	Remote Sensing-Principles and Interpretation, 3rd Edition, Sabins, FF Jr., Freeman &
	Co,New York.
4	Photogeology, Miller, V. C., and Miller, C. F., McGraw-Hill, New York.
5	Image Interpretation in Geology, 2 nd Edition, Drury, S. A., London, Allen and Unwin.

Manning of C	ourse Outcomes	o Programma	Outcomes
Mapping of C	Jourse Outcomes	<u>o r rogramme</u>	Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-701.1	3	3	3	3	3	3	2	3	3	3	3
GT-701.2	3	3	3	2	2	3	3	3	3	2	3
GT-701.3	3	3	3	3	3	2	3	3	3	2	3
GT-701.4	3	3	3	3	3	2	3	2	3	3	3
Average	3	3	3	2.75	2.75	2.5	2.75	2.75	3	2.5	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-701.1	3	3	3	3
GT-701.2	3	3	3	3
GT-701.3	3	3	2	3
GT-701.4	3	2	3	2
Average	3	2.75	2.75	2.75

MINERAL EXPLORATION (GT-702)								
Lecture	Credit	Assessment	External	Internal	Total	<b>Exam Duration</b>		
		method	Assessment	Assessment				
4	4	Theory	100	50	150	3 hrs.		
		C	OURSE OBJE	ECTIVE				
To introdu	ice basic co	oncepts of mineral	l exploration a	nd better unders	tanding o	f mineral resources.		
COURSE OUTCOMES								
1. Stu	idents wil	l get introduced	to mineral e	exploration and	applicat	ions of geological		
mapping i	n it.							
2. Stu	udents will	learn basic conce	pts of geologic	al and geochem	nical prosp	pecting.		
3. Stu	udents will	get to know the	role of geophy	ysical methods	and loggi	ing tools in mineral		
exploration.								
4. Stu	4. Students will get acknowledged with a numerical approach to mineral exploration and							
various m	ethods of	ore reserve estimation	ation as well a	s application of	f various a	software in mineral		
exploratio	n.							

#### **DETAILS OF COURSE:**

Unit	Content
1	Introduction: basic definitions, historical development and future opportunities and complexities. Geological mapping in mineral exploration, overview of various stages of mineral exploration: activities, data and tools.
2	Basic concepts of geological prospecting: geological indicators, lithological and structural controls of mineralization, geobotanical observations. Basic concepts of geochemical prospecting: planning, Soil Sampling, biogeochemical observations analysis and interpretation.
3	Different techniques in mineral exploration: drilling, sampling, core logging, geological plans and sections. Overview of geophysical methods useful in mineral prospecting: airborne survey, magnetic survey, gravity method, electromagnetic method, integration of geological and geophysical data.
4	Principles of reserve estimation: density and bulk density, factors affecting reliability of reserve estimation, reserve estimation based on geometrical models (square, rectangular, triangular and polygon blocks) regular and irregular grid patterns. Remote Sensing, GIS and computer software applications in mineral exploration.

Sr. No.	Name of Books/Authors
1	Introduction to Mineral Exploration, Moon, C.J., Whateley, M.K.G. and Evans, A.M.,
	Blackwell Science, 2 nd Ed.
2	Mineral Exploration: Recent Strategies, Rajendran, S., Srinivasamoothy, K. and
	Aravindan S., New India Pub.
3	Mineral Prospecting and Exploration, T.C Bagchi, Kalyani Publication.
4	Modelling and Geochemical Exploration of Mineral Deposits, Talapatra, A.K., Capital
	Publishing.
5	Magmatic Sulfide Deposits: Geology, Geochemistry and Exploration, Naldrett, A.J.,

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Springer-Verlag.
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COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-702.1	3	2	3	3	2	3	2	3	3	3	2
GT-702.2	3	2	3	2	2	2	3	2	3	2	2
GT-702.3	3	2	3	2	3	2	3	3	3	2	2
GT-702.4	3	2	3	3	2	2	3	2	3	3	2
Average	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4						
GT-702.1	3	3	3	3						
GT-702.2	3	3	3	3						
GT-702.3	3	3	3	3						
GT-702.4	3	3	3	3						
Average	3	3	3	3						
]	MICROPALAEONTOLOGY AND PALYNOLOGY (GT-703)									
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Lecture	Credit	Assessment	External	Internal	Total	Exam Duration				
		method	Assessment	Assessment						
4	4	Theory	100	50	150	3 hrs.				
		(	COURSE OBJ	IECTIVE						
To impart	basic unde	erstanding of the	e significance o	of different asp	ects of Mi	cropalaeontology and				
Palynolog	у.									
			COURSE OUT	<b>FCOMES</b>						
1. Stu	udents will	get introduced	to micropalaed	ontology and s	ampling te	echniques along with				
detailed de	escription of	of few microfoss	sils.							
2. Stu	2. Students will learn detailed descriptions of a few important inorganic shelled microfossils									
with emphasis on their ecology and life cycle.										
3. Stu	3. Students will get acknowledged to organic shelled microfossils and the role of									
microfossi	microfossils in stratigraphic correlations.									

4. Students will understand the applications of microfossils in hydrocarbon exploration, paleobathymetry and stable isotope studies.

### **DETAILS OF COURSE:**

Unit	Content
1	Micropalaeontology, its definition and scope, surface and subsurface sampling, processing of samples for preparation of mineral matter walled and organic walled microfossils. Detailed morphology, geological distribution and ecology of Chitinozoans, Pteropods, and Diatoms.
2	Detailed morphology, geological distribution and ecology of Foraminifera, Ostracoda, Conodonts, Radiolarians, and Silicoflagellates.
3	Morphology of fossil spores, pollen grains, dinoflagellates and acritarchs. Use of microfossils in biostratigraphy and palaeoenvironmental interpretations.
4	Applications of microfossils and palyno fossils in hydrocarbon exploration; CAI (conodont alteration index) and spore coloration index. Paleobathymetry study using benthic foraminifera. Microfossils, stable isotopes and ocean-atmosphere history.

Sr. No	Name of Books/ Authors
1.	Microfossils, Second Edition, Howard Armstrong and Martin Brasier, Blackwell Pub.
2.	Principles of Palaeoecology, Ager, D.V., McGraw Hill.
3.	Palaeoecology, Kennety, P and Ross, C.A, Longman.
4.	Aspects of Palynology, Robert H. Tschudy, Wiley-Interscience, New York.
5.	Essentials of Palynology, P K K Nair, Asia Pub. House, New York.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-703.1	3	2	3	3	2	3	2	3	3	3	2
GT-703.2	3	2	3	2	2	2	3	2	3	2	2
GT-703.3	3	2	3	2	3	2	3	3	3	2	2
GT-703.4	3	2	3	3	2	2	3	2	3	3	2
Average	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-703.1	3	2	3	3
GT-703.2	3	3	2	3
GT-703.3	3	3	2	3
GT-703.4	3	2	3	2
Average	3	2.5	2.5	2.75

HYDROGEOLOGY (GT-704)								
Lecture	Credit	Assessment	External	Internal	Total	<b>Exam Duration</b>		
		method	Assessment	Assessment				
4	4	Theory	100	50	150	3 hrs.		
		(	COURSE OBJ	ECTIVE				
To provid	de underst	tanding about the	hydrogeologic	al properties of	water be	earing formations and		
chemical	parameter	rs of water.						
COURSE OUTCOMES								
1. St	udents w	ill get introduced	to basic conc	epts of hydroge	eology a	along with physical		
parameter	rs of wate	r bearing formatio	ons.					
2. St	udents wi	ill learn about the	e theory of gro	undwater flow a	and math	ematical approach to		
groundwa	ater move	ments.						
3. St	3. Students will understand the role of various geological methods in hydrogeological							
investigations.								
4. St	udents v	will learn phys	iochemical pi	operties of	groundwa	ater and graphical		
representa	ation of gi	round water qualit	у.					

Unit	Content
1	Water on earth: types of water, meteoric, juvenile, magmatic and sea water. Hydrological
	cycle and its components, water balance. Water-bearing properties of rocks: porosity,
	permeability, specific yield and specific retention. Vertical distribution of water, zone of
	aeration and zone of saturation, classification of rocks according to their water-bearing
	properties. Aquifers: classification of aquifers, concepts of drainage basins and
	groundwater basins. Aquifer parameters: transmissivity and storage coefficient, water
	table and piezometric surface
2	Theory of groundwater flow: Darcy's law and its applications: determination of
	permeability in laboratory and in field, constant head permeameter, falling head
	permeameter, tracer test, problem exercise on darcy's law, permeability test and
	transmissivity.
3	Basic geologic and hydrogeologic Investigations: surface methods :remote sensing,
	electrical resistivity method and seismic refraction method and subsurface methods:
	geologic log, drilling time log, radiation log, resistivity logging, temperature logging,
	caliper logging.
4	Groundwater Quality: Physical and chemical properties of water, quality criteria for
	different uses. graphical presentation of groundwater quality data:vertical bar graph
	method, vector diagram, pattern diagram, circular diagram, trilinear diagram, water
	quality and pollution sources, isotopes and their uses, water level fluctuations.

Sr. No.	Name of Books/ Authors
1	Fundamentals of Groundwater, F.W.Schwartz and H.Zhang, Wiley India Pvt. Ltd.
2	Groundwater Hydrology, D.K.Todd, Wiley India Pvt. Ltd.
3	Physical and Chemical Hydrogeology, P.A.Domencio and F.W.Schwartz., Springer.
4	Environmental Isotopes in Hydrogeology, I.Fritz, CRC Press.

5	Geochemistry, Groundwater and Pollution, C.A.J.Appelo and D.Postma, A.A
	Balkema Publisher.
6	Groundwater Science, C.R.Fitts, Academic Press.
7	Environmental Hydrology, A.d.Ward and S.W.Trimble, CRC Press.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-704.1	3	3	3	3	2	3	2	3	3	3	3
GT-704.2	3	3	3	2	3	3	3	2	3	3	3
GT-704.3	3	3	3	3	3	2	3	3	3	3	3
GT-704.4	3	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	2.75	2.75	2.75	2.75	2.75	3	3	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-704.1	3	3	3	3
GT-704.2	3	3	3	3
GT-704.3	3	3	3	3
GT-704.4	3	2	3	2
Average	3	2.75	3	2.75

PETROLEUM GEOLOGY (GT-705)									
Lecture	Credit Assessment		External	External Internal		Exam			
		method	Assessment	Assessment		Duration			
4	4	Theory	100	50	150	3 hrs.			
	COURSE OBJECTIVE								
To introdu	ice the stud	lents to basic concep	ots of Petroleum	Geology					
	COURSE OUTCOMES								
1. Stu	udents can	learn about the origi	in of petroleum a	along with source	ce rock consid	lerations.			
2. Stu	udents will	get acknowledged v	with reservoir roo	cks and their typ	pes.				
3. Stu	3. Students will understand the mechanism of hydrocarbon migration and entrapment.								
4. Stu	4. Students will get to know future prospects of energy in the form of unconventional								
resources	ofhydroca	rbons as well as a de	eep insight on In	dia's oil and ga	s potential.				

Unit	Content
1	Elements of petroleum geology: source rocks, definition of source rock, nature and type
	of source rock kerogen sediments, its composition and origin; transformation of organic
	matter, maturation, thermal cracking, diagenesis, catagenesis and metagenesis in the
	formation of source rocks. Hydrocarbon source rock evaluation: palynofacies and types
	of Dispersed Organic Matter (DOM), Thermal Alteration Index (TAI).
2	Reservoir rocks: classification and nomenclature of reservoir rocks, clastic reservoir
	rocks, carbonate reservoir rocks, unconventional, fractured and miscellaneous reservoir
	rocks. marine and non-marine reservoir rocks.
3	Hydrocarbon migration: primary and secondary migration, migration and accumulation
	of hydrocarbons, Factors affecting primary and secondary migration. Entrapment of
	hydrocarbons: mechanics of entrapment of hydrocarbons. Types of traps: structural,
	stratigraphic and combination type of traps.
4	Unconventional Resources: oil shale, shale gas, tar sands, gas hydrates. India's oil and
	gas resources: source, reservoir rock and types of trap in major oil and gas fields of India.

Sr. No	Name of Books/ Authors							
1	Geology of Petroleum, 2 nd Ed. Levorsen, A.I., W.H. Freeman C. San Francisco.							
2	Petroleum Geochemistry and Geology, 2ndEdn, Hunt, J.M., W. H. Freeman, San							
	Francisco.							
3	Petroleum Geology, North, F.K., Unwin Hyman (Pub.), Boston, USA.							
4	Elements of Petroleum Geology, Richard, C. Selley, Academic Press, London.							
5	Petroleum Geology. 1983, Developments in Petroleum Science, Ser. 16, Chapman,							
	R.E. Elsevier, Amsterdam.							
6	Developments in Petroleum Geology, G.D.Hobson (Ed.), Applied Science Publishers,							
	London.							

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-705.1	3	3	3	3	3	3	2	3	3	3	3
GT-705.2	3	3	3	3	3	2	3	3	3	3	3
GT-705.3	3	3	3	2	3	3	3	3	3	3	3
GT-705.4	3	3	3	3	2	3	3	2	3	3	3
Average	3	3	3	2.75	2.75	2.75	2.75	2.75	3	3	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-705.1	3	3	3	3
GT-705.2	3	3	3	3
GT-705.3	3	3	3	3
GT-705.4	3	2	3	3
Average	3	2.75	3	3

PRACTICAL (GT-706) (Based on GT-701 & GT-702)								
Lecture	LectureCreditAssessmentExternalInternalTotalExam durationMethodAssessmentAssessmentAssessmentAssessmentAssessment							
12	6	Practical	75	25	100	3 Hrs.		
			COURSE OBJI	ECTIVE				
To provid	To provide in-depth practical knowledge of remote sensing and mineral exploration methods.							
	COURSE OUTCOME							
Students §	get knowle	edge about remot	e sensing and mi	neral exploration	on method	s.		

## LIST OF PRACTICALS:

- Exercises based on the studies of remote sensing images.
- Exercise on GPS data collection and Travers.
- Study of aerial photographs and photogrammetical calculations.
- Regional exploration data analysis and ore reserve estimation.
- Exercises related to trenching, pitting and drilling data.

<b>PRACTICAL (GT-707)</b> (Based on GT-703, GT-704 & GT-705)									
LectureCreditAssessmentExternalInternalTotalExam durationMethodAssessmentAssessmentAssessmentAssessmentAssessmentAssessment									
12	6	Practical	75	25	100	3 Hrs.			
	COURSE OBJECTIVE								
To provid	e in-deptl	n practical know	ledge of microp	aleontology, p	alynology,	hydrogeology and			
petroleum	geology.								
	COURSE OUTCOME								
Students get knowledge about practical related to micropaleontology, palynology, hydrogeology									
and petrole	eum geolo	ogy.							

# LIST OF PRACTICALS:

- Exercises based on the knowledge of micropaleontology, palynology.
- Exercises based on the knowledge of hydrogeology
- Exercises based on the knowledge of petroleum geology.

FIELD TRAINING-II (GT-708)									
Credit	Credit Assessment External Internal Tota								
	method	Assessment	Assessment		Duration				
4	Field Training	100	50	150	-				
COURSE OBJECTIVE									
To impart unders	tanding of advanced	mapping methods a	and techniques,	sampling in	the field using				
different tools an	d instruments.								
COURSE OUTCOME									
Students get acknowledged about large scale mapping methods and techniques, sampling in the field									
using different to	ols and instruments.								

<b>ENVIRONMENTAL GEOSCIENCES (GT-801)</b>									
Lecture	Credit	Assessment	External	Internal	ternal Total Exam				
		method	Assessment	Assessment					
4	4	Theory	100	50	150	3 hrs.			
		(	COURSE OBJ	ECTIVE					
To let stu	idents be	exposed to enviro	onmental mitiga	ation and mana	gement a	nd current practices			
with exan	nples.								
		(	COURSE OUT	COMES					
1. St	udents wi	ll get knowledge a	bout environme	ental geology ar	nd land us	e planning.			
2. St	2. Students will learn about methods and importance of solid waste management.								
3. St	. Students will learn about various hazards in geological perspective and their mitigation.								
4. St	udents wi	ll get acknowledg	ed with acts an	d amendments	to protect	the environment in			
India.									

Unit	Content
1	Fundamental concepts of environmental geology: environmental geoscience, its scope,
	objective, and aims; role of geosciences in our society. Land use planning: definition
	and objective of land use planning and their types, landscape aesthetics.
2	Solid Waste: causes of solid waste, their types and effects of solid waste, waste
	disposal. Solid waste management: reduce, reuse, recycle and their method of
	management.
3	Hazard: types of hazards (landslides, volcanoes, earthquakes, droughts, cyclones,
	floods), causes of hazards and their mitigations.
4	Environmental impact assessment (EIA): aims and objectives of EIA, methodology of
	EIA. Environmental legislation: air act, water act, environmental protection act, forest
	act, wildlife act and waste management rules.

Sr. No.	Name of Books/ Authors
1.	Natural Disasters, Alexander, D., UCL Press Ltd, UniColegeLonds.
2.	Environmental geomorphology, Coates Dr., Sate Univ of NY Binghamton.
3.	Mitigation of Natural hazards and disasters: international perspectives, Haque, C.
	Emdad, Springer, Dordrecht.
4.	EA Environmental geosciences, Keller, Prentice hall, New Jersey.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-801.1	3	3	3	3	3	3	3	3	3	3	3
GT-801.2	3	3	3	3	2	2	3	2	3	3	3
GT-801.3	3	3	3	3	3	3	3	3	3	3	3
GT-801.4	3	3	3	3	2	3	3	2	3	3	2
Average	3	3	3	3	2.5	2.75	3	2.5	3	3	2.75

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-801.1	3	3	3	3
GT-801.2	3	3	3	3
GT-801.3	3	3	2	3
GT-801.4	3	2	3	2
Average	3	2.75	2.75	2.75

COAL GEOLOGY AND TECHNOLOGY (GT-802)									
Lecture	Credit	Assessment	External	Internal	Total	Exam Duration			
		method	Assessment	Assessment					
4	4	Theory	100	50	150	3 hrs.			
	COURSE OBJECTIVE								
To familia	rize the st	udents about phy	sical, petrolog	ical and techno	logical pro	operties of coal.			
			COURSE OUT	<b>FCOMES</b>					
1. Stu	udents will	l get familiarized	with the origin	n, types and dia	genesis of	coal.			
2. Stu	udents will	l learn about buil	ding componer	nts of coal and	its chemic	al analysis.			
3. Stu	3. Students will understand methane genesis in coal and its technological properties.								
4. Stu	4. Students will know the geographical and geological distribution of coal in India and their								
utilization									

Unit	Content
1	Origin of coal, allochthonous and autochthonous theories, origin of peat swamps,
	climatic, paleogeography and tectonic requirements, types of coal, physical properties of
	coal, rank and grade, classification of coal, constituents of coal. Diagenesis of peat and
	coalification process, causes, role of time, temperature, physical changes associated with
	increased coal rank.
2	Lithotypes, microlithotypes and macerals and their physical, chemical and optical
	properties. Chemical characterization: proximate and ultimate analysis, trace elements in
	coal.
3	Cleats in coal. Coal bed methane (CBM): elementary idea about generation of methane
	in coal beds and coal bed methane exploration, coal as a source rock for hydrocarbon.
	Technological properties of coal: coal gasification, coal liquefaction, coal carbonisation.
4.	Application of coal geology in hydrocarbon exploration, vitrinite reflectance.
	Environmental impacts of coal mining and burning, mitigation measures to avoid or
	reduce those impacts. Gondwana and Tertiary coal deposits in India; geology of
	important coalfields of India

Sr.	Name of Books/ Authors
No.	
1	Text book of Coal Petrology, Stach, E., Mackowsky, M.T.H., Taylor, G.H., Chandra,
	D., Teichmuller, M., and Teichmuller, R., Gebruder Borntraeger, Stuttgart.
2	Textbook of Coal (Indian context), Gebruder Borntraeger, Stuttgart Chandra, D.,
	Singh, R.M. Singh, M.P. (2000)., Tara Book Agency, Varanasi.
3	International Committee for Coal and Organic Petrology (ICCP). The new inertinite
	classification (ICCP System 1994). Fuel 80, 459–471.
4	International Committee for Coal and Organic Petrology, (ICCP). The new vitrinite
	classification (ICCP System 1994). Fuel 77, 349-358.
5	Coal and organic Petrology, Singh, M.P., Hindustan Publishing Corporation, New
	Delhi.

6	Applied Coal Petrology.	The	Role of Petrology	in Coal Utilization,	Suárez-Ruiz,
	I., Crelling J.C. (Eds.), Els	sevier,	, Academic Press. U	ISA.	

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-802.1	3	3	3	3	3	3	2	3	3	3	3
GT-802.2	3	3	3	2	3	3	3	3	3	2	3
GT-802.3	3	3	3	2	3	3	3	3	3	2	3
GT-802.4	3	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	2.5	3	3	2.75	3	3	2.5	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-802.1	3	3	3	3
GT-802.2	3	3	2	3
GT-802.3	3	3	3	3
GT-802.4	3	3	3	3
Average	3	3	2.75	3

MINING GEOLOGY (GT-803)									
Lecture	Credit	<b>Exam Duration</b>							
		method	Assessment	Assessment					
4	4	Theory	100	50	150	3 hrs.			
		C	OURSE OBJE	ECTIVE					
This cour	se is design	ned to give the ge	ology students	an introductor	y idea abo	out the various			
types of g	geological f	field operations, w	which are carrie	ed out in opence	ast/underg	ground mines.			
		C	OURSE OUT	COMES					
1. St	udents are	introduced to hist	torical develop	ment and princ	iples of m	ining.			
2. St	udents wi	ll learn about i	methods, tools	, advantages	and limi	ts of surface and			
subsurfac	e mining.								
3. St	3. Students will understand the role of geological operations in mining along with a brief								
description of blasting techniques.									
4. St	udents wil	ll learn about mi	ineral dressing	and environm	ental haz	ards of mining in			
detail.									

Unit	Content							
1	Introduction: Historical development, Importance and future scopes, basic							
	understanding of mining industry and processes. Principles of mining industry, mining							
	policy and legislation.							
2	Surface methods of mining: mechanical and aqueous extraction. Subsurface mining:							
	basic infrastructures and common terms. Ocean bottom mining.							
3	Geological operations in mining: preparation of mine plans, bench mapping,							
	underground mine mapping, modeling of ore body, drilling, sampling, explosives &							
	blasting. Mine Economic appraisals							
4	Elements to mineral dressing & mineral beneficiation, mines safety measures.							
	Environmental issues: nature & remedies, mine waste & their management.							

Sr. No.	Name of Books/Authors
1	Mining Engineers hand books, Roberts Peele, John Wiley & Sons.
2	Mining Geology, Mckinstry, H.E, Asia publishing house.
3	Courses in mining Geology, Arogyaswami, R.P.N., Oxford IBH.
4	Elements of mining, Clark, G.B., John Wiley & Sons.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-803.1	3	3	3	3	3	3	2	3	3	3	3
GT-803.2	3	3	3	2	3	2	3	2	3	2	3
GT-803.3	3	3	3	2	3	2	3	3	3	2	3
GT-803.4	3	3	3	3	3	3	3	2	3	3	2
Average	3	3	3	2.5	3	2.5	2.75	2.5	3	2.5	2.75

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-803.1	3	3	3	3
GT-803.2	3	3	3	3
GT-803.3	3	3	3	3
GT-803.4	3	2	3	2
Average	3	2.75	3	2.75

GIS TECHNOLOGY (GT-804)									
Lecture	Credit	Exam Duration							
	1	Theorem	100	Assessment	150	2 hm			
4	4	Ineory	100	50	150	<b>5</b> NFS.			
	COURSE OBJECTIVE								
To provid	le basic un	derstanding about	GIS Technolog	gy and its applie	cation in E	Earth Sciences			
		C	OURSE OUT	COMES					
1. St	udents will	l get introduced to	GIS technolog	y and its scope	s.				
2. St	udents wil	l understand data	representation	models in GIS	and colla	aboration of remote			
sensing an	nd GIS as a	a tool in geology.							
3. St	3. Students will get to know about GIS analysis operations.								
4. St	udents wil	l learn concepts of	f GPS and map	projections alo	ong with	applications of GIS			
in geoscie	ences.								

Unit	Content
1	Introduction: definition, basic concepts, historical background and future scopes of GIS
	technology. Components of GIS: hardware, software and their specifications for GIS.
2	GIS data types and models: spatial, non spatial, raster, vector, their advantage and
	disadvantages; spatial data capture and maintenance. Integration of raster-vector data
	models and integration of remote sensing with GIS, concepts of thematic layers and
	topology.
3	GIS analysis operations: overview, geometrics and measurement operations, spatial and
	non-spatial queries; neighborhood operations, spatial arrangement and connectivity
	functions. Overlays operation, display and interfaces functions, precision and accuracy,
	errors in GIS, their detection and optimization.
4	Triangulated irregular network (TIN), Digital elevation model (DEM) and their
	applications. Map production in GIS, concept of Global positioning system (GPS) and
	GIS as multidisciplinary tools and their applications in geoscience.

Sr. No.	Name of Books/Authors									
1	Introduction to Geographic Information Systems, Chang K., McGraw-Hill Education.									
2	Geographic Information Systems and Science, Paul A. Longley, Wiley Publication.									
3	Integrating GIS and the Global Positioning System, Karen Steede-Terry, ESRI									
	Publication, New York.									
4	Geographic Information Systems: An Introduction, Tor Bernhardsen, Wiley									
	Publication.									
5	Geographic Information Systems: A Management Perspective, S. Aronoff, WDL									
	Publication.									
6	Thinking About GIS: Geographic Information System Planning for Managers, Roger									
	Tomlinson, ESRI Press.									
7	GPS Satellite Surveying, 2nd Edition, A. Leick, Wiley Publication.									
8	Principles of Geographic Information System, Rolf A., ITC, Netherlands.									

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-804.1	3	3	3	3	3	3	2	3	3	3	3
GT-804.2	3	3	3	3	3	3	3	2	3	3	3
GT-804.3	3	3	3	2	3	3	3	3	3	3	3
GT-804.4	3	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	2.75	3	3	2.75	2.75	3	3	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-804.1	3	3	3	3
GT-804.2	3	3	3	3
GT-804.3	3	3	2	3
GT-804.4	3	3	3	2
Average	3	3	2.75	2.75

ENGINEERING GEOLOGY (GT-805)										
Lecture	Lecture Credit Assessment External Internal Total Exam									
		method	Assessment	Assessment		Duration				
4	4	Theory	100	50	150	3 hrs.				
			COURSE OBJ	IECTIVE						
To introdu	uce the stu	idents to the basi	cs of engineerin	g geology for a	pplications in	civil engineering				
projects.										
COURSE OUTCOMES										
1. Int	roduction	of students to f	undamental cor	ncepts of engine	eering geology	y and learning to				
apply thes	e in vario	us civil engineer	ing projects.							
2. St	udents wi	ll get detailed	knowledge abo	ut engineering	properties of	f rock and their				
utilization	in the co	ncept of rock ma	ss classification.							
3. Students will understand causes, classification and analytical techniques of landslides.										
4. Stu	udents wi	ll learn about ge	ological investi	gations useful i	n civil engine	ering projects as				
well as co	ncepts of	soil mechanics.								

Unit	Content
1	Introduction to engineering geology: basic concepts, scope. relationship of engineering
	geology with other branches of geology. Dam: terminology of dam, types of dam,
	criteria for site selection, geological considerations for dam. Tunnel: terminology of
	tunnel, types of tunnel, geological considerations for tunnel.
2	Engineering properties of rocks. Laboratory tests: uniaxial compression test, triaxial
	compression test, tensile strength test and in-situ test, Standard penetration test (SPT),
	Point load test. Concept of rock mass classification: utilities, Rock mass rating (RMR)
	classification.
3	Landslides: causes of landslides (rainfall and climatic conditions, erosion, earthquake,
	human actions) and their classifications, techniques for analysis of landslides. Physical
	characters of building and decorative stones, concrete aggregates.
4	Engineering geological investigations related to highways, buildings and bridges. Soil
	Mechanics: introduction to soils, types of soils and properties of soils. Engineering
	geological maps: types of maps and their applications.

Sr. No	Name of Books/ Authors
1	Geology & Engineering', R.F. Legget & A. Hathway, Geo Science World.
2	Principles of Engineering Geology & Geotechnics, D.P. Krynine & W. R. Judd, CBS
	Publisher.
3	Fundamentals of Engineering Geology, F.G. Bell, Elseveir.
4	Principles of Engineering Geology, P.B. Attewell & I.W. Fermer, Chapman & Hall.
5	Engineering Geology, Q. Zaruba & E. Mencl, Elsevier.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-805.1	3	3	3	3	3	3	3	3	3	3	3
GT-805.2	3	3	3	3	3	3	3	3	3	3	3
GT-805.3	3	3	3	3	3	3	3	3	3	2	3
GT-805.4	3	3	3	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3	3	2.75	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-805.1	3	3	3	3
GT-805.2	3	3	3	3
GT-805.3	3	3	3	3
GT-805.4	3	3	3	2
Average	3	3	3	2.75

PRACTICAL (GT-806) (BASED ON GT-801 & GT-804)									
Lecture	LectureCreditAssessmentExternalInternalTotalExam durationMethodAssessmentAssessmentAssessmentAssessmentAssessmentAssessment								
12	6	Practical	75	25	100	3 Hrs.			
		0	COURSE OBJE	ECTIVE					
To provid	e in-depth	practical knowl	edge of enviror	nmental geolog	y and GIS	s technology in the			
light of ge	ological p	roblems							
COURSE OUTCOME									
Students g	Students get knowledge about practical's of environmental geology and GIS technology in the								
light of ge	ological p	roblems.							

## LIST OF PRACTICALS:

- Exercises based on the studies of environmental geology.
- Practical hands on various GIS softwares.
- Exercises on use of various tools of ARCGIS.
- Exercises on GIS technology in the light of geological problems.

<b>PRACTICAL (GT-807)</b> (Based on GT-802, GT-803 & GT-805)										
Lecture	Lecture Credit Assessment External Internal Assessment Assessment Total Exam duration									
12	6	Practical	75	25	100	3 Hrs.				
		0	COURSE OBJE	ECTIVE						
To provid	le in-dep	th practical know	ledge of coal	geology, minin	ng geolog	gy and engineering				
geological	l problem	s.								
COURSE OUTCOME										
Students a	get ackno	wledged about pr	actical's of coa	l geology, min	ing geolo	gy and engineering				
geologica	l problem	S.								

### LIST OF PRACTICALS:

• Exercises based on the application of coal geology, and engineering geology on geoscientific data analysis and interpretation.

- Lithological cross sections from core drilling data.
- Numerical exercises based on engineering geology.
- Exercises of maps and stereographic projections used in engineering geology.

WELL LOGGING (GT-901)										
Lecture	Credit	Total	<b>Exam Duration</b>							
		method	Assessment	Assessment						
4	4	Theory	100	50	150	3 hrs.				
	COURSE OBJECTIVE									
To introdu	To introduce well-logging tools, methods, interpretation procedures to Geology students.									
COURSE OUTCOMES										
1. Stu	dents will	l be introduced to	well logging ar	nd learn about v	arious log	ging tools.				
2. Stu	idents wil	l understand elec	trical logging t	tools and meth	ods of op	peration and a brief				
introductio	on to log i	nterpretation.								
3. Stu	3. Students will get to know about porosity logs and various types of gamma rays based									
logging.	logging.									
4. Stu	idents car	understand conc	cepts of well lo	ogging via case	e studies	as well as learning				

temperature logging in detail.

# **DETAILS OF COURSE**:

Unit	Content
1	History and introduction to well logging. Logging data acquisition. Geophysical wire-line
	logging tools: Gamma ray tool, SP tool, Neutron tool, Gamma ray tool, Acoustic logging
	tool.
2	Electrical Logging: principle, type, method and tools, normal and lateral tools, induction
	tools, focussed logging tools. Log interpretation: archie law, formation factor, water
	saturation.
3	Porosity Logs: principle of porosity calculations using sonic logging, gamma ray logging
	and neutron-density logging, log characteristics, combined neutron-density log
	characteristics.
4	Temperature logging and its application, relation between well log signature and
	deposition conditions, permeability estimations and cross-plots, well logging case studies.

Sr. No.	Name of Books/ Authors
1	The Geological Interpretation of Well Logs, Rider, M., Rider-French Consulting Ltd.
2	Formation Evaluation, Lynch, E.J., John Cotler Books.
3	Fundamentals of well-log interpretation, Serra, O., Elsevier.
4	Log Interpretation Principles / Applications, Schlumberger.
5	Handbook of Well Log Analysis, Pirsson, S.J., Prentice Hall.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-901.1	3	2	3	3	2	3	2	3	3	3	2
GT-901.2	3	2	3	2	2	2	3	2	3	2	2
GT-901.3	3	2	3	2	3	2	3	3	3	2	2
GT-901.4	3	2	3	3	2	2	3	2	3	3	2
Average	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2

	DSO1	DSO3	DSO3	PSO4
COS/F3OS	F301	F302	1303	F 304
GT-901.1	3	2	3	3
GT-901.2	3	3	2	3
GT-901.3	3	3	2	3
GT-901.4	3	2	3	2
Average	3	2.5	2.5	2.75

ADVANCED STRATIGRAPHY, PALEOGEOGRAPHY AND										
	PALEOECOLOGY (GT-902)									
Lecture	cture Credit Assessment External Internal Total Exam									
		method	Assessment	Assessment	ent Duration					
4	4	Theory	100	50	150	3 hrs.				
		COU	<b>URSE OBJECT</b>	IVE						
To introduce th	he students wi	th applied aspe	cts of stratigraph	y with reconstr	ruction of Pala	eogeography				
and Palaeoecol	logy.									
	COURSE OUTCOMES									
1. Studen	ts can learn ab	out stratigraph	ic principles and	different branc	hes of stratigr	aphy.				
2. Studen	ts are given o	detailed knowle	edge about sequ	ence stratigrap	hy and associ	iated branches				
along with a deep insight on palaeogeographical reconstructions of India.										
3. Students will get to know about the relationship of stratigraphy with environment and ecology										
in context with	n major events									
1 Studen	ta ara aakraw	ladged with an	malata dagarinti	on of Condwan	5 Students and calmendaded with complete description of Conducate and Descen systems along					

4. Students are acknowledged with complete description of Gondwana and Deccan systems along with tertiary hydrocarbon resources.

## **DETAILS OF COURSE**:

Unit	Content
1	Controls on development of stratigraphic records. Stratigraphic principles and nomenclature.
	Biostratigraphy: zonations and significance. Basics of Chronostratigraphy,
	Magnetostratigraphy, Cyclostratigraphy, Pedostratigraphy.
2	Sequence Stratigraphy: definition, factors and controls of sequence stratigraphy. Basin analysis
	through sequence stratigraphy. Event stratigraphy: global bio-events, extinctions and
	radiations, global geo-events. Palaeogeography: palaeogeographic reconstructions,
	palaeogeography of India during Gondwana duration, Paleogene and Neogene.
3	Palaeobiogeography: concepts, recognition, factors controlling geographic distribution of
	species. Palaeoecology: concepts of palaeoecology, application of community analysis in
	palaeoenvironmental reconstruction, mass extinctions, glacial cycles, global climate change.
	Temporal pattern of communities-evolutionary changes in fauna and flora with environments.
4	Gondwana sequence of India: classification, distribution, stratigraphic succession, climatic
	vicissitude and economic significance of Gondwana sequence of India. Deccan volcano-
	sedimentaries, Tertiary stratigraphy of India with special emphasis on hydrocarbon resources.

Sr. No	Name of Books/ Authors
1	Sequence stratigraphy, Emery, D. & Myers, K.J., Oxford, Blackwell Science.
2	Geology of India and Burma, Krishnan, M.S., CBS Publisher
3	Fundamentals of Historical Geology and Stratigraphy, Ravinder Kumar, CBS Publisher.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-902.1	3	3	3	3	3	3	3	3	3	3	3
GT-902.2	3	3	3	3	3	3	3	2	3	2	2
GT-902.3	3	3	3	3	3	3	3	3	3	2	3
GT-902.4	3	3	3	3	3	3	3	3	3	3	2
Average	3	3	3	3	3	3	3	2.75	3	2.5	2.75

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-902.1	3	3	3	3
GT-902.2	3	3	2	3
GT-902.3	3	3	2	3
GT-902.4	3	2	3	3
Average	3	2.75	2.5	3

ORGAN	ORGANIZATIONAL BEHAVIOR AND BUSINESS MANAGEMENT (GT-							
			<b>903</b> )					
Lecture	re Credit Assessment External Internal Total Exam							
		method	Assessment	Assessment		Duration		
4	4	Theory	100	50	150	3 hrs.		
	COURSE OBJECTIVE							
To introduc	the students	s to the basic co	ncept of organiz	ational behavio	our.			
COURSE OUTCOMES								
1. The	students are	introduced to	the organisation	al Behaviour a	and other simi	lar fields of		
study.	study.							
2. Stu	2. Students will be able to apply theories of perception, learning, leadership and motivation							
in their respective geo-organizations.								
3. Stu	dents can unde	erstand about of	rganizational str	ucture and hum	an resource de	evelopment.		
4. Stu	dents will lea	irn about the f	field of busines	s, financial ma	anagement and	d marketing		

management.

#### **DETAILS OF COURSE**:

Content
Introduction to organizational behaviour: nature of organizational behaviour, O.B. and
other similar fields of study. Psychology, sociology, anthropology, political science.
Approaches to O.B challenges and opportunities for organizational behaviour.
Perception: concept of perception, perceptual process, factors influencing perception.
Learning: concepts of learning, components of learning process, factors affecting
learning. Leadership: meaning of leadership, leadership theory, charismatic leadership
theory, trait theory, behavioural theory. Motivation: concept of motivation, motivation
and behaviour, theories of motivation, Maslow's need hierarchy theory.
Concept and forms of organisation structure. Concept of organisational culture, creating
and sustaining organisational culture. Nature of organisational change, factors affecting
organisational change, resistance to Change, overcoming resistance change. Human
resource development: meaning and concept. Personnel management: meaning, nature,
importance and functions of personnel management.
Business: concept, nature and objectives. Social responsibility of business. Environment:
meaning of environment, constituents of environment, Economic, social, political, legal
and technological environment. management: definition, nature and significance.
Functions of management. Planning, organising, staffing, directing and controlling.
Financial management: objectives and functions of financial management. Marketing
Management: nature, scope and importance of marketing management, modern
marketing concepts. Role of marketing in economic development, meaning, nature and
scope of international marketing.

#### **SUGGESTED BOOKS:**

Sr. No.	Name of Books/ Authors
1	Organisational Behaviour, Stephen P. Robbins, Pearson Education.
2	Organisational Behaviour, Jit S. Chandan, Vikas Publishing House Pvt. Ltd.
3	Organisational Behaviour, L.M. Prasad, Sultan Chand & Sons, New Delhi.
4	Human Relations & Organisational Behaviour, R.S. Dwivedi, Oxford, IBH.
5	Personnel Management, C.B. Mamoria, Himalayan Publications, New Delhi.
6	Business Environment, Francis Cherunilam, Himalaya Publishing House.

#### **Mapping of Course Outcomes to Programme Outcomes**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-903.1	3	3	3	3	3	3	2	3	3	3	3
GT-903.2	3	3	3	3	2	2	3	3	3	2	3
GT-903.3	3	3	3	3	3	3	3	3	3	2	3
GT-903.4	3	3	3	3	2	2	3	3	3	3	3
Average	3	3	3	3	2.5	2.5	2.75	3	3	2.5	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-903.1	3	3	3	3
GT-903.2	3	3	2	3
GT-903.3	3	3	2	3
GT-903.4	3	3	3	2
Average	3	3	2.5	2.75

GEO-HAZARDS AND DISASTER MANAGEMENT (GT-904)											
Lecture	Credit	Assessment	External	Internal	Total	Exam Duration					
		method	Assessment	Assessment							
4	4	Theory	100	50	150	3 hrs.					
		C	OURSE OBJE	ECTIVE							
Students w	ill be taugł	nt geological ha	zards and their	role in disaste	er mana	gement to meet the					
demands of	all the stat	es in the country	y and to fill vac	ancies arising i	n each dis	strict of the country.					
		С	OURSE OUT	COMES							
1. Stud	dents will g	get knowledge	about the basic	e principles, mi	tigation a	and management of					
natural haza	ards.										
2. Stud	dents will le	earn about mitig	ation and mana	agement of land	lslides as	well as earthquakes					
along with	seismic sce	narios of India.									
3. Stud	dents will le	arn about flood	s and tsunami 1	nitigation and r	nanageme	ent.					
4. Stud	dents do ca	se studies of dre	oughts and lear	n basic princip	les of dro	ught mitigation and					

management.

# **DETAILS OF COURSE**

Unit	Content
1	Introduction: disasters, types, natural disasters, impact of disasters on environment, basic
	principles and elements of disaster mitigation and management.
2	Earthquakes: introduction to earthquake, causes of earthquakes, earthquake intensity
	scales, seismic activity in India, action plan for earthquakes, actions to be taken before,
	after and during earthquake. Landslides: introduction to landslide, Causes of landslides,
	types of landslide and their mitigations.
3	Floods: introduction to flood, causes of floods, flood mitigation practice, vulnerability
	analysis, risk assessment, action plan for floods, actions to be taken before, after and
	during floods. Tsunami: introduction of tsunami, causes of tsunami and their mitigations.
4	Droughts: introduction to droughts, causes of droughts, types of droughts and their
	mitigations, soil erosion and desertification.

Sr. No	Name of Books/ Authors									
1	Engineering geology, Krynine and Judd WR, McGraw-Hill Book Company, New									
	York.									
2	Rock slope engineering, Hoek and Bray, J, Spon Press; 3 edition.									
3	Applied Geomorphology, Thornbury, John Wiley and sons,. Inc., New York.									
4	EA Environmental geosciences, Keller, prentice hall, New Jersey.									
5	Natural Hazard risk assessment and public policy, Petak,WJ and Atkinson, A.D.,									
	Springer-Verlag. New York.									
6	Natural Disasters and Mitigation, Roy .P.S, Van Western C.J, Jha V.J., IIRS,									
	Dehradun.									
7	Mitigation of natural hazards and disasters: international perspectives, Haque,									
	C.Emdad, Springer, Dordrecht.									

Manning of	Course	Outcomes to	Programme	Outcomes
Mapping Or	Course	Outcomes to	1 Togramme	Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-904.1	3	3	3	3	3	3	3	3	3	3	3
GT-904.2	3	3	3	2	2	2	3	3	3	3	3
GT-904.3	3	3	3	2	3	2	3	3	3	3	3
GT-904.4	3	3	3	3	2	3	3	3	3	3	3
Average	3	3	3	2.5	2.5	2.5	3	3	3	3	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-904.1	3	2	3	3
GT-904.2	3	3	2	3
GT-904.3	3	3	3	3
GT-904.4	3	3	3	2
Average	3	2.75	2.75	2.75

GEOSCIENTIFIC INSTRUMENTATION & ANALYTICAL TECHNIQUES												
(GT-905)												
Lecture	Credit	Assessment	External	Total	Exam Duration							
		method	Assessment	Assessment								
4	4	Theory	100	50	150	3 hrs.						
		C	COURSE OBJE	ECTIVE								
This cours	se is desig	ned to give the po	ost-graduate geo	ology students a	ın introdu	ctory idea about the						
various ty	pes of in	strumentation &	analytical tech	niques used to	obtain n	umerous geological						
data.												
		C	COURSE OUT	COMES								
1. St	udents wil	l learn about the	evolution of te	chnology and in	nstrument	ation in the field of						
Geoscienc	ces.											
2. St	2. Students will get knowledge about various sample and slide preparation as well as remote											
sensing ar	nd GIS tech	hnique.										
3. St	udents wi	ll learn about s	sedimentology	techniques and	l various	spectrometry and						

# spectroscopy.

4. Students will learn about groundwater and engineering geology techniques.

# **DETAILS OF COURSE:**

Unit	Content
1	Introduction: uses of analytical techniques, evolution with technological development,
	importance of sophisticated instruments and accurate analysis. Sample and sampling in
	geoscience, modal count techniques, techniques of photography in geosciences.
2	Preparation thin section and polished section making: cutting, grinding and polishing;
	powder sample preparation crushing & pulverizing. Techniques in microfossils slide
	preparation. Remote sensing and GIS techniques: aerial photograph studies, image
	interpretation and classification techniques.
3	Sedimentological techniques: sieves & sieve shaking. Sample etching & staining, heavy
	minerals & clay minerals methods, size & shape of sediments studies. Geochemistry
	techniques: flame photometer, UV spectrophotometer, (AAS) Atomic Absorption
	Spectrophotometry, ICP-Mass spectrometry, X-ray fluorescence spectrometry, Electron
	microscopy and electron-probe microanalysis, cathodoluminescence &
	thermoluminescence spectrometry.
4	Engineering geology techniques & instrumentation: in-situ and lab testing of strength of
	materials. Hydrogeological techniques & instrumentation: groundwater flow
	measurement, water quality measurement and water harvesting systems. Geophysical
	instrumentations: principles, working and data acquisition.

#### **SUGGESTED BOOKS:**

Sr. No.	Name of Books/Authors												
1	Laboratory handbook of petrographic techniques, Hutchinson, C.S. John Wiley												
2	Using geochemical data, Hugh Rollinson, Routledge.												
3	Modern geotechnical engineering, Alam Singh, IBI Publisher.												
4.	Geophysical practice in mineral exploration and mapping, T.S. Ramakrishna,												
	Geological Society of India												

# Mapping of Course Outcomes to Programme Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-905.1	3	3	3	3	3	3	2	3	3	3	3
GT-905.2	3	3	3	2	3	2	3	2	3	2	3
GT-905.3	3	3	3	2	3	2	3	3	3	2	3
GT-905.4	3	3	3	3	2	3	3	2	3	3	3
Average	3	3	3	2.5	2.75	2.5	2.75	2.5	3	2.5	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-905.1	3	3	3	3
GT-905.2	3	3	3	3
GT-905.3	3	2	2	2
GT-905.4	3	3	3	3
Average	3	2.75	2.75	2.75

OCEANOGRAPHY AND MARINE GEOLOGY (GT-906)									
Lecture	Credit	Assessment External Internal Total Exam							
		method	Assessment	Assessment		Duration			
4	4	Theory	100	50	150	3 hrs.			
	COURSE OBJECTIVE								
To introdu	To introduce concepts of oceanography and marine geology								
	COURSE OUTCOMES								
1. Stu	dents will	get introduced w	ith oceanograph	y and oceanogra	aphic setting	gs in context			
with plate	tectonics.								
2. Stu	2. Students will get knowledge about ocean circulation patterns and classification of marine								
environments.									
3. Stu	dents will	get a deep insigh	nt on oceanic sed	iments along w	ith marine g	eochemistry.			
4. Stu	dents will	understand ocea	n based resource	s and internation	nal marine l	aws.			

Unit	Content							
1	Introduction: origin of oceans, world's oceans, geographical settings. Structural and							
	oceanographic setting: plate tectonics and ocean systems, ocean morphology, marine							
	stratigraphy, ocean crust, heat distribution and age of oceanic crust, structure, petrology							
	and sources of oceanic crust, magnetization of the oceanic crust.							
2	Ocean circulation patterns: wave dynamics, oceanic currents, surface and deep							
	circulation, classification of marine environments, air-sea interaction, geologic effects of							
	bottom currents, marginal marine environments.							
3	Oceanic sediments and microfossils: terrigenous, biogenic and authigenic sediments,							
	calcareous and siliceous microfossils, chemical sediments, carbonate and silicate							
	equilibria, CCD (carbonate compensation depth), marine biogeochemistry.							
4.	Paleoceanography: approaches to paleoceanographic reconstructions, various proxy							
	indicators for paleoceanographic interpretation. Reconstruction of monsoon variability							
	by using marine proxy records. Opening and closing of ocean gateways and their effect							
	on circulation and climate during the Cenozoic. Sea level processes and Sea level							
	changes.							

Sr. No.	Name of Books/Authors						
1	Essentials of Oceanography, Tom Garrison, Cengage Learning.						
2	The Oceans, Johnson and Flemming, Sverdrup.						
3	Introduction to Physical oceanography, Reddy, M.P.M, World Press.						
4	Marine geology, Keen, M.J, Elsevier.						
5	Climatology and Oceanography, Mamoria, Chairperson and Sisodia, M.S, SBPD						
	Publication.						
6	Introduction to Marine Geology and Geomorphology, King, C, Crane Russak.						
7	Oceanography, Lal, D. S., Sharada Pustak Mahal.						
8	Oceanography: A brief Introduction, Siddhartha, K, Kisalaya Publication Pvt. Ltd.						

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-906.1	3	3	3	3	3	3	2	3	3	3	3
GT-906.2	3	3	3	2	3	3	3	3	3	2	3
GT-906.3	3	3	3	2	3	2	3	3	3	3	3
GT-906.4	3	3	3	3	2	2	3	2	3	3	3
Average	3	3	3	2.5	2.75	2.5	2.75	2.75	3	2.75	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-906.1	3	3	3	3
GT-906.2	3	3	3	3
GT-906.3	3	3	2	3
GT-906.4	3	2	3	2
Average	3	2.75	2.75	2.75

METEOROLOGY (GT-907)									
Lecture	Credit	Credit Assessment External Internal Total E							
		method	Assessment	Assessment					
4	4	Theory	100	50	150	3 hrs.			
	COURSE OBJECTIVE								
This cours	This course is designed to give the post-graduate geology students an introductory idea about the								
various br	anches of 1	meteorology.							
			COURSE OUT	<b>FCOMES</b>					
1. Stu	udents are	introduced to the	e basics of mete	eorology and th	ermal stru	cture of atmosphere.			
2. Stu	udents wil	l learn fundam	ental principle	es of climatol	ogy along	g with classification			
schemes.									
3. Stu	3. Students understand the role of meteorology in aviation and some basics of weather								
forecasting	g.								
4. Stu	udents will	learn working p	orinciples of me	teorological sa	tellites.				

Unit	Content
1	Introduction: basic definitions and processes, historical development and scopes of
	meteorology. Thermal structure of the atmosphere and its composition. Radiation: basic
	laws of rayleigh and mie scattering. Vertical stability of the atmosphere: dry and moist air
	parcel.
2	Climatology: fundamental principles of climatology. Earth's radiation balance. Cloud
	formation and classification, precipitation and water balance. Air masses, monsoon, jet
	streams, tropical cyclones, and ENSO. Classification of climates: Koppen and
	Thornthwaite scheme of classification. Global climate change.
3	Aviation meteorology: Role of meteorology in aviation, weather hazards associated with
	takeoff cruising and landing, inflight, icing, turbulence, visibility, fog, clouds, rain, gusts,
	wind shear and thunderstorms, nowcasting and very short range forecasting.
4	Satellite meteorology: meteorological satellites, polar orbiting and geostationary satellites,
	visible and infrared radiometers, multiscanner radiometers. Identification of synoptic
	systems, fog and sandstorms, detection of cyclones, estimation of SST, cloud top
	temperatures, winds and rainfall, temperature and humidity soundings.

Sr. No.	Name of Books/Authors						
1	Essentials of Meteorology 2nd ed, C. Ahrens, World Press.						
2	Atmosphere, Weather and Climate 8th ed, R. Barry, R. Chorley, Routledge.						
3	Physical Meteorology, Houghton, H.G., The MIT Press.						
4	Meteorology for scientists and engineers, Roland B. Stull, Brooks-Cole.						

Manning of C	ourse Outcomes	o Programma	Outcomes
Mapping of C	Jourse Outcomes	<u>o r rogramme</u>	Outcomes

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GT-907.1	3	3	3	3	3	3	2	3	3	3	3
GT-907.2	3	3	3	2	2	2	3	3	3	2	3
GT-907.3	3	3	3	3	3	3	3	3	3	2	3
GT-907.4	3	3	3	3	2	2	3	2	3	3	3
Average	3	3	3	2.75	2.5	2.5	2.75	2.75	3	2.5	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
GT-907.1	3	2	3	3
GT-907.2	3	3	2	3
GT-907.3	3	3	2	3
GT-907.4	3	2	3	2
Average	3	2.5	2.5	2.75

PRACTICAL (GT-908) (BASED ON GT-901, GT -902 & GT-903)						
Lecture	Credit	Assessment Method	External Assessment	Internal Assessment	Total	Exam duration
12	6	Practical	75	25	100	3 Hrs.
COURSE OBJECTIVE						
To provide in-depth knowledge of well log interpretation, stratigraphy and organization behavior.						
COURSE OUTCOME						
Students get knowledge about well log interpretation, stratigraphy and organization behavior.						

## LIST OF PRACTICALS:

• Well log interpretation exercises using computer applications or manually for calculating clay volume, porosity, formation water resistivity and water saturation from a given well log.

• Exercises based on advanced stratigraphy, paleogeography & palaeoecology.

• Exercises based on organizational behavior and business management in the geosciences applications and related industries.
PRACTICAL (GT-909) (Based on two elective subjects opted)										
LectureCreditAssessment MethodExternal AssessmentInternal AssessmentTotalExam dur 										
12	6	100	3 Hrs.							
		(	COURSE OBJE	ECTIVE						
To provid	le in-deptl	n knowledge of pra	acticals related t	o the elective su	ıbjects.					
COURSE OUTCOME										
Students g	get knowle	edge about practic	als related to ele	ective subjects.						

## LIST OF PRACTICALS:

## GT-904:

- Exercises on Geo hazard management.
- Hazard zonation maps of India.

## GT-905:

- Practical hands on microfossils slide preparation techniques.
- Rock thin section and slide preparation.
- Sample digestion procedures in geochemistry.
- Exercise on sedimentological techniques.
- Engineering geology instrumentation exercises.
- Exercise on Hydrogeological techniques and instrumentation.
- Practical hands on various spectrophotometry techniques.

## GT-906:

- Wave Data Analysis Rose Diagrams.
- Structural features of world oceans.
- Bathymetric section of ocean.
- Exercise on distribution of economic mineral deposits in world oceans.
- Computation of Longshore currents
- Computation of relative currents.
- Beach Profiles.

## GT-907:

- Analysis of temperature data.
  - (a) Vertical profiles.
  - (b) Horizontal profiles.
  - (c) Identification of Upwelling and sinking.
  - Determination of Heat budget parameters.
    - (a) Latent heat.
    - (b) Sensible heat.
    - (c) Evaporation.
- Practical exercises based on data analysis of Meteorological station.
- Computation of Atmospheric Heat Budget.

Course No.	Course Title	Total	Credits
GT-1001	Project work	150	4
GT-1002	Dissertation	150	4
GT-1003	Viva voce	150	4
	Total	450	12

# M.Tech. Applied Geology (5-Year Integrated Course) 10th semester

## **CHOICE BASED OPEN ELECTIVE**

GEOSCIENCE AND SOCIETY (GT-808) (OE- 205)											
LectureCreditAssessmentExternal AssessmentInternal AssessmentTotalExam duration											
2	2	Theory	35	15	50	3 hrs					
	COURSE OBJECTIVE										
To provide an overview of Earth Sciences including earth processes, resources and geo-hazards.											

#### **COURSE OUTCOMES**

After completion of the course the students will get to know about the basics of geology, its related disciplines and its relation with mankind.

## **DETAILS OF COURSE:**

Unit	Content
1	Introduction to geo-science and its various branches, Earth and its place in the solar system. origin and structure of Earth. Geological time scale. Origin and evolution of life through Earth history. Elementary idea of rocks, their types, rock cycle, minerals and gemstones. Elementary idea of various Earth processes, continental drift and plate tectonics. Orogenic and epeirogenic movements.
2	Elementary idea of geological considerations in site evaluation of engineering, construction, mining and other geological works. Environmental changes through the Earth history. Significance of earth resources to mankind and society. Hydrological cycle and water budget of an Earth.

## **SUGGESTED BOOKS:**

Sr. No.	Name of Books/Authors									
1.	Understanding the earth, Press, F. and Siever, R., W.H. Freeman & Co.									
2.	Palaeontology, Jain, P.C. and Anantharaman, M.S., Vishal Publication.									
3.	An Introduction to Physical Geology, Tarbuck, Lutgens, Tasa, Eleventh Edition, Pearson Publication.									
4.	Principles of engineering Geology and Geotechnics, Krynine/Judd, Jain Book Agency.									
5.	Ground water Hydrology, Tod David K, PHI Learning.									

## **CHOICE BASED OPEN ELECTIVE**

NATURAL HAZARDS (GT-910) (OE- 305)										
LectureCreditAssessmentExternal AssessmentInternal AssessmentTotalExam dur										
2	2	Theory	35	15	50	3 hrs				
COURSE OBJECTIVE										
Students will be taught geological hazards and their role in disaster management to meet the demands of all the states in the country and to fill vacancies arising in each district of the country.										
	COURSE OUTCOMES									

After completion of the course the students will get to know about the types and causes of natural hazards and their related consequences. The course also provides understanding about various mitigation measures that can be taken during such a hazardous situation.

## **DETAILS OF COURSE:**

Unit	Content
1	Introduction to hazards, hazards classification and distribution, natural hazards and their effects, hazard prediction and early warning, role of community and stakeholders. Earthquakes: classification, distribution, causes and effects. Tsunami: types, effects, prediction and early warning systems.
2	Landslides: classification, distribution, causes, effects and prevention/mitigation of landslides. Volcanic hazards: types, distribution, causes and effects of volcanoes and related hazards. Floods: types and factors leading to floods, flood control/mitigation measures. Cyclones, thunderstorms and lightning, prediction and early warning, droughts and desertification.

## SUGGESTED BOOKS:

Sr. No.	Name of Books/Author
1	Natural Disasters, Patrick Leon Abbott, Mcgraw-Hill Education.
2	Citizens Guide to Disaster Management: How To Save Your Own Life & Help Others, Laxmi Publication.
3	Disaster Management, Mukesh Kapoor, Moti Lal Banarsi Dass Publication.
4	Earthquake and Natural Disasters, Manik Kar, Moti Lal Banarsi Dass Publication.
5	Disasters Guidelines, NIDM.

6

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 301	3	3	3	3	2	3	2	2	3	3	2
CO 302	3	3	3	2.75	3	2.75	2.5	2.5	2.75	2.75	2.75
CO 303	3	2	2	2.5	2.25	2.25	2.75	2.5	3	2.5	2
CO 304	3	2.25	3	2.75	2.25	2.5	2.75	2.5	3	2.5	2
CO 305	3	2.25	2.75	2.5	2.75	2.25	2.75	2.5	2.75	2.25	2
	•		•	•	•				•		
CO 401	3	2.5	3	2.75	2.25	2.25	2.75	2.75	3	2.5	2.5
CO 402	3	2.5	3	2.75	2.25	2.5	2.75	2.5	2.75	2.5	2.25
CO 403	2.75	2.5	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2
CO 404	3	2	3	2.5	2.5	2.5	2.75	2.5	3	2.5	3
CO 405	3	2.5	3	2.5	2.25	2.5	2.75	2.5	3	2.5	2.5

## Mapping Programme Outcomes with Course Outcomes (M.Tech. Applied Geology):

CO 501	3	2.5	3	2.5	2.75	2.5	2.75	2.5	3	2.5	2.5
CO 502	3	2	3	2.5	2.25	2.5	2.75	2.5	2.75	2.5	2.5
CO 503	3	2.25	3	2.75	2.25	2.25	2.75	2.5	3	2.5	2.75
CO 504	3	2.5	2.75	2.5	2.25	2.5	2.75	2.5	3	2.5	2.5
CO 505	3	2.5	3	2.5	2.75	2.5	2.75	2.5	3	2.5	2.25
CO 601	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2.75
C0 602	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2.5
CO 603	3	2.5	2.75	2.5	2.5	2.5	2.75	2.5	3	2.5	2.75
CO 604	3	2	3	2.5	2.5	2.5	2.75	2.5	3	2.5	2
CO 605	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 701	3	3	3	2.75	2.75	2.5	2.75	2.75	3	2.5	3
CO 702	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2
CO 703	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2
CO 704	3	3	3	2.75	2.75	2.75	2.75	2.75	3	3	3
CO 705	3	3	3	2.75	2.75	2.75	2.75	2.75	3	3	3
	-	-	-		-	-	-	-	-	-	
CO 801	3	3	3	3	2.5	2.75	3	2.5	3	3	2.75
CO 802	3	3	3	2.5	3	3	2.75	3	3	2.5	3
CO 803	3	3	3	2.5	3	2.5	2.75	2.5	3	2.5	2.75
CO 804	3	3	3	2.75	3	3	2.75	2.75	3	3	3
CO 805	3	3	3	3	3	3	3	3	3	2.75	3
CO 901	3	2	3	2.5	2.25	2.25	2.75	2.5	3	2.5	2
CO 902	3	3	3	3	3	3	3	2.75	3	2.5	2.75
CO 903	3	3	3	3	2.5	2.5	2.75	3	3	2.5	3
CO 904	3	3	3	2.5	2.5	2.5	3	3	3	3	3
CO 905	3	3	3	2.5	2.75	2.5	2.75	2.5	3	2.5	3
CO 906	3	3	3	2.5	2.75	2.5	2.75	2.75	3	2.75	3
CO 907	3	3	3	2.75	2.5	2.5	2.75	2.75	3	2.5	3

# Kurukshetra University, Kurukshetra (Established by the State Legislature Act XII of 1956) ('A+' Grade, NAAC Accredited)



# Scheme of Examinations and Syllabus of M.Sc. Applied Geology

## Under

Choice Based Credit System (CBCS) Learning Outcome Based Curriculum (LOCF) Ist to IVth Semester w.e.f. Session 2020-21 in phased manner

## DEPARTMENT OF GEOLOGY KURUKSHETRA UNIVERSITY KURUKSHETRA

## **M.Sc. APPLIED GEOLOGY**

## **OUTCOME BASED SYLLABUS**

#### M.Sc. APPLIED GEOLOGY COURSE DURATION OF COURSE - 2 YEARS

## VISION

To be globally acknowledged as a distinguished center 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.

## **DEPARTMENT VISION AND MISSION**

#### VISION

• To be acknowledged as a distinguished center for Geoscience education.

## MISSION

- M1:To provide quality education to aspiring young minds for improving their skills, inculcating values, creating leadership qualities and enhancing research with innovative methods.
- M2:To produce young geoscientists capable of being utilized in the areas of new technological design, environment, ethics and sustainable technologies.
- **M3:**To develop teaching-learning methods which can produce socially committed professional human beings who can contribute effectively in nation building and represent the country internationally.

## Mapping of University vision and mission to Department vision and mission

University vision and mission	Department vision and mission
To be globally acknowledged as a distinguished center of academic excellence.	Yes
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.	Yes

#### **Programme Outcomes (PO) with Post Graduate Attributes**

Programme outcomes are attributes of the post graduates from the Programme that are indicative of the post graduate's ability and competence to work after being a qualified Geologist upon completion of post-graduation. Programme outcomes are statements that describe what students are expected to know or do by the time of post-graduation, they must relate to knowledge and skills that the students acquire from the Programme. The achievement of all outcomes indicates that the student is well prepared to achieve the Programme educational objectives down the road. The department of geology has the following eleven PO's. The course syllabi and the overall curriculum have been designed to achieve these outcomes:

## **PROGRAMME OUTCOMES(POs):**

# Programme Outcomes (POs) for Post Graduate Programmes (CBCS) in the Faculty of Sciences, Kurukshetra University, Kurukshetra

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study						
PO2	Research Aptitude	Capability to ask relevant/appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis						
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	Capable to learn and work effectively as an individual, and as a member						
	Team Work	Or leader in diverse teams, in multidisciplinary settings.						
PO6	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions						
PO7	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific						
		practices						
PO8	Science and	Ability to apply reasoning to assess the different issues related to Society						
	Society	and the consequent responsibilities relevant to the professional scientific						

		practices
PO9	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating
		in learning activities throughout life
PO10	Ethics	Capability to identity and apply ethical issues related to one's work, avoid unethical behavior such as fabrication of data, committing plagiarism and unbiased truthful actions in all aspects of work
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects

#### Programme Specific Outcomes (PSO's):

- **PSO1:** Basic understanding of fundamental concepts of Geology and applying it on the various natural processes occurring on and inside the Earth as a complete system.
- **PSO2:** Clearly formulate and solve real life challenges with respect to human environment interactions.
- **PSO3:** Applications of fundamental principles of Geology in finding out various minerals and other natural resources for the betterment of the human society.
- **PSO4:** Acquisition of skills to effectively communicate the knowledge of Geology to the society for safeguarding the physical environment.

#### Kurukshetra University Kurukshetra Scheme of Examinations and Syllabus for M. Sc. Applied Geology under CBCS - LOCF Ist to IVth Semester w.e.f. 2020-21 in phased manner

Course Code and Type	Nomenclature of the Paper	Credits	Hours/ Week	Exte rnal Assessment Marks	Internal Assessment Marks	Total Marks	Duration of Exam.			
Semester-I										
G-101	Geology I	4	4	75	25	100	3 Hours			
G-102	Geology II	4	4	75	25	100	3 Hours			
G-103	Physics and Chemistry of the Earth	4	4	75	25	100	3 Hours			
G-104	Geo-exploration	4	4	75	25	100	3 Hours			
G-105	Practical G-105 based on G-101	6	12	75	25	100	3 Hours			
G-106	Practical G-106 based on G-101, 102 and 103	6	12	75	25	100	3 Hours			
G-107	Geological Field Training	4	4	75	25	100	3 Hours			
		Semest	er-II							
G 201	Mineralogy instrumentation and analytical	4	4	75	25	100	3 Hours			
0-201	techniques	4	4	75	23	100	5 Hours			
G-202	Structural Geology and Tectonics	4	4	75	25	100	3 Hours			
G-203	Computing techniques in Geosciences	4	4	75	25	100	3 Hours			
G-204	Palaeo-biology and Micro-palaeontology	4	4	75	25	100	3 Hours			
G-205	Mining Geology	4	4	75	25	100	3 Hours			
G-206	Practical G-206 based on G-201,G-203 and G-205	6	12	75	25	100	3 Hours			
G-207	Practical G-207 based on G-202 and G-204	6	12	75	25	100	3 Hours			
OE-205	Geoscience and Society		2	35	15	50	3 Hours			
		Semest	er III							
G-301	Geohydrology	4	4	75	25	100	3 Hours			
G-302	Stratigraphy, Palaeo-geography and Palaeo- ecology	4	4	75	25	100	3 Hours			
G-303	Igneous and Metamorphic Petrology	4	4	75	25	100	3 Hours			
G-304	Sedimentology and Geomorphology	4	4	75	25	100	3 Hours			
G-305	Engineering Geology	4	4	75	25	100	3 Hours			
G-306	Practical G-306 based on G-302, G-303 and G-304		12	75	25	100	3 Hours			
G-307	Practical G-307 based on G-301 and G-305	6	12	75	25	100	3 Hours			
OE-305	Natural Disasters	2	2	35	15	50	3 Hours			
G-308	Geological Field Training	4	4	75	25	100	3 Hours			
		Semest	er IV							
G-401	Geochemistry	4	4	75	25	100	3 Hours			
G-402	Remote Sensing and GIS	4	4	75	25	100	3 Hours			
G-403	Fuel Geology	4	4	75	25	100	3 Hours			
G-404	Environmental Geology (Elective)	4	4	75	25	100	3 Hours			
G-405	Ore Geology and Mineral Economics (Elective)	4	4	75	25	100	3 Hours			
G-406	Oceanography and Marine Geology (Elective)	4	4	75	25	100	3 Hours			
G-407	Practical G-407 based on G-401, G-402 and G-403	6	12	75	25	100	3 Hours			
G-408	Practical G-408 based on G-404, G-405 and G-406	6	12	75	25	100	3 Hours			

## M.Sc. APPLIED GEOLOGY (I SEMESTER)

G-101

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 4

#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

**GEOLOGY – I** To provide a basic understanding of various aspects of Geology.

#### **Course Contents:**

Unit No.	Contents
UNIT-I INTRODUCTION	Earth science: its subdivisions and relation to other sciences. Historical development of geological thoughts. Geo-morphological processes: exogenic processes, weathering, erosion, transportation and deposition by wind; river; glacier; waves and tides.
UNIT-II MINERALOGY AND PETROLOGY	Chemical nature of minerals, isomorphism, solid solution and polymorphism. Physical properties of minerals, classification of minerals, common rock forming and ore minerals and rock cycle. Texture, structure, mineralogy and classification of igneous rocks. Sedimentary rocks and their texture, mineralogy and classification. Metamorphic facies, texture, structures, mineralogy and classification of metamorphic rocks.
UNIT-III STRUCTURAL GEOLOGY AND ENGINEERING GEOLOGY	Primary and secondary structures in rocks, stress and strain, behaviour of rocks under stress, folds, faults, joints and unconformities- their definition, classification and criteria for recognition in the field and on maps. Shear zones, transform faults and lineaments. Elementary idea about Engineering Geology, geological materials used in construction.
UNIT-IV SURVEYING	Principles of surveying and leveling, methods of surveying by chain, plane table, compass, dumpy level, theodolite and total station, Use of field instruments such as pocket compass, prismatic compass, clinometer compass, brunton compass, abney level, pedometer and altimeter. Indexing and reading oftoposheet.

COURSE OUTCOMES (COs): - After successful completion of the course, the students will:

- 1. Get to know about the basics of geology, its related disciplines and its relation with mankind.
- 2. Gain knowledge about the basics of mineralogy and petrology.
- 3. Identify and classify rocks and minerals based on various physical properties and know the basics of structural Geology.
- 4. Gain knowledge regarding the basics of surveying instruments and the techniques applicable in the field.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO1
101.1	3.0	3.0	2.0	1.0	3.0	1.0	3.0	3.0	3.0	2.0	2.0
101.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	3.0	1.0	2.0
101.3	3.0	3.0	2.0	2.0	3.0	1.0	2.0	3.0	2.0	1.0	3.0
101.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
101.5	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	3.0	2.4	1.8	3.0	2.0	2.6	3.0	2.8	1.6	2.6

Mapping of Course Outcomes to Programme Outcomes

## Mapping of Course Outcomes to Programme Specific Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
101.1	3.0	3.0	2.0	3.0
101.2	3.0	3.0	2.0	2.0
101.3	3.0	3.0	3.0	2.0
101.4	3.0	3.0	3.0	3.0
101.5	3.0	3.0	2.0	3.0
Average	3.0	3.0	2.4	2.6

1	Understanding the Earth, Press, F. and Siever, R., W.H. Freeman & Co.
2	Physical Geology, Moore, J.S. and Wicander, R., Brooks-Cole.
3	An Outline of Structural Geology, Hobbs, M B.E., Means, W.D. and Williams, P.F., John
	Wiley & Sons
4	Structural Geology: An Introduction to Geometrical Techniques, Ragan, D.M., John Wiley &
	son.
5	Fundamentals of Structural Geology, Pollard, D.D. and Fletcher, R.C., Cambridge University
	Press.
6	Structural Geology, Billings, M.P., Prentice Hall India.
7	Danas Manual of Mineralogy, Klein, C., Cornelius, S.H., and Dana, J.D., John Wiley & Sons.
8	An Introduction to the Rock-Forming Minerals, Deer, W.A., Howie, R.A. and Zussman, J.,
	ELBS.
9	Rutley's Elements of Mineralogy, Read, H.H., Springer.
10	Introduction to Mineral Sciences, Putnis, A., Cambridge University press.
11	Igneous and Metamorphic Petrology, Best, M.G., Blackwell.
12	Igneous and metamorphic petrology, Turner, F.J. and Verhoogen, J., CBS Publishers.
13	Igneous petrology, Best, M.G., CBS Publishers.
14	Igneous petrogenesis, Wilson, M., Springer.
15	Igneous petrology, Bose, M.K., World Press.
16	An introduction to metamorphic petrology, Yardley, B.W.D., Longman series, Prentice Hall.
17	Surveying Volume I, Punmia, B.C. and Jain, A., Laxmi publications (P) Ltd.

18	Surveying and leveling, Volume 1, Kanetkar, 1.P. and Kulkarni, S.V., Pune Vidyarthi Grina
	Prakashan.
19	Surveying Volume 2, Punmia, B.C., Laxmi Publications (P) Ltd.
20	Surveying and leveling, Volume 2, Kanetkar, T.P. and Kulkarni, S.V., Pune Vidyarthi Griha
	Prakashan.

#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

G-102 GEOLOGY II

To provide knowledge of various disciplines of Geology.

**Course Contents:** 

Unit No.	Contents
UNIT-I PALAEONTOLOGY	Fossils, fossilization processes (taphonomy) and modes of preservation; geological time scale and a brief history of life on Earth, major mass extinctions in the geological past, significance of fossils.
UNIT-II STRATIGRAPHY	Broad outline of physiographic and tectonic framework of India, introduction to lithostratigraphy, biostratigraphy, chronostratigraphy, magnetostratigraphy and stratigraphic principles.
UNIT-III ECONOMIC GEOLOGY AND ORE PROCESSES	Classification of ore deposits, igneous, metamorphic and sedimentary processes of formation of ore deposits, hydrothermal process, supergene enrichment, evaporites and anoxic deposits, stratified and strata-bound deposits etc. Concept of ore, gangue, tenor, grade and specifications. Distribution and geological set up of important metallic and non-metallic mineral deposits of India including coal, petroleum and atomic minerals.
<b>UNIT-IV</b> ENVIRONMENTAL GEOSCIENCE	Basic principles of environment and ecosystem in relation to Geology. Man's activities and their impact on the environment. Depleting natural resources and sustainable development, conservation of mineral resources, mitigation of pollution and environmental hazards and geogenic contamination of groundwater.

COURSE OUTCOMES (COs): - After successful completion of the course, the students will:

- 1. Understand different types of fossils and their various uses to mankind.
- 2. Get to know about the geological time scale and stratigraphic division of India.
- 3. Provide knowledge regarding various types of deposits of ores, petroleum and coal, their distribution and usefulness to mankind.
- 4. Understand the basics and importance of sustainable development and environmental geology to society.

COs/POs	PO1	PO2	PO	PO	РО	PO	РО	PO	РО	PO10	PO11
102.1	3.0	3.0	2.0	1.0	3.0	1.0	3.0	3.0	3.0	2.0	2.0
102.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	3.0	1.0	2.0
102.3	3.0	3.0	2.0	2.0	3.0	1.0	2.0	3.0	2.0	2.0	3.0
102.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
102.5	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	3.0	2.6	2.0	3.0	2.0	2.6	3.0	2.8	2.0	2.6

## Mapping of Course Outcomes to Programme Outcomes

Mapping of Course Outcomes to Programme Specific Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
102.1	3.0	3.0	2.0	3.0
102.2	3.0	3.0	2.0	2.0
102.3	3.0	3.0	3.0	2.0
102.4	3.0	3.0	3.0	3.0
102.5	3.0	3.0	3.0	3.0
Average	3.0	3.0	2.6	2.6

1. A Manual of Geology of India and Burma, Vol. I-IV, Krishnan, M. S. Gov. of India Press.
2. Palaeontology, Jain, P.C. and Anantharaman, M.S., Vishal Publishing Co.
3. Economic mineral deposits, Bateman, A.M., Jensen, M.L., John Wiley and Sons.
4. Ore Deposits of India, Gokhale and Rao, Thomson Press, Delhi.
5. India's mineral resources, Krishnaswami S., New Delhi, Oxford and IBH Pub. Co. (1972).
6. A Handbook of minerals, Crystals, Rocks and Ores, Parmod, A.O., New India Publishing
Agency – 2009.
7. Economic Geology – Economic Mineral Deposits of India, Prasad, U., CBS Publishers Ltd.
8. Natural Disasters, Alexander, D. UCL Press Ltd, Univ College London.
9. <i>Mitigation of Natural hazards and disasters: international perspectives</i> , Haque, C. Emdad., Dordrecht, Springer.
10. Environmental Geosciences, Keller, E.A., Prentice Hall, New Jersey.
11. Fundamental of Historical Geology and Stratigraphy, Kumar Ravinder., New Age International Publishers.

#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

#### PHYSICS AND CHEMISTRY OF THE EARTH

To provide information regarding physics and chemistry of the Earth and the geodynamic evolution of the Himalayas.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Theories of origin of Earth and a brief review of knowledge about the solar system. The Earth in relation to other planets and major surface features of the Earth. The Earth-Moon system.
UNIT-II	The Earth's interior: the nature of the crust-mantle boundary, low velocity zone in the upper mantle, the chemical composition and mineralogy of the Earth's crust, mantle and core, evidence from experimental petrology & study of meteorites, geochemical evolution of the Earth, thermal evolution and state of Earth, continental and oceanic heat flow and convection in mantle.
UNIT-III	Earthquakes, global seismicity, Earth's internal structure derived from seismology, continental drift, Earth's magnetic field, origin of geomagnetic fields, palae-omagnetism, polar wandering, sea-floor spreading, plate tectonics, triple junctions, hot spots & plumes.
UNIT-IV	Major features of the Earth's gravitational field and their relationship with tectonic processes in crust and upper mantle, geochronology: radiometric dating and its significance, mountain belts and new global tectonics, tectonic evolution of the Himalaya and the Indian shield.

#### COURSE OUTCOMES (COs): The paper will provide:

- 1. Knowledge about the Earth and its relation to other planets. Importance of Earth science to mankind.
- 2. Knowledge regarding earth's interior and the dynamic processes of Earth.

G-103

- 3. Detailed knowledge regarding tectonic evolution of the Himalayas and the Indian shield.
- 4. Significance of geochronology, dating techniques and tectonics.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
103.1	3.0	2.0	2.0	1.0	3.0	1.0	3.0	3.0	3.0	2.0	2.0
103.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	3.0	1.0	2.0
103.3	3.0	3.0	2.0	2.0	3.0	1.0	2.0	3.0	2.0	2.0	3.0
103.4	3.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Average	3.0	2.5	2.3	2.0	3.0	2.0	2.6	3.0	2.8	2.0	2.6

#### Mapping of Course Outcomes to Programme Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
103.1	3.0	3.0	2.0	3.0
103.2	3.0	3.0	2.0	2.0
103.3	3.0	3.0	3.0	2.0
103.4	3.0	2.0	3.0	3.0
Average	3.0	2.8	2.6	2.6

## Mapping of Course Outcomes to Programme Specific Outcomes

1.	The Solid Earth, Fowler, C.M.R., Cambridge University Press, New York,
2.	Understanding Earth, Gauss, I.G., Smith, P.S. and Wilson, R.G.L., MIT Press (1973).
3.	The Dynamic earth - A textbook in Geosciences, Wyllie, P.J., Wiley.
4.	Physics and Geology, Jacobs, J.J., Russel, R.D. and Wilson, J.T., McGraw Hill.
5.	Fundamental of Geodynamics, Schiedegger, A.E., Springer.
6.	Aspects of tectonics: focus on south-central Asia, Valdiya, K.S., Tata Mc Graw Hill Pub. Co.
7.	The Inaccessible Earth, Brown, G.C. and Mussett, A.E., Chapman and Hall.
8.	Understanding the Earth, Brown, J., Hawkesworth, C., and Wilson, C., Paperback, Book
	Depository, U.S.A.
9.	Earth, Siever, R., Frank Press.
10.	Plate Tectonics & Crustal Evolution, Condie, K.C., Butterworth-Heinemann Ltd; 4th revised edition
	(1997).

#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

G-104 GEOEXPLORATION

To introduce basic concepts of prospecting and exploration methods.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Prospecting and exploration, history of geophysical methods, planning a prospecting PROGRAMME, various types of geo-exploration methods, electrical properties of rocks and minerals, a brief outline of various types of electrical methods, quantities measured in electrical methods, wenner and schlumberger methods of resistivity profiling and sounding.
UNIT-II	Magnetic properties of rocks and minerals, determination of rock densities, introduction to gravity and magnetic methods, gravity anomalies, quantities measured in gravity and magnetic prospecting.
UNIT-III	Seismic prospecting and seismology, elementary principles of reflection and refraction methods, quantities measured in seismic methods, two layered reflection and refraction problems, principles of radioactive methods, examples/case histories of application of various geophysical methods for minerals, coal, and oil, groundwater and geotechnical investigations.
UNIT-IV	Geological prospecting criteria and guides to ore search, principles of geochemical and geo-botanical prospecting. Geological, geochemical and geo-botanical exploration for important metallic and non-metallic deposits with Indian examples. Elementary ideas about methods of drilling, core-logging and ore reserve estimation. Examples/case histories of application of geological methods of exploration.

COURSE OUTCOMES (COs): After completion of the course, the students will be able to:

- 1. Gain information regarding geo- exploration methods and its usefulness in exploration programmes and to society.
- 2. Information regarding magnetic methods of geo-exploration.
- 3. Know application of various geophysical methods for minerals, coal, oil, groundwater and geotechnical investigations
- 4. Know their applications in solving geological problems on the field.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11
104.1	3.0	2.0	2.0	1.0	3.0	1.0	3.0	3.0	3.0	3.0	3.0
104.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	3.0	3.0	3.0
104.3	3.0	3.0	2.0	2.0	3.0	1.0	2.0	3.0	2.0	3.0	3.0
104.4	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Average	3.0	2.8	2.3	2.0	3.0	2.0	2.6	3.0	2.8	3.0	3.0

## Mapping of Course Outcomes to Programme Outcomes

## Mapping of Course Outcomes to Programme Specific Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
104.1	3.0	3.0	3.0	3.0
104.2	3.0	3.0	2.0	3.0
104.3	3.0	3.0	3.0	3.0
104.4	3.0	2.0	3.0	3.0
Average	3.0	2.8	2.8	3.0

1	Applied Geophysics, Telford, W.M., Geldart, L.P. and Sheriff, R.E., Cambridge University Press.
2	An Introduction to Geophysical Exploration, Kearey, P. Brooks, M. and Hill, I., Blackwell.
3	Principles of Applied Geophysics, Parasnis, D.S., Chapman and Hall.
4	Introduction to Geophysical Prospecting, Dobrin, M.B. and Savit, C.H., McGraw-Hill.

#### **G-105 PRACTICAL**

#### BASED ON G- 101 (MINERALOGY, PETROLOGY AND STRUCTURAL GEOLOGY)

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 6

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**COURSE OBJECTIVE:** To impart the knowledge about fundamental and applied aspects of the subject among the students so that they can better understand the subject and be able to apply it on the ground.

#### **Course contents:**

Megascopic study of important earth materials, including loose soils, sediments, minerals, ore minerals and rocks in hand specimens.

Microscopic study of important minerals and rocks in thin sections and polished sections.

Elementary exercises relevant to recognition of folds, faults and unconformities on maps and in models. Preparation of geological cross sections of horizontal, dipping, folded and faulted structures.

Note: -

5 marks (20%) in each Unit are reserved for practical records / regularity / assiduity and the same are to be given by the teachers teaching the course.

**COURSE OUTCOME (CO):** After successful completion of the course the students will gain the practical knowledge about the subject and will be able to apply it in the field in geo-scientific projects professionally.

#### G-106 PRACTICAL

#### BASED ON G-102 (PALAEONTOLOGY AND STRATIGRAPHY),

#### G-101 (SURVEY) AND G-103 (PHYSICS AND CHEMISTRY OF THE EARTH)

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 6

**COURSE OBJECTIVE:** To impart the knowledge about fundamental and applied aspects of the subject among the students so that they can better understand the subject and be able to apply it on the ground.

#### **Course contents:**

Megascopic and microscopic study of important fossils. Study of important stratigraphic rocks in relation to Geological time and mineral deposits.

Preparation of site plans with the help of chain, tape and plane table. Profiling using dumpy level and determination of height using theodolite. Use of field instruments viz., clinometer, brunton, prismatic compass, abney level, altimeter and pedometer. Toposheet reading, total station.

#### Note: -

As regarding Surveying practical, end semester examination / test shall be internally conducted by the teacher teaching the course in consultation with the Chairman and marks out of 20 (15+5) shall be communicated by him to the Chairman before the practical examination.

**COURSE OUTCOME (CO):** After successful completion of the course the students will gain the practical knowledge about the subject and will be able to apply it in the field in geo-scientific projects professionally.

#### <u>G – 107</u> <u>GEOLOGICAL FIELD TRAINING</u>

Max. Marks: 75+25=100 Time: 3 Hours Credit: 4

**COURSE OBJECTIVE:** To impart understanding of mapping methods, sampling in the field and using different tools and instruments in the field.

Each student in the course is required to undergo few days' field training in an academic session.

# **COURSE OUTCOME:** Students will get knowledge about methods of geological mapping, sampling and learn use of tools and instruments in the field and also learn about preparing field training reports.

## **M.Sc. APPLIED GEOLOGY (II SEMESTER)**

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 4

#### SUBJECT CODE: COURSE TITLE:

#### G-201 MINERALOGY, INSTRUMENTATION AND ANALYTICAL TECHNIQUES To provide basic information regarding structure and optical properties of minerals.

**COURSE OBJECTIVE:** 

<b>Course Cor</b>	itents:
Unit No.	Contents
UNIT-I	Crystals: definition, elements of symmetry, notations-Weiss and miller, space lattice. Morphological classification of crystals into systems and symmetry classes (Holohedral classes). Twinning in crystals. Projections in crystals - spherical, stereoscopic and gnomonic.
UNIT-II	Pleochroic scheme of minerals. Extinction phenomenon: Extinction angle and its determinations. Interference phenomenon, order of interference colors and figures. Uniaxial and biaxial minerals: optical indicatrix. Optic sign.
UNIT-III	Structure of silicate minerals: neso-, soro-, cyclo-, iono-, phyllo- and tecto-silicates and their bearing on properties of minerals. Study of the following mineral groups/minerals with reference to structure, PT - stability, physical, chemical and optical properties, and their mode of occurrence: quartz, feldspar, feldspathoid, pyroxene, amphibole, olivine, mica, clay minerals, garnet, alumino-silicates, staurolite, epidote, zircon, sphene, zeolite, carbonate, and phosphates.
UNIT-IV	Sampling and sample preparation; thin section and polished section making. Sample etching, staining and modal count techniques. Technique in photomicrography. Brief introduction to: principles and geological application of thermo-luminescence; atomic absorption spectrophotometry; ICP-MS; mass spectrometry; x-ray diffractometry; electron microscopy and electron-probe microanalysis.

#### COURSE OUTCOMES (COs):

- 1. Understanding of crystal systems.
- 2. Optical properties of various mineral groups and its application in various geological techniques.
- 3. Understanding mineral optics and structure.
- 4. Knowledge regarding applications of various instruments in data acquisition.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
201.1	3.0	2.0	2.0	1.0	3.0	1.0	3.0	3.0	3.0	3.0	3.0
201.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	3.0	3.0	3.0
201.3	3.0	3.0	2.0	1.5	2.0	1.0	2.0	3.0	2.0	2.0	2.0
201.4	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Average	3.0	2.8	2.3	1.9	2.8	2.0	2.6	3.0	2.8	2.8	2.8

Mapping of Course Outcomes to Programme Outcomes

## Mapping of Course Outcomes to Programme Specific Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
201.1	3.0	3.0	3.0	3.0
201.2	3.0	2.0	2.0	3.0
201.3	2.0	3.0	3.0	3.0
201.4	3.0	2.0	2.0	3.0
Average	2.8	2.5	2.5	3.0

## **BOOKS RECOMMENDED:**

1.	An Introduction to the rock forming minerals, Deer, W.A., Howie, R.A. and Zussman, J. Longman., Prentice Hall.
2.	Manual of Mineralogy, Klein, C. and Hurlbut, Jr.C.S, John Wiley.
3.	Introduction to Mineral Sciences, Putnis, A., Cambridge University press.
4.	Mineralogical phase equilibria and Pressure-Temperature-Time paths, Spear, F.S. Mineralogical
	Society of America Publ., 1993.
5.	Optical Mineralogy, Phillips, W.R. and Griffen, D.T., CBS publishers.
6.	Laboratory handbook of petrographic techniques, Hutchinson, C.S., John Wiley.
7.	Dana's textbook of Mineralogy, Ford, W.E., Wiley Eastern.
8.	Rutley's Elements of Mineralogy, Read, H.H., CBS publishers.
9.	Mineralogy, Berry, Mason and Dictrich, CBS publishers.
10.	Optical Mineralogy, Kerr, P.F., McGraw Hill.
11.	Elements of Optical Mineralogy I & II, Winchell, A.N.
12.	Practical Manual of crystal optics, Babu, S.K. and Sinha, D.K., CBS Publishers.
13.	Mineral optics, Phillips, R.W., Freeman & Company, USA.

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#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

#### STRUCTURAL GEOLOGY AND TECTONICS

To provide the conceptual knowledge of structural Geology.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Mechanical principles and properties of rocks and their controlling factors. Theory of rock failure. Concept of stress and strain and their relationships of elastic, plastic and viscous materials. Strain markers in naturally deformed rocks. Behavior of minerals and rocks under deformation conditions.
UNIT-II	Fold: mechanics of folding and buckling. Fractures and joints: their nomenclature, age relationship, origin and significance. Causes and dynamics of faulting, strike-slip faults, normal faults, over thrust and nappe. Planar and linear fabrics in deformed rocks, their origin and significance. Structural behavior of diapirs and salt domes.
UNIT-III	Concept of petro-fabrics and symmetry: objective, field and laboratory techniques and types of fabrics. Time relationship between crystallization and deformation.
UNIT-IV	Major tectonic division of Himalaya, collision of India with Asia, evolution of volcanic island arc, Indus- suture zone, emergence and evolution of Himalaya, orogeny, fore arc basin and back arc basin. Study of stereographic projection.

#### **COURSE OUTCOMES (COs):**

- 1. Concept and tectonics of deformation structures.
- 2. Kinematic study of deformation structures, their origin and significance.

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- 3. Concept of petrofabric analysis and relationship between crystallization and deformation.
- 4. Detailed Himalayan Orogeny, various Map projections and its applicability in field and society.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
202.1	3.0	3.0	2.0	1.5	3.0	1.0	3.0	3.0	3.0	3.0	3.0
202.2	3.0	3.0	3.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
202.3	3.0	3.0	2.5	1.5	2.0	1.0	2.0	3.0	2.0	2.0	3.0
202.4	3.0	3.0	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Average	3.0	3.0	2.5	2.0	2.5	2.0	2.6	3.0	2.8	2.8	3.0

#### **Mapping of Course Outcomes to Programme Outcomes**

COs/PSOs	PSO1	PSO2	PSO3	PSO4
202.1	3.0	3.0	3.0	3.0
202.2	3.0	2.0	2.0	3.0
202.3	2.0	3.0	2.0	2.0
202.4	3.0	2.0	3.0	3.0
Average	2.8	2.5	2.5	2.8

Mapping of Course Outcomes to Programme Specific Outcomes

1.	Folding and fracturing of rocks, 1967, Ramsay, J.G., McGraw Hill.
2.	An outline of Structural Geology, Hobbs, B.E., Means, W.D. and Williams, P.F., John Wiley.
3.	Structural Geology of rocks and region, Davis, G.R., 1984. John Wiley.
4.	Modern Structural Geology, Volume I & II, 1987, Ramsay, J.G. and Hubber, M.I., Academic Press.
5.	Analysis of geological structures, Price, N.J. and Cosgrove, J.W., 1990, Cambridge Univ. Press.
6.	Structural Geology fundamentals of modern developments, Ghosh, S.K., 1995, Pregamon Press.
7.	Geological structures and Moving plates, Park, R.G., Springer science + Business Media
	Dordrecht 1988.
8.	Global tectonics, 1990 Keary, P. and Vine, F.J., Blackwell.
9.	Dynamic Himalaya, 1998. Valdiya, K.S., Universities press, Hyderabad.
10.	Geomorphology and Global tectonics, 2000, Summerfield, M.A., Springer Verlag.
11.	Mechanics in structural geology, Bayly, B. 1992, Springer Verlag.
12.	Micro-tectonics, Passchier, C.W. and Trouw, R.A.J. 1998, Springer.
13.	Aspects of tectonics: focus on south-central Asia, Valdiya, K.S., Tata Mc Graw Hill Pub. Co., 1984.

#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

#### COMPUTING TECHNIQUES IN GEOSCIENCES

To provide basic information regarding basics of computer and statistical methods in relation to Geology.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Computer system, hardware components: CPU, memory, input/ output devices and information storage media. Software, computer PROGRAMMEs, operating system concepts, DOS and its use.
UNIT-II	Problem solving and computer programming languages useful for scientific computing, various data types, expression and statements, iterative statements, input/output statements, subroutines and functions, data sharing among sub programmes/programmes. Programming examples to handle problems of numerical and statistical type.
UNIT-III	Computer applications in Geology: preparation of charts, frequency diagrams, geological maps, thematic maps, cross sections and litho logs.
UNIT-IV	Statistical parameters: mean median, mode, skewness, and kurtosis. Statistical techniques: probability, correlation and regression. Frequency curve, cumulative curve and histogram.

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#### **COURSE OUTCOMES (COs):**

- 1. Students will gain knowledge regarding the basics of computers and its use to society.
- 2. Knowledge regarding computer languages useful to handle problems of numerical and statistical type in Geology.
- 3. Various applications of computers in Geology.
- 4. Knowledge regarding statistical methods and their significance to Geology and society.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
203.1	3.0	3.0	2.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0
203.2	3.0	3.0	3.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
203.3	3.0	3.0	2.5	2.0	2.0	2.0	2.0	3.0	2.0	3.0	3.0
203.4	3.0	3.0	2.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Average	3.0	3.0	2.5	2.3	2.5	2.3	2.6	3.0	2.8	3.0	3.0

#### Mapping of Course Outcomes to Programme Outcomes

## Mapping of Course Outcomes to Programme Specific Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
203.1	3.0	3.0	3.0	3.0
203.2	3.0	2.0	2.0	3.0
203.3	3.0	3.0	3.0	3.0
203.4	3.0	2.0	3.0	3.0
Average	3.0	2.5	2.8	3.0

1.	Fundamentals of Computer, Rajaraman, V., Prentice Hall India.
2.	Computer applications in Earth Sciences, Merriam, D. F., Springer.
3.	Computer Oriented Numerical Methods, Rajaraman, V., Prentice Hall India, 1984.
4.	<i>Computer programming for science &amp; Engineering</i> , Bhirud, L.L., Oxford and IBH Publishing Co Pvt. Ltd., (1991).
5.	Computer methods in Geology, Loudon, T.V., Academic Press, 1979.

#### SUBJECT CODE: COURSE TITLE:

## G-204 PALAEOBIOLOGY AND MICROPALAEONTOLOGY

**COURSE OBJECTIVE:** 

To impart basic understanding and significance of different aspects of Micropalaeontology and Palaeobiology.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Concepts of organic evolution: evolution of horse, elephant and man. An overview of
	palaeobotany and Gondwana flora.
UNIT-II	Functional morphology, evolutionary trends. Geological history of Brachiopods,
	Trilobites, Mollusca, Echinoderms and Graptolites.
UNIT-III	Sampling techniques in micro-palaeontology, processing of samples for preparation of
	microfossils, morphology and geological distribution of Foraminifera, Ostracoda,
	Conodonts, Radiolarians, Silicoflagellates, and Chitinozoans. Palaeo-environmental
	interpretations based on microfossils.
UNIT-IV	Morphology, ecology and geological history of Charophytes, Dinoflagellates and
	Acritarchs. Morphology of fossil spores and pollen grains. Applications of microfossils
	in fossil fuel exploration.
	A
UNIT-IV	Morphology, ecology and geological history of Charophytes, Dinoflagellates and Acritarchs. Morphology of fossil spores and pollen grains. Applications of microfossils in fossil fuel exploration.

#### **COURSE OUTCOMES (COs):**

- 1. Knowledge of micro-palaeontology and palaeo-biology
- 2. Applications of micro-palaeontology and palaeo-biology in biostratigraphy, biochronology and palaeo-environmental interpretations.
- 3. Understanding evolutionary trends and geological history of invertebrates.
- 4. Applications of microfossils and palyno-fossils in coal and petroleum exploration.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11
204.1	3.0	1.0	2.0	3.0	3.0	1.0	3.0	3.0	3.0	2.0	2.0
204.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
204.3	3.0	2.0	2.0	2.0	3.0	1.0	2.0	3.0	2.0	2.0	2.0
204.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Average	3.0	2.25	2.5	2.8	3.0	1.8	2.5	3.0	2.5	2.3	2.5

#### Mapping of Course Outcomes to Programme Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
204.1	3.0	3.0	2.0	3.0
204.2	3.0	2.0	3.0	3.0
204.3	3.0	3.0	3.0	3.0
204.4	3.0	2.0	3.0	3.0
Average	3.0	2.5	2.8	3.0

## Mapping of Course Outcomes to Programme Specific Outcomes

1.	Invertebrate Palaeontology and Evolution, Clarkson, E.N.K., 1998, IV Ed., Blackwell.
2.	Palaeontology- The record of life, Stearn, C.W. & Carroll, R.L., 1989, John Wiley.
3.	Systematics and the Fossils Record- Documenting Evolutionary Patterns, Smith, A.B., 1994, Blackwell.
4.	Bringing Fossils to Life- An introduction to Palaeobiology, Prothero, D.R., 1998, McGraw Hill.
5.	Introduction to Marine Micropalaeontology, Haq, B.V. and Boersma, A., 1998, Elsevier.
6.	Foraminifera, Haynes, J.R., 1981, John Wiley.
7.	Elements of Micropalaeontology, Bignot, G., Graham and Trotman, 1985, Springer.
8.	Principles of Micropalaeontology, Glassner, M.E., Hafner Publ.
9.	Principles of Zoological Micropalaeontology, Pokherny V., Pargamon Publ.
10	Introduction to Microfossils, Jones, D.J., Hafner Publishing Co Ltd., 1969.
11.	Foraminifera: Their classification and economic use, Cushman, J.A., Andesite Press, 2015.
12.	Microfossils, Brasier, M. and Armstrong, H., Wiley Blackwell, 2013.
13.	Invertebrate Fossils, Moore, Lalicker and Fischer, McGraw Hill.
14.	Principles of Invertebrate Palaeontology, Shrock and Twenoffel, CBS.
15.	Essentials of Palynology, Nair, P.K.K., Asia Pub. House.
16.	<i>Treatise on Invertebrate Palaeontology</i> , Moore, R.O., (Editor), New York: Geological Society of America; Lawrence Kansas: University of Kansas Paleontological Institute, 1953-1981.
17.	The Micropalaeontology of Oceans, Funnel, D.M. and Riede, W.R., Cambridge Univ. Press.
18.	Palaeontology Invertebrate, Woods, H., CBS.
19.	Vertebrate Palaeontology, Ramer, A.S., Univ. of Chicago Press.
20.	Organic Evolution, Lull, R.S., Nabu Press.
21.	Micropaleontology, Kathal, K., CBS publication.

#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

#### G-205 MINING GEOLOGY

This course is designed to give an idea about the various types of geological field operations, which are carried out in opencast/underground mines.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Elements of mining, its methods (alluvial mining, opencast mining and underground mining) for metallic and nonmetallic ores. Coal mining and Ocean bottom mining.
UNIT-II	Preparation of mine plans. Role of geologists in mine operation. Drilling methods and core logging. Sampling and its methods. Mineral processing techniques. Methods of ore reserve estimation.
UNIT-III	Types of explosives, equipment and material required for blasting, method of charging explodes.
UNIT-IV	Shafting, ventilations, drainage and pumping. Mine support and mechanization. Mine safety measures and mine legislation.

#### **COURSE OUTCOMES (COs):**

- 1. Basic knowledge regarding mining and different types of mining methods.
- 2. Role of geologist in mine working operations.
- 3. Methods of blasting and explosion.
- 4. Knowledge on various mine safety measures and legislation.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
205.1	3.0	1.0	2.0	3.0	3.0	1.0	3.0	3.0	3.0	2.0	3.0
205.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
205.3	3.0	2.0	2.0	2.0	3.0	1.0	2.0	3.0	2.0	2.0	3.0
205.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	2.25	2.5	2.8	3.0	1.8	2.5	3.0	2.5	2.0	3.0

#### Mapping of Course Outcomes to Programme Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
205.1	3.0	3.0	2.0	3.0
205.2	3.0	2.0	3.0	3.0
205.3	2.0	2.0	3.0	3.0
205.4	3.0	2.0	3.0	3.0
Average	2.8	2.3	2.8	3.0

## Mapping of Course Outcomes to Programme Specific Outcomes

1.	Mining Engineer's hand books, Roberts, P., John Wiley and Sons.
2.	Mining Geology, Mckinstry, H.E., Asia publishing house.
3.	Courses in mining Geology, Arogyaswami, R.P.N., Oxford IBH.
4.	Elements of mining, Clark, G.B., John Wiley.

#### BASED ON G-201 (MINERALOGY, INSTRUMENTATION AND ANALYTICAL TECHNIQUES), 203 (COMPUTING TECHNIQUES IN GEOSCIENCES) AND G-205 (MINING GEOLOGY)

Max. Marks: 75+25=100 Time: 3 Hours Credit: 6

**COURSE OBJECTIVE:** To impart the knowledge about fundamental and applied aspects of the subject among the students so that they can better understand the subject and be able to apply it on the ground.

Mineralogy

Determination of the following crystallographic parameters:

(a) Zone symbols between faces (b) Angle between faces in different crystal systems (c) Axial ratio with the help of stereogram of different crystal systems.

Study of detailed physical and optical properties of various minerals. Interpretation of X-ray diffractograms.

Exercises on Instrumentation and analytical techniques: sample preparation, thin section making, etching, staining, and spectrometers.

Diagrammatic representation of open cast and underground mining. Methods of mining survey. Exercise on mine sampling and determination of tenor, cut-off grades, and ore reserves.

Computer Lab.

**COURSE OUTCOME (CO):** Students will gain the practical knowledge about the subject and will be able to apply it in the field in geo-scientific projects professionally.

# BASED ON G-202 (STRUCTURAL GEOLOGY AND TECTONICS) AND G-204 (PALAEONTOLOGY AND MICROPALAEONTOLOGY)

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 6

**COURSE OBJECTIVE:** To impart the knowledge about fundamental and applied aspects of the subject among the students so that they can better understand the subject and be able to apply it on the ground.

Preparation and interpretation of geological map and section. Structural problems concerning economic mineral deposits. Recording and plotting of field data. Plotting and interpretation of petro-fabric data and resultant diagrams. Study of large-scale tectonic features of the earth.

Processing of samples, picking and mounting of fauna. Preparation of oriented sections. Study of invertebrate and vertebrate fossils of important groups. Microscopic study of foraminifera, ostracoda, fossil spores, pollen grains and phytoplanktons of different periods. Delineation of environmental conditions on the basis of fossil assemblages

**COURSE OUTCOME:** Students will gain the practical knowledge about the subject and will be able to apply it in the field in geo-scientific projects professionally.

## M.Sc. APPLIED GEOLOGY (III SEMESTER)

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 4

#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

## G- 301

#### GEOHYDROLOGY

To provide understanding regarding the hydro-geological properties of water bearing formations and chemical parameters of water.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Introduction to hydrogeology, hydrologic cycle, water budget on earth, water balance studies, origin of groundwater, springs, their classification and characteristics, quality of groundwater, drinking water criteria, standards of industrial and agricultural use of water.
UNIT-II	Hydrological properties of water bearing materials, porosity, void ratio, permeability, transmissivity, storativity, specific yield, specific retention, diffusivity, and field and laboratory methods of determination of permeability. Movement of groundwater and aquifer performance tests. Darcy law and its range of validity. Theory of groundwater flow under steady and unsteady conditions, determination of permeability, transmissivity and storativity by discharging well methods.
UNIT-III	Mode of occurrence of ground water, classification of rocks with respect to their water bearing characteristics, aquifers, aquicludes, aquitards, aquifuse, classification of aquifers, photo-geological and remote sensing studies for water resources evaluation, groundwater exploration, water well drilling, development of wells, groundwater management, hydrograph analysis, conjunctive and consumptive use of groundwater and hydrograph analysis.
UNIT-IV	Physical properties used for groundwater exploration, groundwater exploration methods, resistivity method, concept of apparent and true resistivity, profiling and sounding, range of resistivity values for various rocks and minerals and application of seismic refraction method for groundwater problems.

#### COURSE OUTCOMES (COs):

- 1. Basic knowledge of geohydrology and groundwater prospecting techniques.
- 2. knowledge regarding groundwater flow under steady and unsteady conditions
- 3. Knowledge regarding groundwater exploration and management.
- 4. Application of seismic refraction methods in groundwater problems.

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COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11
301.1	3.0	1.0	2.0	3.0	3.0	1.0	3.0	3.0	3.0	2.0	3.0
301.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
301.3	3.0	2.0	2.0	2.0	3.0	1.0	2.0	3.0	2.0	2.0	3.0
301.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	2.25	2.5	2.8	3.0	1.8	2.5	3.0	2.5	2.0	3.0

COs/PSOs	PSO1	PSO2	PSO3	PSO4
301.1	3.0	3.0	2.0	3.0
301.2	3.0	2.0	3.0	3.0
301.3	2.0	2.0	3.0	3.0
301.4	3.0	2.0	3.0	3.0
Average	2.8	2.3	2.8	3.0

1.	A text book of Geomorphology, Worcester, P.G., East West Press.
2.	Ground water Hydrology, David K. Todd., John Wiley and Sons.
3.	Principle of Hydrology, Ward, R.C. and Robinson, M., Tata McGraw Hill.
4.	HandBook of applied Hydrology, Chow, V.T., McGraw Hill.
5.	Introduction to groundwater hydrology, Heath, R.C. and Trainer, F.W., John Wiley and Sons.
6.	Hydrology, Meinzer, O.E., Dover.
7.	Hydrogeology, Davis, S.N., and Dewiest. R.J.M., John Wiley and Sons.
8.	Ground water, Toman, C.F., McGraw Hill.
9.	Hydrology, Wister, C.P. & Brater, E.F., Yoppen Co. Ltd, Tokyo.
10.	Geohydrology, Dewiest, R.J.M., John Wiley and Sons.
11.	Ground water, Walton, W.C., McGraw Hill.
12	Ground water, Raghunath, H.M., Wiley Eastern Ltd.
13	Hydrology, Joya, P. and Reddy Remi, Laxmi Publications, Delhi.
14	Basic Exploration Geophysics, Robinson, E.S., Wiley.

#### SUBJECT CODE: COURSE TITLE:

## STRATIGRAPHY, PALAEO-GEOGRAPHY AND PALAEO-ECOLOGY

**COURSE OBJECTIVE**: To impart basic understanding regarding significance of different aspects of stratigraphy, palaeo-geography and palaeo-ecology.

G-302

#### **Course Contents:**

<b>T</b> T <b>1</b> / <b>N</b> T	
Unit No.	Contents
UNIT-I	Code of stratigraphic nomenclature, principles of stratigraphic correlation, cyclo-
	stratigraphy node stratigraphy event stratigraphy ecquance stratigraphy
	strangraphy, pedo-strangraphy, event strangraphy, sequence strangraphy.
UNIT-II	Precambrian stratigraphy of India, Paleozoic stratigraphy (Spiti, Kashmir and Kumaon),
	Mesozoic stratigraphy (Spiti Kutch Narmada Valley and Trichinopoly)
	Wesozofe strangraphy (Spiri, Ruten, Narmada Vancy and Thenmopory).
TINITT III	Conducate Supergroup, Conoracia stratigraphy (Assam, Dangel basing and Carbural
UNII-III	Gondwana Supergroup, Cenozoic strangraphy (Assani, Bengar Jasins and Garnwai-
	Shimla Himalayas). Siwaliks and Indo Gangetic alluvial plains.
UNIT IV	Palaeo-geographic reconstruction of India during Condwana time Palaeogene and
	Talaco-geographic reconstruction of india during Gondwana time, Talacogene and
	Neogene periods. Palaeoecological analysis of foraminifera and ostracods.
	6 I G

**COURSE OUTCOMES (COs):** The students will acquire basic knowledge on:

- 1. GTS, stratigraphy and applications in Geology and society.
- 2. Stratigraphic procedures of correlation and their applications.
- 3. Stratigraphic sequences with reference to India.
- 4. Palaeo-geographic reconstruction of India.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	P011
302.1	3.0	1.0	2.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0
302.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
302.3	3.0	2.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	3.0	3.0
302.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Average	3.0	2.25	2.5	2.8	3.0	2.3	2.5	3.0	2.5	2.8	3.0

#### Mapping of Course Outcomes to Programme Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
302.1	3.0	3.0	3.0	3.0
302.2	3.0	2.0	3.0	3.0
302.3	3.0	3.0	3.0	3.0
302.4	3.0	2.0	3.0	3.0
Average	3.0	2.5	3.0	3.0

1.	The Cenozoic Era: Tertiary and Quaternary, Pomerol, C., 1982, Ellis Horwood Ltd.
2.	Precambrian Geology: The Dynamic Evolution of Continental Crust, Goodwin, A.M., (1991), Academic Press.
3.	Principles of Sedimentology and Stratigraphy, Boggs, Sam Jr. 1995, Prentice Hall.
4.	Integrative Stratigraphy: Concepts and Applications, Brenner, R.L. and Mcttargue, T.R., 1988, Prentice Hall.
5.	Sedimentary and Evolutionary Cycles, Bayer, U. and Seilacher, A., 1985, Springer-Verlag.
6.	Palaeozoic; Vol.1; Mesozoic, Vol. II; Cenozoic Vol. III, Moullade, M. and Nairn, A.E.M., 1983, Elsevier.
7.	Seismic Stratigraphy-Applications to Hydrocarbon Exploration, Payton, C.E., Amer. Assoc. Petrol. Geol. Publ., 1977.
8.	Unlocking the Stratigraphic Record, Doyle, P and Benett, M.R., 1996, John Wiley.
9.	Precambrian Geology of India, Naqvi, S.M. and Rogers, J.J.W., 1987, Oxford Univ. Press.
10.	A Manual of Geology of India and Burma, Krishnan, M.S., Vol. I-IV, Govt. of India Press.
11.	<i>Palaeomagnetism-Principles and Applications in Geology, Geophysics and Archaeology</i> , Tarling, D.H., 1983, Chapman and Hall.
12.	Seismic Stratigraphy, Sheriff, R.E., 1980, International Human Resource Development Corp. Boston.
13.	Introduction to Palaeoecology, Ager, D.V. 1980, McGraw Hill.
14.	Principles of Palaeoecology, Ager, D.V., 1963, McGraw Hill.
15.	The Ecology of Fossils, Mckerrow, W.S., 1982, MIT Press.
16.	Palaeoecology: Concepts and Application, Dodd, J.R. and Stanton, R.J., John Wiley.
17.	<i>Treatise on Marine Ecology &amp; Palaeoecology, Vol.</i> 2, Ladd, H.S., 1957, (Palaeoecology) Mem. Soc. America.
18.	Geology of India, Wadia, D.N., Alpha Edition.
19.	Manual of Geology of India, Vol. I, II and III, Pascoe, Geological Survey of India.
20.	Fundamental of Historical Geology and Stratigraphy, Kumar, R., New Age (publisher).
21.	Stratigraphic Geology, Gignoux, M., W.H. Freeman and Company.
22.	Historical Geology, Dunbar, C.O. & Waage, K.M., John Wiley.
23.	Principles of Precambrian Geology, Goodwin, A., Academic Press.
24.	Vertebrate Paleontology, Ramer, A.S., Univ. of Chicago Press.
25.	Colbert's Evolution of the Vertebrates, Colbert, E.H., Wiley-liss.

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## SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

## IGNEOUS AND METAMORPHIC PETROLOGY

To provide in depth knowledge regarding genesis and association of igneous and metamorphic rocks.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Magma generation and emplacement in the crust, mantle and their relation to plate tectonics. Factors affecting magma and evolution of magma (differentiation, assimilation, mixing and mingling). Phase equilibrium of ternary system: (a) Ab-An-Di system, (b) Fo-An-SiO ₂ system (c) Fo-Di-SiO ₂ and their relation to magma genesis and crystallisation in the light of modern experimental work.
UNIT-II	Criteria for classification of the igneous rocks - IUGS classification of plutonic and volcanic rocks. Variation diagrams. CIPW Norms. Texture, chemical composition, distribution and petrogenesis of major igneous rock types such as granite, pegmatite, granodiorite, rhyolite, syenite, diorite, trachyte, andesite, gabbro, basalt, komatiite, alkaline and mono-mineralic rocks.
UNIT-III	ACF, AKF, AFM diagrams. A detailed description of each facies of low-pressures, medium- to high- pressures, very high pressure with special reference to characteristic metamorphic zones and sub-facies. Nature of metamorphic reactions and pressure- temperature conditions of metamorphism. Mineral assemblages and application of mineralogical phase rule to metamorphic rocks. Iso-reactiongrad, schreinemakers rule and construction of petrogenetic grids.
UNIT-IV	Metasomatism, metamorphic differentiation. Anatexis and origin of migmatites, granitisation in the light of experimental studies. Regional metamorphism and paired metamorphic belts in reference to plate tectonics. Ultra-high temperature, ultra-high pressure and ocean floor metamorphism. Study of charnockite, khondalites and gondites. Regional and contact metamorphism of pelitic and impure calcareous rocks.

G-303

- 1. Knowledge on magma generation and relation to plate tectonics. The students will understand the process and kinematics involved in the genesis of igneous and metamorphic rocks.
- 2. Classification of the igneous rocks, variation diagrams, CIPW Norms and their applicability.
- 3. Detailed description of facies and assemblages and applications to metamorphic rocks.
- 4. Detailed study on metamorphism and relation to plate tectonics.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
303.1	2.0	2.0	2.0	1.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0
303.2	3.0	2.0	3.0	2.0	3.0	2.0	2.0	3.0	3.0	1.0	2.0
303.3	2.0	3.0	2.0	2.0	3.0	1.0	2.0	3.0	2.0	1.0	3.0
303.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	2.5	2.5	2.5	1.8	3.0	2.0	2.5	3.0	2.8	1.5	2.8

## Mapping of Course Outcomes to Programme Specific Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
303.1	3.0	2.0	2.0	3.0
303.2	2.0	3.0	3.0	3.0
303.3	3.0	3.0	3.0	3.0
303.4	3.0	2.0	3.0	3.0
Average	2.8	2.5	2.8	3.0

1.	Igneous and metamorphic petrology, Turner, F.J. and Verhoogen, J., CBS Publishers.
2.	Igneous petrology, Best, M.G., CBS Publishers.
3.	Igneous and metamorphic petrology, Philipotts, A., Prentice Hall.
4.	Igneous petrology, Bose, M.K., World press.
5.	Igneous petrogenesis, Wilson, M., Unwin Hyman Ltd, London.
6.	Metamorphic petrology, Turner, F.J., McGraw Hill, NY.
7.	An introduction to metamorphic petrology, Yardley, B.W., Longman, NY.
8.	Petrogenesis of metamorphic rocks, Bucher, K. and Frey, M., Springer - Verlag.
9.	Petrogenesis of metamorphic rocks, Winkler, H.G.F., Narosa publishers, New Delhi.
10.	Petrography, Williams, H., Turner, F.J. and Gilbert, C.M., CBS Publishers, New Delhi.
11.	Metamorphic crystallisation, Kretz, R., John Wiley.
12.	Physical chemistry of magmas, Perchuk, L.L. and Kushiro, I. (eds), Springer Verlag.
13.	Igneous petrology, Mc Birney, A.R., Jones & Bartlet, Publ.
14.	A descriptive petrography of igneous rocks, Johansen, A., Allied Pacific Pvt. Ltd, Bombay.
15.	Petrology of metamorphic rocks, Mason, R., CBS publishers.
16.	The study of rocks in thin sections, Moorhouse, W.W., CBS publishers.
17.	Atlas of igneous rocks and their textures, Mackenzie, W.S., Donaldson, C.H. and Guilford, C.,
	ELBS/Longman.

## SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

## SEDIMENTOLOGY AND GEOMORPHOLOGY

To provide in-depth knowledge of sedimentological and geomorphic processes.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Concept of size, size classification of sedimentary aggregates, causal factors of grain size distribution- provenance, transportation and depositional processes, shape, roundness, porosity and permeability. Sedimentary structures. Maturity of sediments: lithification and diagenesis. Facies.
UNIT-II	Conglomerate types -ortho, para, intraformational. Sandstone types - feldspathic and arkose, lithic, wackes and quartz arenites. Shales and clays. Classification of sandstones. Sedimentological characteristics of fluvial, glacial and aeolian environments. Provenance of sediments, paleocurrent analysis.
UNIT-III	Size analysis of sediments by sieving method, staining technique, X-ray and DTA analysis of clays, heavy mineral analysis and its significance. Application of sedimentary petrology to science, industry and technology. Active tectonic studies of sedimentary basins. Paleochannels of the ancient Saraswati and Drishadvati river systems and their geological significance.
UNIT-IV	Fundamental concepts of geomorphology, base level erosion and peneplanation, cycle concept, rejuvenation and interruption of geomorphic cycle. Climate and geomorphic processes. Factors governing evolution of landforms. Influence of structure and lithology on drainage. Application of geomorphology in civil engineering and strategic terrain evaluation.

G-304

- 1. Detailed knowledge of sedimentary rocks, structures, environments of sedimentation and sedimentary facies in nature.
- 2. Characteristics of various sedimentary environments and palaeo-current analysis.
- 3. Field and laboratory methods to study and analyze sedimentary rocks.
- 4. Fundamental concepts of geomorphology and their application in society.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
304.1	3.0	2.0	2.0	2.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0
304.2	3.0	2.0	3.0	2.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0
304.3	3.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
304.4	3.0	3.0	3.0	2.5	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	2.5	2.5	2.2	3.0	2.3	2.5	3.0	2.8	2.0	3.0

Mapping of Course Outcomes to Programme Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
304.1	3.0	2.5	2.0	3.0
304.2	3.0	3.0	3.0	3.0
304.3	3.0	3.0	3.0	3.0
304.4	3.0	2.5	2.0	3.0
Average	3.0	2.8	2.5	3.0

1.	Sedimentary Rocks, Pettijohn, F.J., CBS.
2.	Depositional Sedimentary Environments, Reineck and Singh, Springer.
3.	Manual of Sedimentary petrography, Krumbein and Pettijohn.
4.	Principles of Sedimentary deposits: Stratigraphy and Sedimentology, Friedman, Gerald and Sanders,
	Macmillan USA.
5.	Introduction of Sedimentology, Shelly, R.C., Academic Press.
6.	Petrography of Sedimentary rocks, Folk, R.L., Hemphill Pub.Co.
7.	Procedures in Sedimentary environments, Carver, R.F., New York, Wiley Interscience, 1971.
8.	Palaeocurrent and Basin analysis, Pettijohn and Potter, Springer.
9.	Sedimentology, Mclane, M., OUP USA.
10.	Petrology of the Sedimentary rocks, Greensmith, J.T., Springer.
11.	Applications of Sedimentology, Trask, scholarly article.
12.	Sequence in Layered rocks, Shrock and Robert, R., McGraw Hill.
13.	Introduction to Sediment analysis, Rouse, F., Arizona State Univ.
14.	Principles of Geomorphology, Thornbury, W.D., CBS.
15.	Introduction to Sedimentology, Sengupta, S., 1997 Oxford and IBH.
16.	Sand and Sandstone, Pettijohn, F.J., Potter, P.E. and Siever, R., 1990, Springer Verlag.
17.	Introduction to Physical Geology, Dutta, A.K., Kalyani Publishers.
18.	Geomorphology, Sharma, V.K., 1986, Tata McGraw Hill.

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19.	A Text Book of Geomorphology, Worcester, P.G., D. Van Nostrand Co.
20.	Fundamentals of Geomorphology, Rice, R.J., Longman.
21.	An Introduction to Physical Geology, Miller, W.J., 1949, D. Van NostrandCo.
22.	An outline of Geomorphology: the physical basis of geography, Morgan, R.S. and Wooldridge, S.W., 1959, Orient Longman Limited.
23.	Introduction to Marine Geology and Geomorphology, King, A.M.C., 1975, Hodder and Stoughton Educational.
24.	Principles of Physical sedimentation, Allen, J.R.L., 1985, The Blackburn Press and Springer.
25.	Earth Surface Processes, Allen, P., 1997, Wiley-Blackwell.
26.	Sedimentology and Stratigraphy, Nichols, G., 1999, Wiley India Pvt. Ltd.
27.	Sedimentary Environments, Readings, H.G., 1996, Wiley-Blackwell.
28.	Depositional Systems, Davis, R.A., 1992, PearsonCollege Div.
29.	Sedimentary Basins: evolution, facies and sediment budget, Einsele, G., 1992, Springer- Verlag.
30.	Sedimentary Geology, Prothero, D.R. and Schwab, F., 1996, W.H. Freeman.
31.	Principles of Sedimentary Basin Analysis, Miall, A.D., 2000, Springer.
32.	Origin of Sedimentary rocks, Blatt, Middleton and Murray, 1980, Prentice Hall.
33.	Analyses of sedimentary Successions, Bhattacharya, A. and Chakraborti, C., 2000, CRCPress.
34.	Principles of Sedimentology and Stratigraphy, Boggs, Sam. Jr., 1995, Pearson.

## SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

#### G-305 ENGINEERING GEOLOGY

To provide knowledge regarding basic concepts of engineering Geology and its applications in engineering projects.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Mechanics of rocks- compressive and shear strength, modulus of elasticity, Poisson's ratio, residual stresses, engineering properties of rocks, bearing strength of foundations, strength of discontinuities. Rock mass classification: rock quality design index, rock structure rating, rock mass ratings, rock tunnel quality index, rock mass index and geological strength index. Slope mass ratings.
UNIT-II	Mechanics of soils- soil profile, soil description and classifications, Atterberg's limits, porosity, permeability and weathering, swelling and pore pressure of soils, cohesion and friction of soil, shear strength of soils, Mohr's envelope, engineering geological characteristics of sediments and problematic soils.
UNIT-III	Construction materials in practice. Dam: types and their foundations, case histories. Tunnel: classification, method of tunneling and case histories. Application of geological and geophysical methods in civil engineering projects. Role of engineering Geology in planning, designing and constructions of civil engineering projects: dam, tunnel, rail, road and highways, bridges and building.
UNIT-IV	Landslides, types of rock slope failures, slope stability assessment, causes and consequences of earthquakes and landslides on engineering structures and preventive/mitigation measures. Watershed management, river improvement and flood control. Engineering geological maps.

- 1. Knowledge of Soil and rock mechanics.
- 2. Identification and classification of soil properties and soil types.
- 3. Investigation and analyses of construction materials, slopes, landslides and foundations.
- 4. Application of Geology in civil engineering, watershed management and other applications in society.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
305.1	3.0	2.5	2.0	2.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0
305.2	3.0	2.5	3.0	3.0	3.0	2.0	2.0	3.0	3.0	2.0	3.0
305.3	3.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
305.4	3.0	3.0	3.0	30	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	2.8	2.5	2.5	3.0	2.3	2.5	3.0	2.8	2.0	3.0

Mapping of Course Outcomes to Programme Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
305.1	3.0	2.0	2.0	3.0
305.2	3.0	3.0	3.0	3.0
305.3	3.0	3.0	3.0	3.0
305.4	3.0	20	3.0	3.0
Average	3.0	2.5	2.8	3.0

1.	Engineering Geology, Krynine and Judd, CBS publishers.
2.	Soil mechanics, Lambe, T.W. and Whitman, R., Wiley India PvtLtd.
3.	Soil mechanics and foundation engineering, Bharath Singh and Shamser Prakash, Nem Chand and
	Bros.
4.	Soil mechanics, Tsytovich, N.A., Central Books Ltd.
5.	Design of small dams, Udall, S.L. and Dominy, F.E., United States Govt. Printing Office.
6.	Manual of Engineering Geology, Blyth, F.G.H. and Freitas, M., CRC Press.
7	Geological Engineering Luis Conzélez de Valleio and Ferrer M. CPC Press

#### BASED ON G-302 (STRATIGRAPHY, PALAEO-GEOGRAPHY AND PALAEO-ECOLOGY), G-303 (IGNEOUS AND METAMORPHIC PETROLOGY) AND G-304 (SEDIMENTOLOGY AND GEOMORPHOLOGY)

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 6

**COURSE OBJECTIVE:** To impart the knowledge about fundamental and applied aspects of the subject among the students so that they can better understand the subject and be able to apply it on the ground.

Study of rocks from different stratigraphic horizons. Exercises on stratigraphic classification and correlation. Exercises on interpretation of seismic records. Study of paleogeographic maps of different geological periods.

Megascopic and microscopic study of the following rocks types: -Igneous rocks: acidic, intermediate, basic, ultrabasic and alkaline rocks.

Metamorphic rocks: slate, phyllite, quartzite, marble, schist, gneiss, amphibolite, eclogite, migmatite, granulite and charnockite.

Graphic construction and interpretation of variation diagrams.

Study of primary, secondary and biogenic sedimentary structures in hand specimens, in photographic atlases, field photographs and wherever possible on the outcrops. Analysis and interpretation of depositional sedimentary environments using actual case histories from the Indian stratigraphic records. Megascopic and microscopic study of clastic and chemical sedimentary rock. Detailed study of diagenetic features in thin sections. Microscopic study of heavy minerals. Exercises on mineralogical and geochemical data plots for environmental interpretations. Interpretation of different sedimentological characteristics from size data. Roundness and sphericity analysis. Paleo-current data interpretation.

Geomorphological analysis from maps and toposheets evaluation.

#### COURSE OUTCOME (CO):

Students will gain the practical knowledge about the subject and will be able to apply it in the field in geo-scientific projects professionally.

#### **G-307 PRACTICAL**

#### BASED ON G-301 (GEOHYDROLOGY) AND G-305 (ENGINEERING GEOLOGY)

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 6

**COURSE OBJECTIVE:** To impart the knowledge about fundamental and applied aspects of the subject among the students so that they can better understand the subject and be able to apply it on the ground.

Preparation and interpretation of water table contour map and depth of water table maps. Chemical quality maps, hydrographic maps, analytical instruments and their uses, interpretation of hydro-geochemical data, evaluation of hydrological parameters of aquifers, processing and interpretation of pumping test data. Numerical and graphical exercises.

Analysis of stress-strain diagrams of different rock types and soil. Engineering index properties and diagrams. Problems related to foundations and soil properties: Atterberg's Limits. Weathering coefficient of rocks and soils. Identification of building materials/stones for various constructions. Study of maps and models of important engineering structures/dam sites and tunnels, engineering geological maps. Soil/rock slope stability analysis. Assessment of mode of failure of rock slopes.

**COURSE OUTCOME (CO):** Students will gain the practical knowledge about the subject and will be able to apply it in the field in geo-scientific projects professionally.

#### <u>G – 308</u> <u>GEOLOGICAL FIELD TRAINING</u>

## Max. Marks: 75+25=100 Time: 3 Hours Credit: 4

# **<u>COURSE OBJECTIVE:</u>** To impart understanding of mapping methods, sampling in the field and using different tools and instruments in the field.

Each student in the course is required to undergo few days' field training in an academic session.

**COURSE OUTCOME:** 

Students will get knowledge about methods of geological mapping, sampling and learn use of tools and instruments in the field and also learn about preparing field training reports.

## **M.Sc. APPLIED GEOLOGY (IV SEMESTER)**

## Max. Marks: 75+25=100 Time: 3 Hours Credit: 4

# SUBJECT CODE:G-401COURSE TITLE:GEOCHEMISTRYCOURSE OBJECTIVE:To provide knowledge regarding basics and significance of<br/>geochemistry in Geosciences.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Objective and history of geochemistry, chemical composition and characteristics of atmosphere, lithosphere and hydrosphere, geochemical cycles, meteorites - types and composition, Goldschmidt's classification of elements, application of thermodynamics in Geology.
UNIT-II	Principles of ionic substitution in minerals, concept of distribution coefficient and its uses in geochemical modeling, Nernst's partition coefficient (compatible and incompatible elements), physico-chemical factors in sedimentation. Applications of trace elements in Geology and REE patterns.
UNIT-III	Geochemistry of uranium, thorium, rubidium and strontium. Principles and application of Rb-Sr, K-Ar, U-Pb and Sm-Nd methods of dating. Principle methodology and application of fission track dating method. Cosmo-genic radionuclides, production of 10Be and 26Al in the atmosphere, and their application in dating sediments.
UNIT-IV	Significance of stable isotope geochemistry in Geology, isotope fractionation in nature. Stable isotopes of oxygen, carbon and hydrogen and their determination. Delta 18O/16O in marine planktonic foraminifera as paleo-temperature indicator, other factors governing its variations. Pleistocene glacial and de-glacial cycles and delta 18O event stratigraphy. 13C/12C ratios in marine planktons and organic matter. Delta 13C characterization of ocean-water masses, factors affecting variations of carbon isotope ratios. Significance of delta D and delta 18O in hydrological studies - relative age determination of groundwater reservoirs, effect of mixing and evaporation.

- 1. Applications of geochemistry in Geology and nature.
- 2. Knowledge regarding geochemical cycle and modeling.
- 3. Methods of dating and their applications.
- 4. Emphasis on Significance of stable isotope geochemistry in Geology.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
401.1	3.0	1.0	2.0	3.0	3.0	1.0	3.0	3.0	3.0	2.0	3.0
401.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
401.3	3.0	2.0	2.0	2.0	3.0	1.0	2.0	3.0	2.0	2.0	3.0
401.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	2.25	2.5	2.8	3.0	1.8	2.5	3.0	2.5	2.0	3.0

Mapping of Course Outcomes to Programme Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
401.1	3.0	3.0	2.0	3.0
401.2	3.0	2.0	3.0	3.0
401.3	2.0	2.0	3.0	3.0
401.4	3.0	2.0	3.0	3.0
Average	2.8	2.3	2.8	3.0

1.	Introduction to Geochemistry, Mason, B. and Moore, C.B., 1991, Wiley Eastern.
2.	Introduction to Geochemistry, Krauskopf, K.B., 1967, McGraw Hill.
3.	Principles of Isotope Geology, Faure, G., 1986, John Wiley.
4.	Stable Isotope Geochemistry, Hoefs, J., 1980, Springer-Verlag.
5.	Geochemistry, Wedepohl, K.H. Holt, Rinehart and Winston Inc. USA.
6.	Geochemistry, Brownlow, A.H., Prentice-Hall.
7.	Inorganic Geochemistry, Henderson, P., Pergamon Press.
8.	Geochemical Thermodynamic, Nordstrom, D.K. and Munoz, J.L., Blackwell.
9.	Hand book of Exploration Geochemistry, Govett, G.J.S., Elsevier.
10.	Encyclopedia of Geochemistry, Marshal, C.P. and Fairbridge, R.W. Kluwer Academic.
11.	Using geochemical data, Rollinson, H. Longman Scientific & Technical NY.

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## SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

#### G-402 REMOTE SENSING & GIS

To introduce the principles of satellite based remote sensing, GIS and its application in the field of Geoscience.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Electromagnetic spectrum, interaction of electromagnetic waves with earth's surface and atmosphere, image characteristics - scale, brightness and tone, contrast ratio, detectability, recognizability, signature, texture, interpretation key, spatial resolution and resolving power, remote sensing platforms. Remote sensing systems - framing systems, scanning systems and multispectral systems. Aerial photographs: types of aerial photographs, photographic scale, relief displacement, stereoscopic vision, vertical exaggeration, geotechnical elements, photo-mosaics.
UNIT-II	Active and passive sensors; MSS, LISS, CCD, infra-red and thermal scanners. Low earth orbit and geostationary orbit, Indian remote sensing series, different satellite PROGRAMMEs, microwave sensors, fundamentals of image interpretation and analysis and false color composite.
UNIT-III	Interpretation and analysis of aerial photographs and images for identification of different rock types, structures, lineaments, recognition of landforms, drainage patterns. Application in engineering projects, (dam, reservoir, tunnel alignment, route location etc.), groundwater prospecting, geothermal studies, geo-environmental studies (soil conservation, land degradation etc.) and disaster management (flood, landslides etc.). Role in resource management.
UNIT-IV	Components of GIS: hardware and software. GIS data types, raster and vector data models. Concept of thematic layers and topology. Triangulated irregular networks (TIN), digital elevation model, digital terrain model and their applications. Global positioning system and its application in Geology.

- 1. Introduction to fundamentals of remote sensing.
- 2. Satellite Imagery analysis and satellite programmes till date.
- 3. Interpretation and analysis of aerial photographs and their various applications to mankind.
- 4. Introduction to fundamentals of GIS and its application in Geology.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11
402.1	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0
402.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
402.3	3.0	2.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
402.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	2.5	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0

## Mapping of Course Outcomes to Programme Specific Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
402.1	3.0	3.0	2.0	3.0
402.2	3.0	2.5	3.0	3.0
402.3	3.0	2.0	3.0	3.0
402.4	3.0	2.5	3.0	3.0
Average	3.0	2.5	2.8	3.0

1.	Remote sensing Geology, Gupta, R.P., Springer – Verlag.
2.	Principles and applications of photogeology, Pandey, S.N., Tata – McGraw Hill.
3.	Remote sensing in Geology, Siegal, B.S. and A.R., John Wiley & sons.
4.	Photogeology, Miller, V.C. and Miller, C.F., McGrawHill.
5.	Remote sensing and image interpretation, Lillesand, T.M., and Kieffer, R.W., John Wiley & Sons.
6.	Remote principles and interpretations, Sabbins, F.F., W.H. Freeman Company.
7.	Remote sensing for earth resources, Rao, D.P., AEG publications, Hyderabad.
8.	Manual of remote sensing, American Society of Photogrammetry.
9.	Principles of Remote Sensing, Currian, P.J., ELBS, London.
10.	Advances in Geophysics, Vol. 1 and 13, Landsberg, H.E., Academic Press.
11.	Hand book/ brochures issued by Geological Survey of India (Airborne Mineral Survey and
	Exploration Wing), Atomic energy commission (Atomic Minerals Division) and National
	Geophysical Research Institute.

## SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

#### G-403 FUEL GEOLOGY

To impart knowledge regarding nuclear energy, coal and petroleum deposits and their process of formation.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Introduction to coal, process of coalification. Proximate and ultimate analyses of coal; lithotypes, macerals and micro-lithotypes of coal, coal gasification and coal liquefaction.
UNIT-II	Present day peat bogs and swamps, geological and geographical distribution of coal deposits in India, origin and tectonic controls on deposition of Gondwana coals of India. Coal as a source of hydrocarbon. Coal Bed Methane (CBM), utilisation of coal and its impact on the environment.
UNIT-III	Kerogen sediment, its composition and origin, transformation of organic matter, maturation, thermal cracking, metagenesis and ketagenesis, nature of migration of oil and gas, characteristics of reservoir rocks and traps. Major oil and gas fields of India.
UNIT-IV	Radioactivity and nuclear energy; important atomic minerals – their mode of occurrence and associations. U and Th deposits of India, production, reserves and future scenario. Nuclear power production and its potential in India. Peaceful uses of nuclear energy and nuclear environmental hazards.

- 1. Introduction to the process of coalification and technological properties of coal.
- 2. Coal forming epochs in geological past and present scenario with reference to India.
- 3. Present and future prospects of oil and gas fields in India and World.
- 4. Radioactive and nuclear energy, their deposits in India and its application in Geology and to society.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
403.1	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0
403.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
403.3	3.0	2.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
403.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	2.5	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0

Mapping of Course Outcomes to Programme Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
403.1	3.0	3.0	2.0	3.0
403.2	3.0	2.5	3.0	3.0
403.3	3.0	2.0	3.0	3.0
403.4	3.0	2.5	3.0	3.0
Average	3.0	2.5	2.8	3.0

1.	Organic Petrology, Taylor, G.H., Teichmuller, M., Davis, A., Diessel, C.F.K., Littke, R. and
	Robert, P. 1998, Gebruder Borntraeger, Stuttgart.
2.	Textbook of coal (Indian Context), Chandra, D., Singh, R.M. and Singh, M.P., Tata Book Agency,
	Varanasi.
3.	Coal and organic Petrology, Singh, M.P. (Ed), Hindustan Publication Ltd, New Delhi.
4.	Text book of Coal Petrology, Stach, E., Mackowsky, M.T.H., Taylor, G.H., Chandra, D., Teichmuller,
	M., and Teichmuller, R. 1982, Gebruder Borntraeger, Stuttgart.
5.	Introduction to Petroleum Geology, Holson, G.D. and Tiratsoo, E.N. 1985, Gulf Publication Houston,
	Texas.
6.	Petroleum formation and occurrence, Tissot, B.P. and Welte, D.H. 1984, Springer-Verlag.
7.	Elements of Petroleum Geology, Selley, R.C., 1998, Academic Press.
8.	Radioactivity in Geology- Principles and Applications, Durrance, E.M. 1986, Ellis Hoorwool.
9.	Uranium ore deposits, Dahlkamp, F.J. 1993, Springer Verlag.
10	Geochemical prospecting for Thorium and Uranium deposits, Boyle, R.W. 1982, Elsvier.
11.	Coal Geology and Coal Technology, Ward, C.R. 1984, Blackwell Scientific, Australia.
12.	Sedimentology of coal bearing sequence of North America, Rahmani, R.A. and Flores, R.M. 1984,
	Blackwell Scientific, Australia.
13.	Coal Industry in India, Kumarmangalam, S.M. 1973, Oxford and IBH.
14.	Ore deposits of India, Gokhale and Rao, Thomson Press, Delhi.
15.	Distribution of World's Mineral Wealth, Rajagopalswami, K. 1971, Mysore University.

		10
16.	India's mineral resources, Krishnaswami S., New Delhi, Oxford and IBH Pub. Co. (1972).	40
17.	Economic mineral deposits, Bateman, A.M., Jensen, M.L., John Wiley and Sons.	
18.	Geology of Petroleum, Leverson, A.I., CBS.	
19.	Introduction to Petroleum Geology, Hobson, G.D., Houston, Texas, U.S.A., Gulf Pub Co.	
20.	Petroleum Geology, Chapman, R.E., Elsevier Science Pub Co.	
21.	Basic Petroleum Geology, Peter, K. Link, Oil and Gas Consultant Intl.	
22.	Petroleum Geology, North, F.K., 1985, Kluwer Academic Publishers.	

## SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

#### **G-404 ENVIRONMENTAL GEOLOGY (Elective)** To provide knowledge regarding basic concepts of Environmental Geology.

#### **Course Contents:**

Unit No.	Contents
UNIT-I	Components of environment, ecology and ecosystem. Interactions between atmosphere, hydrosphere, lithosphere, biosphere and man. Principles of environmental Geology, ethics of conservation. Atmosphere and increasing trend of CO ₂ and other greenhouse gases. Fossil fuel burning, ozone layer and global warming. Smog pollution and acid rains, causes and remedies. Other causes of pollution.
UNIT-II	Hydrologic cycle and Earths' water balance, pollution of surface and subsurface water. Water quality criteria for domestic and industrial use, water quality degradation due to use of fertilizers, pesticides and geogenic causes. Hydrogeologic considerations for liquid waste disposal. Hydrologic implications of solid waste disposals. Waste (solid, liquid, gases) management and control.
UNIT-III	Natural resources of lithosphere, land, soil and minerals and their depletion. Land degradation due to natural hazards. Land conservation and land use planning. Watershed management. Impact of irrigation - water logging and soil degradation. Energy minerals and their conservation, nonconventional sources of energy. Nuclear waste disposal and geological constraints.
UNIT-IV	Types of microorganisms, role of sulfur, nitrogen and iron bacteria in the environment. Biogeochemistry of iron, manganese and sulfur. Marine pollution- causes and controls. Environmental impact assessment – impact of mining on environment, environmental health and environmental law in India.

- 1. Introduction to ecology and their inter-relationship with mankind.
- 2. Water quality and waste management.
- 3. Natural resources and their conservation.
- 4. Environmental impact assessment and knowledge of environmental laws.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11
404.1	3.0	3.0	2.0	3.0	3.0	2.5	3.0	3.0	3.0	2.0	3.0
404.2	3.0	2.0	3.0	2.0	3.0	2.5	2.0	3.0	2.0	2.0	3.0
404.3	3.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
404.4	3.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	2.5	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0

## Mapping of Course Outcomes to Programme Specific Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
404.1	3.0	3.0	2.0	3.0
404.2	3.0	2.5	3.0	3.0
404.3	3.0	2.5	3.0	3.0
404.4	3.0	3.0	3.0	3.0
Average	3.0	2.8	2.8	3.0

1.	Environmental geology, Lindgren, L., Prentice Hall.
2.	Environmental geology, Keller, E.A., Pearson.
3.	Organic micro-pollutants in the aquatic environment, Angeletti, G., Springer Science Business Media.
4.	<i>Environmental Geoscience: Interaction between natural systems and man</i> , Strahler, A.N. and Strahler, A.H., John Wiley And Sons Inc.
5.	A text book of environmental chemistry and pollution control, Dara, S.S. and Mishra, D.D., S. Chand and Company.
6.	Water pollution, Tripathi, A.K. and Panday, S.N., CBS.

## SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

## **ORE GEOLOGY AND MINERAL ECONOMICS (Elective)** To impart basic understanding of different types of mineral

deposit and processes of their formation.

## **Course Contents:**

Unit No.	Contents
UNIT-I	Concept of ore bearing fluids, their origin and migration. Spatial and temporal distribution of ore deposits - a global perspective. Ore deposits and plate tectonics. Paragenesis and zoning of ores and their significance. Chemical composition of ores. Fluid inclusion in ores: principles and their applications.
UNIT-II	Mineralogy, genesis, mode of occurrence, uses and Indian distribution of ore minerals related to Iron, Manganese, Copper, Lead, Zinc, Tin, Tungsten, Chromium, Nickel, Gold, Silver, Aluminum.
UNIT- III	Concept of mineral economics, importance of minerals in national economy, marketing and marketing speculation, trade and trade restriction, production and development incentives. Strategic, critical and essential minerals. National mineral policy. Foreign policy in mineral trade, Mineral concession rules in India. Mineral transport, freight, insurance and customs-INCO terms and contracts.
UNIT-IV	Changing mineral requirements. Foreign investment in the development and exploitation of mineral raw materials. Project feasibility report of minerals and ores, principles of management in mineral industries. Principles and methods of ore dressing and their economic aspects (Metallic and non-metallic). Refractory and abrasives, ceramic and glass fertilizers cements industries minerals. Precious and semi-precious stones.

## **COURSE OUTCOMES (COs):**

1. Introduction to ore deposits, their distribution and relation to plate tectonics.

G-405

- 2. Uses and distribution of ore minerals with reference to India.
- 3. Mineral economics, mineral policy and concession rules in India.
- 4. Project feasibility reports, ore dressing techniques and uses in industry.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
405.1	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0
405.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
405.3	3.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
405.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0

## Mapping of Course Outcomes to Programme Outcomes

												51
Average	3.0	3.0	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0	54

COs/PSOs	PSO1	PSO2	PSO3	PSO4
405.1	3.0	3.0	2.0	3.0
405.2	3.0	2.5	3.0	3.0
405.3	3.0	2.5	3.0	3.0
405.4	3.0	2.5	3.0	3.0
Average	3.0	2.7	2.8	3.0

## **BOOKS RECOMMENDED:**

1.	Economic mineral deposits, Bateman, A.M., Jensen, M.L., John Wiley and Sons.
2.	Mineral Economics: An Indian Perspective, Randive, K., (2020), Nova Science Publishers Inc.
3.	Ore deposits of India: their distribution and processing, Gokhle, K.V.G.K. and Rao, T.C., Thomson Press (India).
4.	Economic Geology, Prasad, U., CBS.
6.	India's mineral resources, Krishnaswami S., New Delhi, Oxford and IBH Pub.Co.
7.	Geology of mineral deposits, Smirnov, V.I., Mir Publishers.
8.	Ore Petrology, Stanton, R.L., McGraw Hill Higher Education.
9.	Geology of India, Wadia, D.N., Alpha Edition
10.	Ore Microscopy and ore petrology, Craig, J.R. and Vaughan, D.J., Wiley Blackwell.
11.	Principles of economic geology, Emmons, W.H., University of California Libraries.
12.	Mineral deposits, Lindgren, W., McGraw Hill Book Company.
13.	A Manual of Geology of India and Burma, Vol. I-IV, Krishnan, M. S. Gov. of India Press.
14.	Ore geology and industrial minerals: an introduction, Evans, A.M., (2011), Wiley India Pvt. Ltd.

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G 406

## SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

**OCEANOGRAPHY AND MARINE GEOLOGY (Elective)** 

To impart basic understanding of oceanography and marine Geology.

Course	<b>Contents:</b>
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UNIT-I	Distribution of land, seas and oceans: structure, origin, evolution and age of ocean basins. Geomorphology of ocean floor; continental shelf, continental slope, submarine canyons, ridges, plateaus, fracture zones, sea mounts, abyssal plains, deep sea channels trenches, and coral reefs; their distribution and origin.
UNIT-II	Ocean currents and circulation pattern; turbidity and bottom currents; zones of high plankton productivity; bathymetric section, Fauna in ocean floor sediments, their distribution and climatic and palaeoclimatic significance. Eustatic changes of sea level, causes and methods of study. Temperature-salinity distribution in oceans and seas.
UNIT-III	The concept of sea floor spreading evidence of magnetic reversal for seafloor spreading, volcanism and mid oceanic ridge system Indian ocean ridge system. Marine sediments, source, transportation, deposition classification and types of sediments, CaCO3 deposition, carbonate compensation depth, pelagic and abyssal plain sediments. Biological factors in the formation of sediments. Occurrence of anoxic facies sediments in different types of marine environment. Continental margins, sedimentation on active and passive margins. Structural feature of World oceans Origin, evolution and physiography of Indian ocean.
UNIT-IV	Introduction and historical aspects of marine Geology, geological and geophysical methods for ocean floor exploration, techniques of sampling. Sample collection, underwater dragging and underwater photography. Marine mineral resources: Beach placer deposits, phosphorites, metalliferous sediments, sulphate deposits, polymetallic nodules; hydrocarbons in marine sediments. India's marine mineral resources. International sea law.

- 1. Knowledge regarding nature and scope of oceanography and distribution pattern of land, sea and oceans.
- 2. Knowledge of ocean bottom relief, waves and current in relation to origin, type, characteristics and various ocean resources and their influences upon mankind.
- 3. Fair knowledge about ocean sediments, different marine environments. Knowledge on structural and physiography of the world and Indian Ocean.
- 4. Students will acquire knowledge of economically important marine mineral resources, their exploration and International sea laws.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
406.1	3.0	2.0	2.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0
406.2	3.0	3.0	3.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
406.3	3.0	2.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0	3.0
406.4	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0
Average	3.0	2.5	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0

Mapping of Course Outcomes to Programme Outcomes

COs/PSOs	PSO1	PSO2	PSO3	PSO4
406.1	3.0	3.0	2.0	3.0
406.2	3.0	2.5	3.0	3.0
406.3	3.0	2.0	3.0	3.0
406.4	3.0	2.5	3.0	3.0
Average	3.0	2.5	2.8	3.0

1.	Marine geology, Keen, M.J., Elsevier.
2.	Oceanography, Lal, D. S., Sharada Pustak Mahal.
3.	Oceanography: A brief Introduction, Siddhartha, K., Kisalaya Publication Pvt. Ltd.
4.	Climatology and Oceanography, Mamoria and Sisodia, M.S., SBPD Publication.
5.	Introduction to Marine Geology and Geomorphology, King, C., Crane Russak.

#### **G-407 PRACTICAL**

#### BASED ON G-401 (GEOCHEMISTRY), G- 402 (REMOTE SENSING AND GIS) AND G-403 (FUEL GEOLOGY)

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 6

**COURSE OBJECTIVE:** To impart the knowledge about fundamental and applied aspects of the subject among the students so that they can better understand the subject and be able to apply it on the ground.

Calculation of mineral formulae from the concentration of various oxides in minerals. Calculation of CIPW normative mineralogy from rock composition. Presentation and interpretation of geochemical analytical data. Study and interpretation of geochemical data. Study and interpretation of radiogenic and stable isotope data. Calculation of weathering indices in soils and sediments.

Study of aerial photographs and satellite imageries and their interpretation.

Megascopic characterization of banded coals. Proximate analysis of coal. Completion of outcrops in the given maps and calculation of coal reserves. Preparation of polished particulate mounts of coal. Megascopic examination of polished coal pellets. Megascopic and microscopic study of cores and well cuttings. Study of geological maps and sections of important oil fields of India and the world. Calculation of oil reserves. Study of geological sections of U-Th bearing rocks of the country. Megascopic study of Uranium and thorium bearing minerals and rocks.

**COURSE OUTCOME (CO):** Students will gain the practical knowledge about the subject and will be able to apply it in the field in geo-scientific projects professionally.

#### **G-408 PRACTICAL**

## BASED ON G-404 (ENVIRONMENTAL GEOLOGY), G-405 (ORE GEOLOGY AND MINERAL ECONOMICS) AND G-406 (OCEANOGRAPHY AND MARINE GEOLOGY)

#### Max. Marks: 75+25=100 Time: 3 Hours Credit: 6

**COURSE OBJECTIVE:** To impart the knowledge about fundamental and applied aspects of the subject among the students so that they can better understand the subject and be able to apply it on the ground.

Preparation of ecological maps and their interpretation. Evaluation of water quality criteria for potable, domestic, industrial, irrigation and waste water. Evaluation of environmental impact of air pollution, groundwater pollution, soil and land degradation, landslides, deforestation, cultivation and urbanization in specified areas.

Megascopic study of ore minerals. Mineralogical and textural studies of common ore minerals under ore microscope.

Bathymetric section of an ocean. Structural features of world oceans. Study of ocean circulation pattern using ocean and land distribution map. Exercises on distribution of economic mineral deposition in the world ocean.

**COURSE OUTCOME:** Students will gain the practical knowledge about the subject and will be able to apply it in the field in geo-scientific projects professionally.

#### **CHOICE BASED OPEN ELECTIVE**

#### Max. Marks: 35+15=50 Time: 3 Hours Credit: 2

#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

OE- 205 GEOSCIENCE AND SOCIETY To impart the knowledge about fundamental and applied aspects of the subject among the students.

#### **UNIT I**

Introduction to Geo-science and its various branches, Earth and its place in the solar system. Origin and structure of Earth. Geological time scale. Origin and evolution of life through Earth history. Elementary idea of rocks, their types, rock cycle, minerals and gemstones. Elementary idea of various Earth processes, continental drift and plate tectonics. Orogenic and epeirogenic movements.

#### **UNIT II**

Elementary idea of geological considerations in site evaluation of engineering, construction, mining and other geological works. Environmental changes through the Earth history. Significance of earth resources to mankind and society. Hydrological cycle and water budget of an Earth.

**COURSE OUTCOME** (CO): After completion of the course the students will get to know about the basics of Geology, its related disciplines and its relation with mankind.

- 1. Understanding the Earth, Press, F. and Siever, R., W.H. Freeman & Co.
- 2. Palaeontology, Jain, P.C. and Anantharaman, M.S., Vishal Publishing Co.
- 3. *An Introduction to Physical Geology, Eleventh Edition*, Tarbuck, Lutgens and Tasa, Pearson Publication.
- 4. Principles of engineering Geology and Geotechnics, Krynine/Judd., Jain Book Agency.
- 5. Ground water Hydrology, Todd David K., PHI Learning.

#### **CHOICE BASED OPEN ELECTIVE**

#### Max. Marks: 35+15=50 Time: 3 Hours Credit: 2

#### SUBJECT CODE: COURSE TITLE: COURSE OBJECTIVE:

#### OE- 305 NATURAL DISASTERS

To impart the knowledge about natural and man-made disasters, their consequences and mitigation measures.

#### UNIT I

Introduction to hazards: Hazards' classification and distribution, Natural Hazards and their effects,

hazard prediction and early warning, role of community and stakeholders. Earthquakes: classification, distribution, causes and effects. Tsunami: Types, effects, prediction and early warning systems.

#### **UNIT II**

Landslides: classification, distribution, causes, effects and prevention/mitigation of landslides. Volcanic hazards: Types, distribution, causes and effects of volcanoes and related hazards. Floods: Types and factors leading to floods, flood control/mitigation measures. Cyclones, thunderstorms and lightning, prediction and early warning, droughts and desertification.

**COURSE OUTCOME (CO):** After completion of the course the students will get to know about the types and causes of natural hazards and their related consequences. The course also provides understanding about various mitigation measures that can be taken during such hazard situations.

1. Natural Disasters, Patrick Leon Abbott., McGraw-Hill Education.
2. Disasters Guidelines, NIDM.
3. Disasters Guidelines, NDMA.
4. Citizens Guide to Disaster Management: How to Save Your Own Life & Help Others, Satish Modh, Laxmi
Publication.
5. Disaster Management, Mukesh Kapoor, Moti Lal Banarsi Dass Publication.
6. Earthquake and Natural Disasters, Manik Kar, Moti Lal Banarsi Dass Publication.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 101	3.0	3.0	2.4	1.8	3.0	2.0	2.6	3.0	2.8	1.6	2.6
CO 102	3.0	3.0	2.6	2.0	3.0	2.0	2.6	3.0	2.8	2.0	2.6
CO 103	3.0	2.5	2.3	2.0	3.0	2.0	2.6	3.0	2.8	2.0	2.6
CO 104	3.0	2.8	2.3	2.0	3.0	2.0	2.6	3.0	2.8	3.0	3.0
	1			•			-				
CO 201	3.0	2.8	2.3	1.9	2.8	2.0	2.6	3.0	2.8	2.8	2.8
CO 202	3.0	3.0	2.5	2.0	2.5	2.0	2.6	3.0	2.8	2.8	3.0
CO 203	3.0	3.0	2.5	2.3	2.5	2.3	2.6	3.0	2.8	3.0	3.0
CO 204	3.0	2.25	2.5	2.8	3.0	1.8	2.5	3.0	2.5	2.3	2.5
CO 205	3.0	2.25	2.5	2.8	3.0	1.8	2.5	3.0	2.5	2.0	3.0
		•				•		•			
CO 301	3.0	2.25	2.5	2.8	3.0	1.8	2.5	3.0	2.5	2.0	3.0
CO 302	3.0	2.25	2.5	2.8	3.0	2.3	2.5	3.0	2.5	2.8	3.0
CO 303	2.5	2.5	2.5	1.8	3.0	2.0	2.5	3.0	2.8	1.5	2.8
CO 304	3.0	2.5	2.5	2.2	3.0	2.3	2.5	3.0	2.8	2.0	3.0
CO 305	3.0	2.8	2.5	2.5	3.0	2.3	2.5	3.0	2.8	2.0	3.0
		•	•	•		•	•			•	
CO 401	3.0	2.25	2.5	2.8	3.0	1.8	2.5	3.0	2.5	2.0	3.0
CO 402	3.0	2.5	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0
CO 403	3.0	2.5	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0
CO 404	3.0	2.5	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0
CO 405	3.0	3.0	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0
CO 406	3.0	2.5	2.5	2.8	3.0	2.5	2.5	3.0	2.5	2.0	3.0

Mapping Programme Outcomes with Course Outcomes (M.Sc. Applied Geology):

## KURUKSHETRA UNIVERSITY, KURUKSHETRA

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



## Structure and Syllabus of M. Sc. PHYSICS (Ist to IVth Semesters) Course Under CBCS-LOCF (Effective from the Academic Session 2020-21) In phased manner

Department of Physics Kurukshetra University Kurukshetra - 136 119 Haryana (INDIA)

## Structure and Syllabus of M. Sc. PHYSICS (Ist to IVth Semesters) Course Under CBCS-LOCF

(Effective from the Academic Session 2020-21) In phased manner

## **SEMESTER I**

Course Code	Course Title	Credits	Teaching Hours	Maximum Mar	Duration of Exam.			
			per week	Internal Assessment [*]	End-semester Examination	Total	Hours	
PHY 101	Mathematical Physics	4	4	20	60	80	3	
PHY 102	Classical Mechanics	4	4	20	60	80	3	
PHY 103	Quantum Mechanics-I	4	4	20	60	80	3	
PHY 104	Electronic Devices and Circuits-I	4	4	20	60	80	3	
PHY 105	Physics Laboratory-I	8	20	40	120	160	5	
Total Credits/Marks		24		480				

## **SEMESTER II**

Course Code	Course Title	Credits	Teaching Hours	Maxi		Duration of Exam.	
		per wee		Internal Assessment [*]	End- semester Examination	Total	Hours
PHY 201	Quantum Mechanics-II	4	4	20	60	80	3
PHY 202	Nuclear and Particle Physics	4	4	20	60	80	3
PHY 203	Solid State Physics	4	4	20	60	80	3
PHY 204	Electronic Devices and Circuits-II	4	4	20	60	80	3
PHY 205	Physics Laboratory-II	8	20	40	120	160	5
PHY 206	Seminar ^{**}	2 ¹	2			40	40 minutes
Open Elective Paper-I ( <i>Course code and course title as per choice made by the student</i> )		2	2	15	35	50	1.30
Total Credits/Marks		28				570	

## SEMESTER III

Course	Course Title	Credits	Teaching	Maxi		Duration of	
Code			Hours per week	Internal Assessment [*]	End- semester Examination	Total	Exam. Hours
PHY 301	Electrodynamics and Plasma Physics	4	4	20	60	80	3
PHY 302	Statistical Mechanics	4	4	20	60	80	3
Any one of the following subject electives/specializations ^{\$}		4	4	20	60	80	3
PHY 303A	Condensed Matter Physics-I						
PHY 303B	Nuclear Physics-I						
PHY 303C	Particle Physics-I						
Any one of t electives/spe	he following subject ecializations [§]	4	4	20	60	80	3
PHY 304A	Computational Physics-I						
PHY 304B	Electronics-I						
PHY 304C	Material Science-I						
PHY 305	Physics Laboratory-III	8	20	40	120	160	5
Open Elective Paper-II (Course code and course title as per choice made by the student)		2	2	15	35	50	1.30
Total Credi	ts/Marks	26				530	

## SEMESTER IV

Course Code	Course Title	Credits	Teaching Hours per week	Maximum N	Duration of Exam.		
				Internal Assessment [*]	End-semester Examination	Total	Hours
PHY 401	Advanced Quantum Mechanics	4	4	20	60	80	3
PHY 402	Atomic and Molecular Physics	4	4	20	60	80	3
Same electives/specializations are to be taken as in Semester III		4	4	20	60	80	3
PHY 403A	Condensed Matter Physics-II						
PHY 403B	Nuclear Physics-II						
PHY 403C	Particle Physics-II						
Same electives/specializations are to be taken as in Semester III		4	4	20	60	80	3
PHY 404A	Computational Physics-II						
PHY 404B	Electronics-II						
PHY 404C	Material Science-II						
PHY 405	Physics Laboratory- IV/Project***	8	20	40	120	160	5
PHY 406	PHY 406 Seminar ^{**}		2			40	40 minutes
Total Marks		26				520	

** Seminar will be held once a week during the laboratory hrs.

## **Open Elective Papers**

## For the Students of M.Sc. Physics

A student will earn four credits by way of selecting one open elective paper of two credits in second semester and one more such paper of same credits in third semester, out of the open elective papers offered by the departments/institutes on the campus other than the Department of Physics or MOOCs.

## For the Students of Other Departments/Institutes on the campus

The Department of Physics offers the following open elective papers to the students of other departments/institutes on the campus. A paper shall be run only if the number of students opting for it is at least 20. There will be an upper limit of 50 students in each paper. Open elective papers will be allotted by the Chairperson as per university norms.

Course Code	Course Title	Credits	Teaching Hours	Maximum Marks				
			per week	Internal Assessment [*]	End-semester Examination	Total		
OE-208 (For 2 nd Semester)	Elements of nano-science & nano-technology	2	2	15	35	50		
OE-308 (For 3 rd Semester)	Radiation Physics	2	2	15	35	50		
# **Total Marks of all Four Semesters**

Semester	Marks	Credits
Semester I	480	24
Semester II	570	28
Semester III	530	26
Semester IV	520	26
Grand Total	2100	104

^{*}Internal Assessment in theory papers will be made on the basis of sessional test(s) and other parameters as decided by the University from time to time, while in Laboratory papers it will be decided from continuous assessment in internal viva-voce examination of all the experiments performed.

^{**} Each student will deliver one seminar of about 40 minutes duration on the topic to be allotted by the departmental seminar committee in both 1st and 2nd years of the M. Sc. Physics Course as per the schedule drawn in the beginning of each year. The marks will be awarded by the seminar committee on the basis of performance in the seminar and the seminar report submitted by the student.

***Total number of students' project offered will be one per faculty member per year, and allotment will be made on the basis of merit cum preference of the students. Students opting for project will be exempted from the corresponding laboratory course.

^{\$}The special papers will be allotted to students on the basis of their preference cum percentage of marks in the First Semester examination of M. Sc. Physics.

### General guidelines:

- 1. If a course is being taught by two or more teachers, they should coordinate among themselves the coverage of course material as well as the internal assessment of the students to maintain uniformity.
- 2. Each theory course in a semester has been designed for a period of 48-54 lectures. The total number of actual lectures delivered may vary at most by 10 %.
- 3. The books indicated as references are suggestive of the level of coverage. However, any other standard book may be followed.
- 4. In specialization courses, new specializations may be added to the list from time to time keeping in view the expertise available in the Department and/or the emergence of new frontier areas of specialization.
- 5. New experiments in the Laboratory Courses may be added from time to time.

# Program Outcomes (POs) for Post Graduate Programs (CBCS) in the Faculty of Sciences, Kurukshetra University, Kurukshetra

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study
PO2	Research Aptitude	Capability to ask relevant/appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis
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 diverse teams, in multidisciplinary settings.
PO6	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide 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	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout life
PO10	Ethics	Capability to identify and apply ethical issues related to one's work, avoid unethical behaviour such as fabrication of data, committing plagiarism and unbiased truthful actions in all aspects of work
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects

## **Program Specific Outcomes (PSOs)**

After successful completion of M. Sc. Physics program, the students will

- PSO1 Acquire an in-depth understanding and knowledge of the core areas of Physics encompassing mathematical physics, classical mechanics, quantum mechanics, electrodynamics, and statistical mechanics for explicating physical phenomena covering wide length and time scales.
- PSO2 Be capable of applying the core physical laws to unravel multitude of physical properties, processes, and effects involving radiation, nuclei, atoms, molecules, and bulk forms of matter.
- PSO3 Develop hands-on skills for carrying out elementary as well as advanced experiments in different sub-fields of Physics viz. condensed matter physics, nuclear physics, particle physics, materials science, computational physics & electronics, along with enhancing their understanding of physical concepts and theories.
- PSO4 Attain abilities of critical thinking, problem mapping & solving using fundamental principles of Physics, systematic analysis & interpretation of results, and unambiguous oral & writing/presentation skills.
- PSO5 Have robust foundation in basic and practical aspects of Physics enabling them to venture into research in front-line areas of physical sciences, and career as Physics teachers and scientists.

# **DETAILED COURSES OF STUDY**

# M. Sc. Physics (Semester I)

## **PHY 101: Mathematical Physics**

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 40% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Mathematical Physics, a student will be able to:

PHY101.1	Learn basics of group theory and prepare group multiplication tables.
PHY101.2	Understand reducible and irreducible group representations and construct character
	table of symmetry groups of equilateral triangle, rectangle and square.
<i>PHY101.3</i>	Find the Fourier series expansion and develop Fourier integrals.
<i>PHY101.4</i>	Learn properties of Fourier and Laplace transforms and evaluate the Fourier and
	Laplace transforms of functions and derivatives.
PHY101.5	Obtain explicit expressions of Bessel and Legendre polynomials by solving the concerned differential equations.
<i>PHY101.6</i>	Find explicit expressions of Hermite, Laguerre, Bessel and Legendre polynomials using the corresponding generating functions and derive various recurrence relations among these special functions.
<i>PHY101.7</i>	Derive Cauchy integral theorem and Cauchy integral formula and find Taylor and Laurent series expansion of functions of complex variable.
<i>PHY101.8</i>	Understand the calculus of residue and evaluate some typical definite integral using the method of contour integration.

## **Unit I: Group Theory** (14 hrs.)

Fundamentals of Group theory: Definition of a group and illustrative examples, Group multiplication table, rearrangement theorem, cyclic groups, sub-groups and cosets, permutation groups, conjugate elements and class structure, normal devisors and factor groups, isomorphism and homomorphism, class multiplication.

Group representation: Reducible and irreducible representations, great orthogonality theorem (without proof) and its geometric interpretation, character of a representation, construction of character table with illustrative examples of symmetry groups of equilateral triangle, rectangle and square. Decomposition of reducible representation, the regular representation. The elements of the group of Schrodinger equation.

## Unit II: Fourier Series and Integral Transforms (12 hrs.)

Fourier series, General properties, Advantages and applications, Gibbs phenomenon, Development of the Fourier integral, Inversion theorem, Fourier transform, Fourier transform of derivatives, Momentum representation, Laplace transform, Laplace transform of derivative, Properties of Laplace transforms, Faltungs theorem, Inverse Laplace transformation.

# **Unit III: Special Functions** (12 hrs.)

Bessel Functions: Bessel functions of the first kind  $J_n(x)$ , Generating function, Recurrence relations, Expansion of  $J_n(x)$  when n is half an odd integer, Integral representation; Legendre Polynomials  $P_n(x)$ : Generating function, Recurrence relations and special properties, Rodrigues' formula, Orthogonality of  $P_n(x)$ ; Associated Legendre polynomials, Spherical harmonics, Addition theorem for spherical harmonics, Hermite and Laguerre Polynomials: generating function & recurrence relations only.

## Unit IV: Functions of a complex variable and calculus of residues (10 hrs.)

Complex algebra, Functions of a complex variable, Cauchy's integral theorem, Cauchy's integral formula; Taylor and Laurent expansions; Singularities; Cauchy's residue theorem, Cauchy principle value, Singular points and evaluation of residues, Jordan's Lemma; Evaluation of definite integrals of the type:  $\int_0^{2\pi} f(\sin \theta, \cos \theta) d\theta$ ;  $\int_{-\infty}^{\infty} f(x) dx$ ;  $\int_{-\infty}^{\infty} f(x) e^{iax} dx$  using Cauchy's residue theorem. *Exercises in this unit are at the level of those given in book at Ref. No. 2.* 

- 1. Group Theory and Quantum Mechanics by M. Tinkam.
- 2. Mathematical Methods for Physicists (4th edition) by G. Arfken.
- 3. Mathematical Methods for Physicists (6th edition) by Arfken and Weber.
- 4. Mathematical Physics for Physicists & Engineers by L. Pipes.
- 5. Introduction to Mathematical Physics by C. Harper

## **PHY 102: Classical Mechanics**

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Classical Mechanics, a student will be able to:

PHY102.1	Demonstrate a basic and advanced knowledge of Lagrangian and Hamiltonian
	Formulations and solve related problems.
<i>PHY102.2</i>	<i>Identify the cyclic coordinates and understand their importance in Hamiltonian formulation.</i>
PHY102.3	Acquire knowledge of canonical Transformation and various generating functions for this transformation.
<i>PHY102.4</i>	Develop a deep understanding to tackle the problems of classical mechanics under small oscillations.
PHY102.5	Demonstrate the concept of motion of a particle under central force and apply advanced methods to deal with central force problems.
PHY102.6	Use Hamilton-Jacobi theory for finding the solutions of various Classical systems.
<i>PHY102.7</i>	Understand the foundations of nonlinear dynamics in general, and chaotic motion and fractals, in particular.
<i>PHY102.8</i>	Perform stability analysis of cubic anharmonic oscillator and undamped pendulum, and find chaotic trajectories.

### Unit I: Lagrangian and Hamiltonian formulation (12 hrs.)

Mechanics of a system of particles, Constraints of motion, Generalized coordinates, D'Alembert's Principle and Lagrange's Equations, Simple applications of Lagrangian formulation, Hamilton's Principle, Lagrange's equations from Hamilton's Principle. Extending Hamilton's Principle to systems with constraints, Advantages of variational principle formulation, Legendre Transformation and Hamilton's Equations of Motion, Cyclic Coordinates, Routh's Procedure, Conservation theorems using Hamiltonian, Simple applications of Hamiltonian formulation.

#### Unit II: Canonical Transformation and Small Oscillations (12 hrs.)

Equations of Canonical Transformation and Generating Functions, Examples of canonical Transformations, Poisson bracket and its properties, Angular momenta and Poisson bracket, Jacobi identity, Invariance of Poisson Bracket using Canonical Transformation, Lagrange bracket and its properties, Relation between Poisson and Lagrange brackets, Formulation of the problem under small oscillations, Eigenvalue equation and the principle axis transformation, Frequencies of free vibrations and Normal coordinates, Free vibrations of a linear triatomic molecule.

#### Unit III: Central Force problem and Hamilton-Jacobi theory (14 hrs.)

Reduction to equivalent one body problem, Equations of motion and first integrals, Classification of Orbits, Virial theorem, Differential equation for the orbit and integrable power law Potentials, The Kepler Problem, Deduction of Kepler's laws, Scattering in Central Force Field, Hamilton-Jacobi Equation for Hamilton's Principle Function, Harmonic Oscillator Problem as an example of Hamilton-Jacobi Method, Hamilton-Jacobi Equation for Hamilton's Characteristic Function, Separation of variables in Hamilton-Jacobi Equation.

#### **Unit IV: Introductory Nonlinear Dynamics** (12 hrs.)

Classical Chaos: Linear and nonlinear systems, periodic motion, Perturbation and KAM theorem, dynamics in phase space, phase portraits for conservative systems, attractors, classification and stability of equilibrium points, stability analysis of cubic anharmonic oscillator and undamped pendulum, chaotic trajectories and Liapunov exponent, Poincare Map, Henon-Hiels Hamiltonian, bifurcation, driven-damped harmonic oscillator, the logistic equation, Fractals and dimensionality.

- 1. Classical Mechanics (3rd Edition) by H. Goldstein, C. P. Poole and J. Safko
- 2. Classical Mechanics by John R. Taylor
- 3. Chaos and Integrability in nonlinear dynamics: An introduction (1989) by Michael Tabor
- 4. Nonlinear dynamics: Integrability, Chaos and patterns (2003) by M. Lakshmanan and S. Rajasekar Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering by S. Strogatz

## PHY 103: Quantum Mechanics-I

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Quantum Mechanics-I, a student will be able to:

PHY103.1	Realize the basic quantum-mechanical view point, and learn its wave mechanical and matrix formulations for a non-relativistic situation
РНҮ103.2	Solve the Schrödinger wave equation for eigenfunctions and eigenvalues for simple interaction potentials, including harmonic and central potentials.
PHY103.3	Construct matrices for observables and wave functions in different representations, and apply the matrix theory for calculating eigenvalues and eigenfunctions of linear harmonic oscillator.
PHY103.4	Describe the time-development of a quantum system in Schrödinger, Heisenberg and Interaction pictures, and to envisage the same in Hilbert space.
PHY103.5	Calculate the eigenvalues and eigenfunctions for the orbital and general angular momenta, along with the matrix representation of angular momentum.
<i>PHY103.6</i>	Perform quantum-mechanical addition of two general angular momenta, and calculate Clebsch-Gordan coefficients for some simple situations.
<i>PHY103.7</i>	Grasp the concepts of identity, indistinguishability, and see how eigenstates of a system of identical particles bifurcate into totally symmetric and anti-symmetric ones.
<i>PHY103.8</i>	Find the spin and total wave functions for a system of two identical spin ¹ / ₂ particles, and comprehend connection among spin, symmetry and statistics of identical particles.

### Unit I: Schrödinger formulation of Quantum Mechanics (14 hrs.)

Recapitulation of basic concepts: Why quantum mechanics? Two-slit experiment with *em* radiation and matter particles, Quantum-mechanical view point, The Schrödinger wave equation, Expectation values, Ehrenfest theorem; Interpretative postulates of quantum mechanics: Dynamical variables as Hermitian operators, Eigenvalues and eigenfunctions, Expansion in eigenfunctions; Illustration of postulates for energy and momentum: Orthonormality of eigenfunctions, Reality of eigenvalues, Closure property, Probability function and expectation value, Co-ordinate and momentum representations of wave function, Uncertainty principle for two arbitrary observables; Problems: A charged particle in a uniform static magnetic field (eigenfunctions and Landau levels); The Hydrogen atom (reduced mass, radial wave functions and energy eigenvalues).

## Unit II: Matrix formulation of Quantum Mechanics (12 hrs.)

Preliminaries: Hermitian and unitary matrices, Transformation and diagonalization of matrices, Matrices of infinite rank; Representation of observables and wave functions as matrices, Transformation theory, choice of basis, change of basis, unitary transformations, Hilbert space representation; Dirac's ket and bra notation; Time-development of quantum system: Schrödinger, Heisenberg and Interaction pictures, Link with classical equations of motion, Quantization of a classical system; Application to motion of a particle in an *em* field; Matrix theory of the harmonic

oscillator: Spectrum of eigenvalues and eigenfunctions, Matrices for position, momentum and energy operators (energy representation).

# Unit III: Quantum theory of Angular Momentum (12 hrs.)

Orbital angular momentum operator **L**, Cartesian and spherical polar co-ordinate representation, Commutation relations, Orbital angular momentum and spatial rotations, Eigenvalues and eigenfunctions of  $\mathbf{L}^2$  and  $\mathbf{L}_z$ , Spherical harmonics; General angular momentum **J**: Eigenvalues and eigenfunctions of  $\mathbf{J}^2$  and  $\mathbf{J}_z$ , Matrix representation of angular momentum operators, Spin angular momentum, Wave function including spin (Spinor); Spin one-half: Spin eigenfunctions, Pauli spin matrices; Addition of two angular momenta, Clebsch-Gordan coefficients and their calculation for  $j_1 = j_2 = 1/2$ ,  $j_1 = 1$ ,  $j_2 = 1/2$  and  $j_1 = j_2 = 1$ ; The Wigner-Eckart theorem.

## Unit IV: Many-particle systems and identical particles (12 hrs.)

Many-particle Schrödinger wave equation, Stationary-state solutions; Systems of identical particles, Physical meaning of identity, Principle of indistinguishability, Exchange and transposition operators, Totally symmetric and anti-symmetric wave functions, Time-invariance of symmetry, Construction of symmetric and anti-symmetric wave functions, Connection among spin, symmetry and statistics of identical particles, Fermions and bosons; Spin and total wave functions for a system of two spin ½ particles, Pauli exclusion principle and Slater determinant; Application to the electronic system of the helium atom (*para-* and *ortho-*helium); Limit of distinguishability of identical particles.

- 1. Quantum Mechanics (3rd edition) by L. I. Schiff
- 2. Quantum Mechanics (2nd edition) by B. H. Bransden and Joachain
- 3. Quantum Mechanics (3rd edition) by S. Gasiorowicz
- 4. Quantum Mechanics (3rd edition) by E. Merzbacher
- 5. Quantum Mechanics by John L. Powell and B. Crasemann
- 6. Quantum Mechanics by A. K. Ghatak and S. Loknathan
- 7. Introductory Quantum Mechanics (4rd edition) by Richard L. Liboff
- 8. Quantum Mechanics: Concepts and Applications (2nd edition) by N. Zettili

### PHY 104: Electronic Devices and Circuits-I

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Electronic Devices and Circuits-I, a student will be able to:

PHY104.1	<i>Be aware of the general characteristics of important semiconductor materials.</i>
<i>PHY104.2</i>	Develop a deep understanding of the basic design, operation and characteristics of a
	pn-junction and a BJT along with knowledge of the basic network theorems and their
	applications in electronic circuit analysis.
PHY104.3	Learn to devise and analyze various transistor amplifier models.
PHY104.4	Understand the concept of negative feedback and its importance in amplifiers.
PHY104.5	Perform a load-line analysis and design of various biasing schemes in amplifiers.
<i>PHY104.6</i>	Acquaint with the frequency response of variously coupled amplifiers and sources of noise in electronic devices.
PHY104.7	Gain knowledge of classification, sources of distortions and their estimation, operation and determination of efficiency of power amplifiers.
<i>PHY104</i> .8	<i>Clearly understand the need of regulation, operation and circuit analysis of different voltage and current regulators.</i>

### Unit I: Basics of pn-junction, BJT and Network Theorems (14 hrs.)

Semiconductors: intrinsic and extrinsic semiconductors, charge densities in p and n type semiconductors, conduction by charge drift and diffusion, the pn-junction, energy level diagrams of pn-junction under forward and reverse bias conditions, derivation of pn-diode equation, Zener diode, Zener and avalanche breakdowns, clipping and clamping circuits; The bipolar junction transistor: basic working principle, configurations and characteristics, voltage breakdowns, Network theorems: node theorem, mesh theorem, superposition theorem, Miller's theorem, Thevenin's theorem and Norton's theorem.

### Unit II: Amplifier Models, Feedback and Biasing (12 hrs.)

Two port network analysis: active circuit models, gain in decibels, equivalent circuit for BJT, the transconductance model for BJT, analysis of CE, CB, and CC amplifiers; An amplifier with feedback, effect of negative feedback on gain and its stability, distortions, input and output impedances of amplifiers, Location of quiescent (Q) point, biasing circuits for amplifiers: fixed bias, emitter feedback bias & voltage feedback bias, bias compensation, bias techniques for linear integrated circuits, thermal runaway and thermal stability.

#### Unit III: Frequency Response of Amplifiers (12 hrs.)

The amplifier pass band, mid frequency range response of a direct coupled CE cascade, the high frequency equivalent circuit (Miller effect), the high frequency response of a direct coupled CE cascade, the frequency response of RC and transformer coupled CE amplifiers, gain-frequency plots of amplifier response (Bode plots), bandwidth of cascaded amplifiers, bandwidth criterion for the transistor, the gain-bandwidth product, composite amplifier designs, bootstrapping in amplifiers, noise in amplifiers, noise figure.

#### Unit IV: Power Amplifiers and Regulators (12 hrs.)

Power amplifiers: class A large signal amplifier, second and higher order harmonic distortions, the transformer coupled power amplifier, impedance matching, efficiency, push-pull amplifiers, class-B amplifiers, complementary stages, cross over distortions, class-AB operation, heat sinks, derating curve; Electronic voltage regulators: basic operation and analysis of Zener diode voltage regulator, single BJT shunt and series regulators, feedback series BJT regulator and current regulator, overload and short circuit protection circuits.

- 1. Electronic fundamentals and applications (5th ed.) by J. D. Ryder
- 2. Integrated Electronics by J. Millman and C. C. Halkias
- 3. Circuits and Networks: Analysis and Synthesis by A Sudhakar and S.S. Palli
- 4. Electronic devices and circuits by Y. N. Bapat
- 5. Pulse, digital and switching waveforms by J. Millman and H. Taub
- 6. Millman's Electronic Devices & Circuits by J. Millman, C. C. Halkias & Satyabrata Jit
- 7. Electronic Devices & Circuit Theory by Robert L Boylestad & Louis Nashelsky
- 8. Solid state Electronic Devices by B.G. Streetman and S.K. Banerjee

## PHY 105: Physics Laboratory-I

Credit: 8 Max. Marks: 120+40 Time: 5 Hours

**Note:** Experiments in the First Year Laboratory are grouped into two sections, viz. A and B, with sections A and B containing electronics experiments and general physics experiments, respectively. In this course, students will complete at least nine experiments in a semester from one of the two sections as per allotment by the teacher in-charge of the Laboratory. Experiments pertaining to the remaining section will be undertaken in the second semester. Besides continuous assessment of students through internal viva-voce examination of the experiments performed, there shall be end-semester laboratory examination wherein each student will be required to perform at least one experiment as per paper setting by a duly appointed panel of examiners. The evaluation will be made on the basis of performance of students in (i) experiment, (ii) report and analysis of the experiment and (iii) viva-voce examination.

#### **Section A (Electronics)**

#### **Course Outcomes (COs)**

After successful completion of the course on Physics Laboratory-I (electronics), a student will be able to:

- *PHY105.1* Draw and understand the frequency response of different Filter circuits and a RCcoupled amplifier in its three configurations.
- *PHY105.2* Design and measure important parameters of rectifier, filter, voltage regulator and pn-junction circuits.
- *PHY105.3* Design and draw load characteristics of a push-pull amplifier and generate and determine the frequency of saw-tooth waves using UJT.
- *PHY105.4 Design and verify truth tables of the basic logic gates.*
- *PHY105.5* Design and understand the operations of astable multivibrator, clipping and clamping circuits.
- *PHY105.6 Design and understand the operations of differentiating, integrating, modulation and demodulation circuits.*
- *PHY105.7 Measure the sensitivities of X and Y plates of a CRO and determine frequency and phase-difference using CRO.*
- *PHY105.8* Draw the characteristics of various opto-electronic devices and determine high resistance by leakage and k/e using a transistor.

## List of experiments²

- E1 To study the frequency response of low-pass, high-pass and band-pass filters.
- E2 To study the rectifier circuits and to measure the ripple factors of C, L and  $\pi$ -section filters. Also study the stabilization characteristics of a voltage regulator consisting of IC-741.
- E3 To study the load characteristics of a class-B push-pull amplifier.
- E4 To generate saw-tooth waves using UJT and find its frequency.
- E5 To draw frequency response characteristics of a RC-coupled single stage BJT amplifier in all the three configurations.
- E6 To design circuits for OR, AND, NOT, NAND and NOR logic gates and verify their truth tables.
- E7 To measure (a) phase difference, (b) deflection sensitivities and (c) frequency of an unknown ac signal using CRO.
- E8 To study the astable multivibrator.
- E9 To study the clipping and clamping circuits.
- E10 To study the differentiating and integrating circuits.

- E11 To determine various parameters of a pn-junction diode.
- E12 To study the modulation and demodulation circuits.
- E13 To draw characteristics of opto-electronic devices.
- E14 To determine high resistance by leakage and k/e using a transistor.

## Section B (General Physics)

#### **Course Outcomes (COs)**

After successful completion of the course on Physics Laboratory-I (general physics), a student will be able to:

PHY105.1	Measure the width of a narrow slit using diffraction phenomenon and ionization
	potential of mercury.
PHY105.2	Calculate the Planck's constant using a suitable light source and half life of Indium.
PHY105.3	<i>Measure the mass absorption coefficient of</i> $\beta$ <i>-rays in Aluminum and the band gap of a semiconductor.</i>
PHY105.4	Set Michelson and Fabry-Parot interferometers for various practical measurements.
PHY105.5	Determine the strength of $\alpha$ -source and verify nuclear statistics using SSNTD.
PHY105.6	Verify the energy quantization using the Frank-Hertz Experiment.
PHY105.7	Demonstrate different harmonics present in complex signals using Fourier Analysis.
<i>PHY105.8</i>	Understand the underlying dynamics mimicked by the Feigenbaum and the Chua' circuits.

## List of experiments²

- G1 To measure the width of a narrow slit using the diffraction phenomenon.
- G2 To determine the ionization potential of mercury.
- G3 To determine the value of Planck's constant using photocell/LED.
- G4 To study absorption of  $\beta$ -rays in Aluminum.
- G5 Michelson interferometer experiment.
- G6 Fabry-Parot interferometer experiment.
- G7 To determine the half-life of Indium.
- G8 To determine the strength of an  $\alpha$ -source using SSNTD.
- G9 To study nuclear statistics using SSNTD.
- G10 Demonstration of energy quantization using the Frank-Hertz Experiment.
- G11 Fourier analysis of complex signals.
- G12 To determine band-gap of a semiconductor material.
- G13 To study nonlinear dynamics using Feigenbaum circuit.
- G14 To study nonlinear dynamics using Chua' circuit.

# M. Sc. Physics (Semester II)

# PHY 201: Quantum Mechanics-II

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Quantum Mechanics-II, a student will be able to:

- *PHY201.1* Formulate perturbation, variational and WKB methods for obtaining approximate solutions of the Schrödinger equation, and apply these to simple physical situations.
- *PHY201.2 Comprehend on how perturbation can remove the degeneracy, particularly explanation of the Zeeman and Stark effects.*
- *PHY201.3* Use the WKB method to understand tunneling through a barrier and the alpha decay process.
- *PHY201.4* Apply the time-dependent perturbation theory to deal with atom-em radiation interaction and calculate explicitly the transition probability for the induced absorption and emission processes.
- *PHY201.5 Explicate the electronic structure of many-electron atoms in central-field approximation, and estimate the central potential using the Thomas-Fermi and Hartree methods.*
- *PHY201.6 Have an understanding of the nature of molecular energy levels, and calculate these for diatomic molecules.*
- *PHY201.7 Grasp the basics of non-relativistic quantum scattering theory, and learn the partial waves and Green's function methods for deriving scattering cross-sections.*
- *PHY201.8 Calculate and analyze scattering cross-sections for finite square well, hard sphere and screened Coulomb potentials.*

## **Unit I: Approximate methods for bound states-I** (13 hrs.)

Stationary perturbation theory: Non-degenerate case- First-order and second-order corrections to energy eigenvalues and eigenfunctions, Perturbation of an oscillator (harmonic and anharmonic  $(ax^3 + bx^4)$  perturbations), Ground state of Helium atom; Degenerate case- Removal of degeneracy in first and second order, Zeeman effect without electron spin, First-order Stark effect in n=2 state of Hydrogen, Fine structure of hydrogen atom (Relativistic and spin-orbit coupling corrections); Rayleigh-Ritz variational method: Ground and excited states, Application to ground state of Helium, Van der Waals interaction using perturbation and variational methods.

## Unit II: Approximate methods for bound states-II (12 hrs.)

The WKB approximation: Classical limit, Approximate solutions, Asymptotic nature of the solutions, Solution near a turning point, Linear turning point, Connection at the turning point, Asymptotic connection formulae, Application to energy levels of a quantum well, tunneling through a potential barrier and alpha decay; First-order time-dependent perturbation theory, Transition probability for constant and harmonic perturbations, Transition to a group of final states- The Fermi golden rule, Applications: Ionization of a hydrogen atom, Ionization

probability, Interaction of an atom with *em* radiation (semi-classical treatment), Transition probability for induced absorption and emission, perturbation theory in scattering problems.

# Unit III: Selected applications of Quantum Mechanics (12 hrs.)

Atomic structure of many-electron atoms: Central-field approximation, Periodic system of elements, Thomas-Fermi statistical model, Evaluation of the potential, Hartree's self-consistent fields and connection with the variational method, Corrections to the central-field approximation, L-S and j-j couplings; Molecular structure: Classification of energy levels, Wave equation; The Hydrogen molecule: Potential energy function, The Morse potential, Rotation and vibration of diatomic molecules, Energy levels.

# Unit IV: Quantum theory of scattering (12 hrs.)

Scattering experiments and cross-sections, The laboratory and centre-of-mass systems, Scattering amplitude and cross-section; The method of partial waves: Phase shift, Differential and total cross-sections, Relation between phase shift and scattering potential, Convergence of the partial-wave series, Scattering by a finite square well, Resonances- Breit-Wigner formula, Scattering by a hard-sphere potential; Green's function method: Lippmann-Schwinger equation, The Born series, The first Born approximation, Scattering of an electron by a screened Coulomb potential in Born approximation and validity criterion; Scattering of two identical spinless bosons, and spin-1/2 fermions.

- 1. Quantum Mechanics (3rd edition) by L. I. Schiff
- 2. Quantum Mechanics (2nd edition) by B. H. Bransden and Joachain
- 3. Introduction to Quantum Mechanics (2nd edition) by David J. Griffiths
- 4. Quantum Mechanics by A. K. Ghatak and S. Loknathan
- 5. A Textbook of Quantum Mechanics by P. M. Mathews and K. Venkatesan
- 6. Quantum Mechanics by John L. Powell and B. Crasemann
- 7. Quantum Mechanics: Concepts and Applications (2nd edition) by N. Zettili

## **PHY 202: Nuclear and Particle Physics**

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Nuclear and Particle Physics, a student will be able to:

PHY202.1	Understand the energy loss processes of different energetic particles in a medium and
	mechanisms of interaction of gamma photon with matter.

- *PHY202.2* Learn about the basic properties and characteristics of Nuclear forces, and their mediating particle.
- *PHY202.3* Know and learn about various type of detectors used in nuclear physics experiments, unique properties of different detectors and their applications in the field of nuclear physics.
- *PHY202.4* Differentiate between different type of nuclear reactions, relevant aspects associated with nuclear reactions and kinematics of such reactions.
- *PHY202.5* Describe certain properties associated with nuclei, models governing different aspects of nuclear behaviour and detailed understanding of deuteron problem.
- *PHY202.6* Understand the phenomenon of radioactive decays of alpha and beta particles, their detailed formalism.
- *PHY202.7 Know about different elementary particles, their quark content and quark model.*
- PHY202.8 Learn about decay of some elementary particles and laws governing such decays.

## Unit I: Radiation Interaction and Nuclear Forces (12 hrs.)

Interaction of Charged Particles with Matter: qualitative description of various energy loss mechanisms, their relative contribution in case of heavy ions and electrons, classical stopping power equation for electronic energy-loss (no derivation) with significance of various terms involved, behavior of electronic energy-loss curve as a function of ion velocity, concept of energy straggling and range straggling and their correlation; Interaction of Gamma Radiation with Matter: features of photoelectric, Compton and pair production processes, Nuclear Forces: experimental evidence of charge symmetry and charge independence of nuclear forces, concept of isospin, Meson theory of nuclear forces, relationship between the range of the force and mass of the mediating particle.

## Unit II: Radiation Detectors and Nuclear Reactions (12 hrs.)

Gamma Ray Spectrometer: basic principle and working of NaI (Tl) scintillation detector, mechanism of pulse formation, basic idea of pulse processing unit, concept of energy resolution and efficiency of detector and its applications; Semiconductor Detectors: basic principle, construction and working and applications of Si surface barrier detector, high purity germanium detector. Nuclear Reactions: types of nuclear reactions, Q-value of a nuclear reaction and its determination, definition of cross section and its significance, elementary idea of compound nuclear reactions and direct reactions. concept of neutron detection, Coulomb excitation, nuclear kinematics.

## **Unit III: Nuclear Properties and Radioactive Decays**

Basic nuclear properties: size, shape and charge distribution, spin and parity. Binding energy, semiempirical mass formula, liquid drop model, Deuteron problem; Ground state of deuteron, Magnetic moment and its importance in the determination of exact ground state of deuteron. Radioactive Decays: energetics of alpha decay, tunnel theory of alpha decay, energetics of beta decay, Fermi theory of allowed beta decay, importance of Fermi-Kurie plot, parity non-conserving property of neutrino;

## **Unit IV: Particle Physics** (12 hrs.)

Units in high energy physics; Classification of particles- fermions and bosons, particles and antiparticles; Strange particles, Basic idea of different fundamental types of interactions with suitable examples; Quark flavors and their quantum numbers, Quarks as constituents of Hadrons, Qualitative idea of Quark confinement and asymptotic freedom, necessity of introducing the Color quantum no., Quark model, decay of pion and muon, Gell-Mann Nishijima formula, conservation laws.

- 1. Introduction to Experimental Nuclear Physics by R. M. Singru.
- 2. Elements of Nuclear Physics by W. E. Meyerhof.
- 3. Nuclear Radiation Detectors by S. S. Kapoor and V. S. Ramamurthy
- 4. Introduction to High Energy Physics (2nd edition) by D. H. Perkins.
- 5. Radiation Detection and Measurement by G. F. Knoll.
- 6. Nuclear Physics Theory and Experiment, by R. R. Roy and B. P. Nigam.

## **PHY 203: Solid State Physics**

Note: Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Solid State Physics, a student will be able to:

PHY203.1	Analyze the structure of a crystalline solid in terms of lattice, basis and unit cell, and
	of a non-crystalline solid on the basis of pair-distribution function.
PHY203.2	Deduce the structure of a crystalline solid from an analysis of the XRD pattern and the theoretically calculated crystal structure factor.
PHY203.3	Calculate the dispersion of lattice waves for crystals with mono- and diatomic basis, and understand the principle underlying its experimental measurement using neutron scattering.
PHY203.4	Acquire an understanding of the concept of phonon and use it to determine the lattice heat capacity in the Einstein and Debye models.
PHY203.5	Learn the Bloch's theorem, its application to the KP model, solve the one-electron Schrödinger equation for a periodic potential to see the emergence of energy bands, and classify materials into conductors, semiconductors and insulators.
PHY203.6	Learn and apply the tight binding and Wigner-Seitz methods for calculating the energy bands.
PHY203.7	Grasp important characteristics of superconductors, along with qualitative aspects of the BCS theory of superconductivity.
<i>PHY203.8</i>	Explain the flux quantization in a superconducting ring, and the DC and AC Josephson effects.

## **Unit I: Crystal structure** (12 hrs.)

Recapitulation of basic concepts: Bravais lattice and Primitive vectors; Primitive, Conventional and Wigner-Seitz unit cells; Crystal structures and lattices with bases; Symmetry operations and fundamental types of lattices; Index system for crystal planes. Determination of crystal structure by diffraction: Reciprocal lattice and Brillouin zones (examples of sc, bcc and fcc lattices); Bragg and Laue formulations of X-ray diffraction by a crystal and their equivalence; Laue equations; Ewald construction; Brillouin interpretation; Crystal and atomic structure factors; Structure factor of the bcc and fcc lattices, Examples of NaCl and diamond; Experimental methods of structure analysis: Types of probe beam, The Laue, rotating crystal and powder methods. Non-crystalline solids: Diffraction pattern; Monatomic amorphous materials; Pair-distribution function.

## **Unit II: Lattice dynamics and thermal properties** (12 hrs.)

Binding in solids: Crystals of inert gases, Lennard-Jones potential; Qualitative idea of Ionic, Covalent and Metallic binding. Classical theory of lattice vibration (in harmonic approximation): Vibrations of crystals with monatomic basis- Dispersion relation, First Brillouin zone, Group velocity; Two atoms per primitive basis- dispersion of acoustical and optical modes. Quantization of lattice waves: Phonons, Phonon momentum, Inelastic scattering of neutrons by phonons. Thermal properties: Lattice (phonon) heat capacity; Normal modes; Density of states in one and three dimensions; Models of Debye and Einstein; Effects due to anharmonic crystal interactions; Thermal expansion; Thermal conductivity.

# **Unit III: Electronic properties of solids** (12 hrs.)

Failure of the free electron gas model; Band theory of solids: Nearly free electron model, Energy gap; Periodic potential and Bloch's theorem; Kronig-Penney model; Wave equation of electron in a periodic potential, Solution of the central equation, Approximate solution at and near a zone boundary; Periodic, extended and reduced zone schemes of energy band representation; Number of orbitals in a band; Classification into metals, semiconductors and insulators. Calculation of energy bands: Tight binding method and its application to *sc* and *bcc* structures; Wigner-Seitz method, Cohesive energy; Pseudo-potential methods (qualitative idea).

# **Unit IV: Superconductivity** (12 hrs.)

Experimental survey: Superconductivity and its occurrence, Destruction of superconductivity by magnetic fields, Meissner effect, Type I and type II superconductors, Entropy, Free energy, Heat capacity, Energy gap, Microwave and infrared properties, Isotope effect; Theoretical survey: Thermodynamics of the superconducting transition, London equation, Coherence length; Microscopic theory: Qualitative features of the BCS theory, BCS ground state wave function; Quantitative predictions of the BCS theory, critical temperature, energy gap, critical field, specific heat; Flux quantization in a superconducting ring; Dc and Ac Josephson effects; Macroscopic long-range quantum interference; High  $T_c$  superconductors (introduction only).

- 1. Introduction to Solid State Physics (7th edition ) by Charles Kittel
- 2. Solid State Physics by Neil W. Ashcroft and N. David Mermin
- 3. Solid State Physics: An Introduction to Theory and Experiment by H. Ibach and H. Luth
- 4. Principles of the Theory of Solids (2nd edition) by J. M. Ziman
- 5. Condensed Matter Physics by Michael P. Marder
- 6. Applied Solid State Physics by Rajnikant

## PHY 204: Electronic Devices and Circuits-II

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Electronic Devices and Circuits-II, a student will be able to

- *PHY204.1* Well acquainted with the basic structures, operations, characteristics and biasing schemes of various field effect transistors.
- PHY204.2 Understand the operations of different multivibrator circuits.
- PHY204.3 Develop a clear understanding of the basics of OPAMPS, its operating modes, internal structure of an IC OPAMP and its vital design parameters.
- *PHY204.4* Become familiar with the basic structure, operation, characteristics and important applications of negative resistance devices.
- *PHY204.5 Design and describe the operations of various families of logic gates.*
- PHY204.6 Simplify involved Boolean expressions with the help of Boolean algebra and K-map
- *PHY204.7 Explain the construction, operation, characteristics and important technological applications of various photonic devices.*
- *PHY204.8 Explain the construction, operation, characteristics and important technological applications of different temperature sensitive devices.*

### Unit I: Field Effect Transistors and Multivibrators (12 hrs.)

Basic structure and operation of JFET, calculation of pinch off voltage, V-I characteristics of JFET, the FET small signal model, metal oxide semiconductor field effect transistor (MOSFET), physical structure, operation and characteristics, enhancement and depleted modes of operation, metal semiconductor field effect transistor (MESFET), low frequency common source and common drain FET amplifiers, FET biasing, FET as a voltage variable resistor (VVR); Multivibrators: a fixed biased transistor, a self-biased transistor and a direct connected bistable multivibrator circuits, Schmitt trigger circuit, triggering techniques for bistable multivibrators, collector-coupled and emitter-coupled monostable and astable multivibrators.

### Unit II: OPAMPs and Negative Resistance Devices (12 hrs.)

The basic OPAMP, inverting and non-inverting mode of operation of OPAMP, effect of negative feedback on input and output resistances of OPAMPs, the differential amplifier, common mode rejection ratio (CMRR), the emitter coupled differential amplifier, the transfer characteristics of a differential amplifier, an IC OPAMP (MC-1530 Motorola) and its dc analysis, offset voltages and currents, universal balancing techniques, measurement of OPAMP parameters; basic working principles, characteristics and applications of uni-junction transistor (UJT), four layer diode (pnpn-diode), tunnel diode and silicon controlled rectifier (SCR).

#### **Unit III: Digital Circuits** (14 hrs.)

Digital (binary) operation of a system, logic systems, the OR gate, the AND gate, the NOT gate, the exclusive OR gate, De Morgan's laws, Boolean algebra, the NAND and NOR diode-transistor gates, Modified DTL gates, fan-in and fan-out, wired logics, high threshold logic (HTL) gates, transistor-transistor logic (TTL) gates, output stages for TTL gates, resistance-transistor logic (RTL) gates, direct coupled transistor logic (DCTL) gates, emitter coupled logic (ECL) gates, digital MOSFET circuits, complementary MOS (CMOS) logic gates, comparison of logic families, Karnaugh- map (K-map) up to four variable and its applications.

#### Unit IV: Optoelectronic and Temperature Sensing Devices (11 hrs.)

Radiative and nonradiative transitions, basic construction, operation, characteristics and applications of solar cells, light dependent resistance (LDR), photodiodes, p-i-n diodes, metal semiconductor photodiodes, avalanche photodiodes, light emitting diodes (LEDs), semiconductor diode lasers, photo transistors, resistance thermometers, thermocouples and thermistors.

- 1. Integrated Electronics by J. Millman and C. C. Halkias
- 2. Pulse, digital and switching waveforms by J. Millman and H. Taub
- 3. Electronic devices and circuits by Y. N. Bapat
- 4. Microwave devices and circuits by Samuel Y. Liao
- 5. Physics of semiconductor Devices by S. M. Sze
- 6. Electronic instrumentation and measurement techniques by W. D. Cooper and A. D. Helfrick
- 7. OPAMPs and linear IC circuits by Ramakant A. Gayakwad
- 8. Electronics for Scientists and Engineers: Devices, Circuits and Systems by TV Viswanathan, GK Mehta and V Rajaraman

## PHY 205: Physics Laboratory-II

Credit: 8 Max. Marks: 120+40 Time: 5 Hours

**Note:** Experiments in the First Year Laboratory are grouped into two sections, viz. A and B, with Sections A and B containing electronics experiments and general physics experiments, respectively. In this course, students shall complete at least nine experiments from the section other than the one undertaken in 1st semester. The course outcomes, evaluation pattern and list of experiments are the same as given in the Course PHY 105.

# PHY 206: Seminar

**Note:** Each student will deliver one seminar on the topic to be allotted by the departmental seminar committee in both  $1^{st}$  and  $2^{nd}$  years of the M. Sc. Physics Course as per the schedule drawn in the beginning of each year. The marks will be awarded by the seminar committee on the basis of performance in the seminar and the seminar report submitted by the student.

### **Course Outcomes (COs)**

After successful completion of the course on seminar a student will be able to:

PHY206_1	Achieve effective communication skills
PHY206.2	Understand the concepts involved in the topic of seminar.
PHY206.3	Acquire skills for working in team.
PHY206.4	Develop confidence for facing audience.
PHY206.5	Learn to write effectively a report on a particular topic.
PHY206.6	Know the techniques of responding to the questions posed by audience.
PHY206.7	Enhance the presentation abilities.
PHY206.8	Improve interpersonal skills.

# M. Sc. Physics (Semester III)

## PHY 301: Electrodynamics and Plasma Physics

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

### **Course Outcomes (COs)**

After successful completion of the course on Advanced Quantum Mechanics a student will be able to:

- *PHY301.1* Have sound knowledge of basic concepts of electrostatics and find solution of Poisson's and Laplace's equations.
- PHY301.2 Enhance skills for solving Boundary value problems especially using Method of images.
- *PHY301.3* Understand basic concepts of magnetostatics and apply them for solving the related problems.
- PHY301.4 Recognize various 4-vectors and develop understanding of Minkowski space in context with special theory of relativity.
- *PHY301.5* Describe the propagation of electromagnetic wave through different media and rectangular waveguide.
- *PHY301.6 Get familiarize with concept of retarded time for charges undergoing acceleration and evaluate Lienard-Wiechert Potentials.*
- PHY301.7 Understand the basic concepts of Plasma Physics and find validity of plasma approximation.
- *PHY301.8 Realize the mechanism of plasma oscillations and have knowledge of plasma instabilities.*

### Unit I: Electrostatics and Method of Images (12 hrs.)

Electric Field, Gauss's Law, Differential Form of Gauss Law, Poisson's and Laplace's equations, Solution of Laplace's equation in various coordinates, Green's Theorem, Dirichlet and Neumann boundary conditions, Formal solution of boundary value problem with Green Function, Method of Images, Point charge near an infinite Grounded Conducting Plane, Point charge in the presence of Grounded Conducting Sphere, Point charge in the presence of Charged, Insulated Conducting sphere, Point charge near a Conducting Sphere held at Fixed Potential, Conducting sphere in a Uniform Electric Field.

### Unit II: Magnetostatics, Maxwell Equations and Special Theory of Relativity (12 hrs.)

Magnetostatics: Biot-Savart Law: Steady Currents, The magnetic field of a Steady Current, Ampere's Law, Comparison of Magnetostatics and Electrostatics, Maxwell's Displacement Current; Maxwell's Equations, Scalar and Vector potentials, Maxwell's equations in terms of scalar and vector potentials, Non uniqueness of Electromagnetic potentials, Gauge Transformation, Lorentz gauge and Coulomb gauge. Minkowski Space and Four vectors, Mathematical Properties of the Space-Time of Special Relativity, Electromagnetic field strength tensors, Covariance of Maxwell's and Lorentz force equations.

#### **Unit III: Electromagnetic Waves and Radiation by Moving Charges** (14 hrs.)

Electromagnetic Waves in Vacuum: The Wave Equation for E and B, Monochromatic Plane Waves, Energy and Momentum in Electromagnetic Waves. Electromagnetic Waves in Matter: Propagation in Linear Media, Reflection and Transmission at Normal Incidence, Reflection and Transmission at Oblique Incidence. Electromagnetic Waves in Conductors, Reflection at a Conducting Surface. Wave Guides, TE and TM Waves in a Rectangular Wave Guide, Retarded Time, Lienard-Wiechert Potentials for a point charge, Total power radiated by a point charge: Larmor's formula and its relativistic generalization.

#### Unit IV: Plasma Physics (12 hrs.)

Occurrence of Plasmas in Nature, Quasineutrality of plasma, Debye Shielding, The Plasma Parameter, Criteria for Plasmas, Representation of Waves in Plasma, Group Velocity, Plasma Oscillations, Electron Plasma Waves, Sound Waves, Ion Waves, Validity of the Plasma Approximation, Comparison of Ion and Electron Waves, Electrostatic Electron Oscillations Perpendicular to B. Introduction to plasma Instabilities: Streaming instabilities, Rayleigh–Taylor instabilities, Universal instabilities, Kinetic instabilities. Velocity Distribution Function in Plasma, Derivation of the Fluid Equations as moments of the Boltzmann equation.

- 1. Classical Electrodynamics by J.D. Jackson.
- 2. Introduction to Electrodynamics by D. J. Griffiths.
- 3. Introduction to Electrodynamics by A. Z. Capri and P. V. Panat.
- 4. Electrodynamics by S. P. Puri.
- 5. Introduction to Plasma Physics by F. F. Chen.
- 6. Introduction to Plasma Theory by D. R. Nicholson.

## PHY 302: Statistical Mechanics

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Statistical Mechanics, a student will be able to:

- PHY302.1 Realize the fundamental connection between statistical mechanics and thermodynamics.
  PHY302.2 Learn the ensemble formulation of statistical mechanics, and apply these to calculate important thermodynamical quantities for simple systems.
  PHY302.3 Formulate the quantum mechanical ensemble theory and use it to derive the laws of quantum statistics, viz. Fermi-Dirac (FD) and Bose-Einstein (BE) statistics.
- PHY302.4 Apply the laws of quantum statistics to determine the equation of state for ideal Bose and Fermi gases, and understand the origin of Bose-Einstein condensation.
- *PHY302.5* Grasp the basics of cluster expansion method for a classical real gas to obtain its equation of state and simple cluster integrals.
- PHY302.6 Construct and solve the Ising model, along with the Landau theory of phase transition.
- *PHY302.7* Understand fluctuations, their spectral analysis and connection with spatial correlations.
- PHY302.8 Describe the theoretical basis of Brownian motion on the basis of Enistein-Smoluchowski, and Langevin approaches.

## Unit I: Classical Statistical Mechanics (14 hrs.)

Foundations of Statistical Mechanics: The macroscopic and microscopic states, Postulate of equal a priori probability, Contact between statistics and thermodynamics; Entropy of mixing and the Gibbs paradox, Sackur-Tetrode equation, Ensemble theory: Concept of ensemble, Phase space, Density function, Ensemble average, Liouville's theorem, Stationary ensemble; The microcanonical ensemble, The canonical and grand canonical ensembles, Application to the classical ideal gas; Canonical and grand canonical partition functions, Calculation of statistical quantities; Thermodynamics of a system of non-interacting classical harmonic oscillators using canonical ensemble and of classical ideal gas using grand canonical ensemble, Energy and density fluctuations.

## Unit II: Quantum Statistical Mechanics (14 hrs.)

Quantum-mechanical ensemble theory: Density matrix, Equation of motion for density matrix, Quantum mechanical ensemble average; Statistics of indistinguishable particles, Fermi-Dirac and Bose-Einstein statistics, Fermi-Dirac and Bose-Einstein distribution functions using microcanonical and grand canonical ensembles (ideal gas only), Statistics of occupation numbers; Ideal Bose gas: Internal energy, Equation of state, Bose-Einstein Condensation and its critical conditions; Bose-Einstein condensation in ultra-cold atomic gases: its detection and thermodynamic properties; Ideal Fermi gas: Internal energy, Equation of state, Completely degenerate Fermi gas.

## Unit III: Non-Ideal Systems (12 hrs.)

Cluster expansion method for a classical gas, Simple cluster integrals, Mayer-Ursell relations, Virial expansion of the equation of state, Van der Waal's equation, Validity of cluster expansion method; Phase transitions: Construction of Ising model, qualitative description of ferromagnetism, Lattice gas and Binary alloy, Solution of Ising model in the Bragg-William approximation, Exact solution of the one-dimensional Ising model; Critical exponents, Landau theory of phase transition, Scaling hypothesis. The role of correlation and fluctuation

## Unit IV: Fluctuations (12 hrs.)

Thermodynamic fluctuations and their probability distribution law, Spatial correlations in a fluid, Connection between density fluctuations and spatial correlations; Brownian motion, Enistein-Smoluchowski theory of Brownian Motion, Langevin theory of the Brownian motion (derivations of mean square displacement and mean square velocity of Brownian particle), Auto-correlation function and its properties, The fluctuation-dissipation theorem, Diffusion coefficient; the Fokker-Planck equation; Spectral analysis of fluctuations: the Wiener-Khintchine theorem.

- 1. Statistical Mechanics by R. K. Pathria (2nd edition)
- 2. Statistical Mechanics by R. K. Pathria and P. D. Beale (3rd edition)
- 3. Statistical and Thermal Physics by F. Reif
- 4. Statistical Mechanics by K. Huang
- 5. Statistical Mechanics by L. D. Landau and I. M. Lifshitz
- 6. Statistical Mechanics by R. Kubo

## PHY 303A: Condensed Matter Physics-I

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

### **Course Outcomes (COs)**

After successful completion of the course on Condensed Matter Physics-I, a student will be able to:

- *PHY303A.1* Have an understanding of basic physical concepts (like band gap, holes, effective mass, etc.) related to semiconductors.
- PHY303A.2 Appreciate the concept and importance of Fermi surface of metals and its experimental determination through De Hass-van Alphen effect, along with magneto-transport in a 2D channel.
- *PHY303A.3* Learn the description of collective excitations of the Fermi Sea (plasmons) and the electrostatic screening of electron-impurity interaction, in terms of the dielectric function of the electron gas.
- PHY303A.4 Understand different physical quantities (reflectivity coefficient, reflectance, real & imaginary parts of response etc.) related to the optical response of solids, and Raman Effect in crystals.
- *PHY303A.5 Relate the dielectric polarization with the macroscopic electric field and the local electric field acting on an atom in the dielectric, along with frequency dependence of polarizability.*
- *PHY303A.6 Comprehend ferroelectricity and the Landau theory of phase transition.*
- PHY303A.7 Calculate magnetic susceptibility for atoms, insulating solids and conduction electrons, and have an understanding of the microscopic origin of ferromagnetism and anti-ferromagnetism.
- PHY303A.8 Determine the low-energy excitations (spin waves/magnons) for ferromagnetic and antiferromagnetic systems, understand principle underlying their experimental measurement, and learn about ferromagnetic domains.

#### Unit I: Semiconductor crystals, Fermi surfaces & metals, and Magnetotransport (12 hrs.)

Semiconductor crystals: Band gap, Direct and indirect absorption processes; Equations of motion in an energy band, Concept and properties of holes, Effective mass and its physical interpretation, Effective masses in semiconductors, Examples of Silicon and Germanium; Intrinsic carrier concentration, Law of mass action, Intrinsic mobility. Fermi surfaces and metals: Fermi surface and its construction for square lattice (free electrons and nearly free electrons); Electron orbits, Hole orbits, Open orbits; Experimental determination of Fermi surface: Quantization of orbits in a magnetic field, De Hass-van Alphen effect, Extremal orbits. Magnetoresistance in a twodimensional channel, Integral Quantized Hall Effect.

## **Unit II: Optical properties of solids** (12 hrs.)

Dielectric function of the free electron gas, Plasma optics, Dispersion relation for *em* waves, Transverse optical modes in a plasma, Transparency of alkalis in the ultraviolet, Longitudinal plasma oscillations, Plasmons and their measurement; Electrostatic screening, Screened Coulomb potential, Mott metal-insulator transition, Screening and phonons in metals; Optical reflectance, Kramers-Kronig relations, Electronic inter-band transitions, Excitons, Frenkel and Mott-Wannier excitons; Raman effect in crystals; Electron spectroscopy with X-rays.

# Unit III: Dielectrics and Ferroelectrics (12 hrs.)

Polarization, Macroscopic electric field, Dielectric susceptibility, Local electric field at an atom, Dielectric constant and polarizability, Clausius-Mossotti relation, Electronic polarizability, Classical theory of electronic polarizability; Structural phase transitions; Ferroelectric crystals and their classification; Displacive transitions; Landau theory of the phase transition; Anti-ferroelectricity, Ferroelectric domains; Piezoelectricity, Ferroelasticity.

# Unit IV: Magnetism (14 hrs.)

Diamagnetism and paramagnetism: Magnetization density and susceptibility, Calculation of atomic susceptibilities, Larmor diamagnetism; Quantum theory of paramagnetism- Curie law; Hund's rules; Paramagnetic susceptibility of conduction electrons. Ferromagnetism and anti-ferromagnetism: Ferromagnetic order, Mean field theory- Curie-Weiss law; Electrostatic origins of magnetic interactions, Magnetic properties of a two-electron system, Singlet-triplet (exchange) splitting in Heitler-London approximation, Exchange interaction; Spin Hamiltonian and the Heisenberg model; Spin waves and their dispersion; Quantization of spin waves, Magnons, Thermal excitation of magnetic domains: Magnetization curve, Bloch wall, Origin of domains; Antiferromagnetic order and magnons.

- 1. Introduction to Solid State Physics (7th edition) by Charles Kittel
- 2. Solid State Physics by Neil W. Ashcroft and N. David Mermin
- 3. Solid State Physics: An Introduction to Theory and Experiment by H. Ibach and H. Luth
- 4. Principles of the Theory of Solids (2nd edition) by J. M. Ziman
- 5. Condensed Matter Physics by Michael P. Marder
- 6. Advanced Solid State Physics by P. Phillips

## PHY 303B: Nuclear Physics-I

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Nuclear Physics-I, a student will be able to:

- *PHY303B.1* Do Particle identification using solid state and gaseous detectors using the formalism of particle energy in two slices of the detectors.
- PHY303B.2 Learn about the concept, working and properties of various gas filled detectors.
- *PHY303B.3* Describe the mechanisms adopted for processing a pulse through nuclear electronics, optimization of signal processing and techniques of coincidence for nuclear experiments.
- *PHY303B.4* Understand the concept of pulse processing and data acquisition using different methods.
- *PHY303B.5* Grasp the concept and working of different ion accelerators used in modern day nuclear/material research.
- *PHY303B.6* Describe the mechanisms such as ion range, channelling and sputtering etc. associated with study of material properties.
- PHY303B.7 Understand about various type of fission reactors used in different branches of research and energy production.
- PHY303B.8 Understand the concept of fusion reactor and process of breeding in fission reactors.

## **Unit I: Particle Identification** (12 hrs.)

Basic principle of  $\Delta E$ -E detector telescopes, short range charged particles  $\Delta E$ -E telescope, methods of particle identification using semiconductor and gaseous detectors,  $\Delta E$ -E time of flight spectroscopy; Event by event particle identification system for heavy ion induced reaction analysis; neutron-gamma discrimination; Modem Gas Detectors: basic principle and operation of split anode ionization chamber, position sensitive proportional counter & multi wire proportional counter.

## **Unit II: Nuclear Electronics** (12 hrs.)

Types of preamplifiers: basic idea of voltage sensitive and current sensitive pre-amplifiers, details of charge sensitive preamplifier and its applications; Amplifier Pulse Shaping Circuits: RC, Gaussian, delay-line, bipolar and zero cross-over timing circuits, pole zero cancellation and base line restorer; Coincidence Techniques: basic idea of coincidence circuit and its resolving time, basic principle of slow coincidence, slow fast coincidence and sum coincidence techniques, electronic considerations for pulse processing, device impedance, pulse attenuator, pulse splitter, linear and logic pulses, Single Channel Analyzer; Multi-Channel Analyzer; CAMAC Based Data Acquisition System.

# Unit III: Ion Accelerators and Ion Beam Interaction in Solids (12 hrs.)

Ion Accelerators: Ion sources- basic features of RF ion source, direct extraction negative ions source (Duoplasmatron) and source of negative ions by Cs sputtering (SNICS); Basic principle and working of Tandom accelerator and Pelletron accelerator and its applications; Ion Beam Interaction in Solids: Basic ion bombardment processes in solids- general phenomenon, ion penetration and stopping, ion range parameters, channelling, components of an ion implanter, energy deposition during radiation damage, sputtering process and ion beam mixing.

# Unit IV: Nuclear Reactors (12 hrs.)

Nuclear stability, fission, prompt and delayed neutrons, fissile and fertile materials- characteristics and production, classification of neutrons on the basis of their energy, four factor formula, control of reactors, reactors using natural uranium, principle of breeder reactors, fast breeder reactor & doubling time, calculation of critical size and mass of reactor; Basic principle of neutron detection; Basic concept of fusion reactors.

- 1. Nuclear Radiation Detectors by S. S. Kapoor and V. S. Ramamurthy
- 2. Introduction to Experimental Nuclear Physics by R. M. Singru
- 3. Techniques for Nuclear and Particle Physics Experiments by W. R. Leo
- 4. Radiation Detection and Measurement by G. F. Knoll
- 5. The Physics of Nuclear Reactions by W. M. Gibson
- 6. VLSI Technology by S. M. Sze

# PHY 303C: Particle Physics-I

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

# **Course Outcomes (COs)**

After successful completion of the course on Particle Physics-I, a student will be able to:

PHY303C.1	Realize the Fundamental constituents of matter, their origination
РНҮ303С.2	Understand qualitative and quantitative analysis of Resonance and Dalitz plots.
DIM202G2	

- *PHY303C.3* Formulate Quantum mechanical scattering theory leading to understand origination of field particles.
- *PHY303C.4* Understand three major interactions viz strong, electromagnetic and weak are in existence.
- *PHY303C.5* Understand Isospin formulation and its fundamentals.
- *PHY303C.6* Invariance and violation of various conservation laws and symmetries in these interactions.
- *PHY303C.7* Understand fundamental knowledge of the subject matter leading to the attempt for grand unification.
- PHY303C.8 Formulate Parity conservation, violation and Charge conjugation invariance.

## Unit I: Wave Optical Description of Hadron Scattering (12 hrs.)

Partial wave analysis for elastic scattering cross-section (non identical and spin less particles), characteristic S and P wave scattering, reaction cross-section, optical theorem and its significance; Resonances: Introduction to resonances, difference between resonances and unstable particles,  $\Delta(1236)$  resonance, W and Z⁰ Resonance, Briet- Wigner resonance formula and its significance, introduction to Dalitz plots with example of K₊ $\rightarrow 3\pi$  decay, discovery of charm, bottom and top quarks (qualitative description).

## **Unit II: Isospin Formalism** (12 hrs.)

Concept of isospin, assignment of isospin to hadrons, Isospin Symmetry, isospin multiplets, generalized Pauli principle, assignment of isospin to deuteron in its ground state, isospin wavefuctions for nucleon-nucleon, pion-nucleon and pion-pion systems, isospin invariance in strong interactions through examples like, and, relative cross-section  $\sigma_{pn\to d\pi0}/\sigma_{pp\to d\pi+} = 1/2$ , and  $\sigma_{pd\to 3He\pi0}/\sigma_{pd\to 3H\pi+} = 1/2$ , relative cross sections for  $\pi+p$  (elastic scattering),  $\pi-p$  (elastic scattering) and  $\pi-p$  (charge exchange) processes using isospin analysis, relation in Isospin-Strangeness-Hypercharge.

## **UNIT III: Conservation Laws** (12 hrs.)

The conservation of electric charge and stability of electron, the conservation of baryon number and stability of proton, Lepton number conservation, conservation and violation of isospin in different types of interactions, assignment of strangeness number to hadrons, strangeness conservation in strong and electromagnetic interactions and violation in weak interactions with suitable examples, The Ge11-Mann-Nishijima formula, the baryon  $3/2_{+}$  decuplet,  $1/2_{+}$  octet and the meson 0- octet,

SU(3) classification of hadrons, qualitative idea of Grand Unification theory, prediction of proton decay.

# **Unit IV: Symmetry Principles** (12 hrs.)

Charge conjugation invariance, suppression of  $\pi_0 \rightarrow 3\gamma$  decay w. r. t.  $\pi_0 \rightarrow 2\gamma$  decay, restrictions imposed by C invariance on the states of positronium annihilating in the modes  $e_+ e_- \rightarrow 2\gamma \ 3\gamma$ , G-Parity, I- $\theta$  puzzle, parity conservation in strong and electromagnetic interactions and violation in weak decays, C and P operations on neutrino states, CPT theorem (statement only) and its consequences.

- 1. Introduction to High Energy Physics (2nd, 3rd and 4th edition): D. H. Perkins.
- 2. Intermediate Energy Nuclear Physics: W. O. Lock and D. F. Measday.
- 3. Introduction to Particle Physics: M. P. Khanna.
- 4. Elementary Particle Physics: Yorikiyo Nagashima.
- 5. Symmetry Principles in Elementary Particle Physics: W. M. Gibson and B. R. Pollard.

## PHY 304A: Computational Physics-I

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Computational Physics-I, a student will be able to:

- PHY304A.1 Understand the working of FORTRAN statements and tracing of FORTRAN programs.
- PHY304A.2 Implement algorithms in developing FORTRAN programs and learn shell based plotting using Gnuplot.
- *PHY304A.3* Understand different type of errors, their propagation, and to minimize errors while writing a program.
- *PHY304A.4* Find roots of algebraic equations using various iterative methods.
- PHY304A.5 Solve numerical problems involving interpolation and/or extrapolation using different methods.
- PHY304A.6 Fit a given data set with a best fit curve using principle of least square fitting and learn about fitting of different non-linear functions.
- PHY304A.7 Solve a set of simultaneous linear algebraic equations numerically.
- *PHY304A.8* Find numerically the eigenvalues and eigenvectors of matrices using polynomial and power methods.

### Unit I: Computer Fundamentals and Programming in FORTRAN (12 hrs.)

Basic Computer Organization: Input unit, Output unit, Storage unit, Arithmetic logic unit, Control unit, Central processing unit, The system concept, Linux operating system; distributions, linux shell, basic commands, Introduction to compilers, Fortran Programming: Data types, Data handling, Arithmetical and logical expressions, Intrinsic functions, Input-Output statements, Format statements, IF statement, DO statement, While loop, Common blocks, Arrays and subscripted variables, Functions and subroutines, Handling of files. Plotting using Gunuplot, Computer programs for arranging numbers in ascending and descending orders, Matrix multiplication, Program debugging.

### Unit II: Errors and Solution of Algebraic Equations (12 hrs.)

Errors: Round off error, Truncation error, Machine error, Random error, Propagation of errors. Loss of Significance: Significant Digits, Computer caused loss of significance, Avoiding loss of significance in subtraction. Solutions of algebraic equations: Bisection method, Iteration method, Method of false position, Newton-Raphson method, Convergence conditions, Muller's method, Secant Method.

### **Unit III: Interpolation and Curve fitting** (12 hrs.)

Interpolation and Extrapolation: Finite differences, Forward differences, Backward differences, Central differences, Newton's formula for interpolation, Gauss central difference formula, Stirling's formula, Bessel's formula, Lagrange's interpolation formula, error of interpolation, Least square

curve fitting: The principle of least square fitting, Linear regression, Polynomial regression, Fitting exponential and trigonometric functions, Data fitting with cubic splines, Data fitting using Gnuplot.

## **Unit IV: Systems of Linear Equations and Eigenvalue Problem** (12 hrs.)

Solutions of simultaneous linear algebraic equations: Gauss elimination method, Gauss Jordan elimination method, Doolittle method, Matrix inversion method, Ill-conditioned matrix and error correction, Jacobi Method, Gauss Seidel iterative method, Matrix eigenvalues and eigenvectors: Polynomial method, Power method.

- 1. William E. Mayo and Martin Cwiakala, Programming with Fortran 77, Schaum's outline serios, McGraw Hill, Inc.
- 2. R C Desai, Fortran Programming and Numerical methods, Tata McGraw Hill, New Delhi.
- 3. S S Sastry Introductory methods of numerical Analysis, Prentice Hall of India Pvt. Ltd.
- 4. V Rajaraman, Computer Oriented Numerical Method, Prentice Hall of India Pvt. Ltd.
- 5. P B Patil and U. P. Verma, Numercal Computational Methods, Narosa Publishing House

## PHY 304B: Electronics-I

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Electronics-I, a student will be able to:

PHY304B.1	Design and comprehend a host of OPAMP based linear analog electronic circuits.
PHY304B.2	Design and understand various nonlinear analog electronic circuits with the help of
	OPAMPs.
<i>PHY304B.3</i>	Gain a fair understanding of the operation and underlying circuitry of amplitude and frequency modulations.
PHY304B.4	Understand the necessary circuitry of digital modulation techniques and Radars.
PHY304B.5	Explain the principle of optical fibers, their various types & fabrication techniques.
PHY304B.6	Comprehend connectors, splices and amplifiers in fiber optics communication.
PHY304B.7	Become familiar with the ideal MS contacts, their classification, surface effects and
	their important applications.
PHY304B.8	Describe the basics of ideal and non-ideal MOS systems, MOS capacitance,
	MOS memories and charged-coupled devices.

#### Unit I: Applications of Operational Amplifiers (12 hrs.)

Linear analog systems: inverters, scale changers, phase shifters, adders, subtractors, voltage to current and current to voltage convertors, dc voltage follower, differential dc amplifier, bridge amplifier, ac coupled amplifier, instrumentation amplifier, integrator and differentiator, analog computer to solve linear differential equations with constant coefficients; non-linear analog systems: comparators, sample and hold circuits, precision ac/dc convertors, log & antilog amplifiers, logarithmic multipliers and dividers, square, pulse and triangular waveform generators, regenerative comparator (Schmitt-trigger circuit).

#### **Unit II: Modulation and Communication** (12 hrs.)

Basic operation and internal circuitry of PLL, active filters (Butter-Worth 1st and 2nd order), amplitude modulation, frequency spectrum and power in the AM wave, generation of AM waves, demodulation of AM waves. frequency modulation, block diagram of transmitter and super heterodyne receiver, digital communication, basic idea about delta modulation, PCM and PWM, block diagram of Radar, radar range equation and applications of Radars.

#### **Unit III: Introduction to Fiber Optics** (12 hrs)

Optical fibers, basic principle, numerical aperture, V-parameter, types of optical fibers: single mode step index fiber, multimode step index fiber, multimode graded index fiber, material dispersion, signal degradation, fiber losses, fiber materials, fabrication methods for fiber cables: liquid-phase techniques, vapor-phase deposition techniques, fiber connectors and splices, applications of fiber cables, an introduction to semiconductor optical amplifiers.

#### Unit IV: MS contacts and MOS systems (12 hrs.)

Metal semiconductor contacts, ideal MS contacts, Schottky barriers and ohmic contacts, surface effects on
MS contacts, applications of MS contacts, the ideal MOS structure and its analysis, capacitance of MOS system, non-ideal MOS system: oxide and interface charges, origin of oxide charges, effect of bias voltage, MOS memories, and charge-coupled devices.

- 1. Integrated electronics by J Millman & CC Halkias.
- 2. Micro Electronics by J Millman & A Grabel.
- 3. Electronic communications by D Roddy and J Coolen.
- 4. Electronic Communications: Modulation and Transmission by RJ Schoenbeck
- 5. OPAMPs and linear IC circuits by Ramakant A. Gayakwad
- 6. Electronic fundamentals and applications (5th ed.) by J D Ryder
- 7. Electronic Devices & Circuit Theory by Robert L Boylestad & Louis Nashelsky
- 8. Microelectronic Circuits: Theory and Applications (6th ed.) by Adel S Sedra and Kenneth C Smith

### PHY 304C: Material Science-I

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Material Science-I, a student will be able to:

- *PHY304C.1* Understand the basic concepts and properties of Materials
- PHY304C.2 Describe how and why defects (point, line and planar) in materials greatly affect engineering properties and limit their use in service
- *PHY304C.3* Understand strengthening and grasp the importance of various strengthening mechanisms.
- *PHY304C.4* Describe various parameters involved in elastic deformation, plastic deformation, anelastic deformation etc.
- *PHY304C.5* Grasp the concept of phase diagrams and be able to predict microstructures and understand transformation mechanisms (nucleation and growth, martensitic).
- PHY304C.6 Comprehend Iron-Carbon system and ceramics.
- PHY304C.7 Elucidate the kinematics of elastic collisions and have in depth understanding energetic ion beam based techniques (given in the syllabus) for analysis of materials
- PHY304C.8 Perform computations of depth profiles and concentration analysis using these techniques, Choose the most appropriate technique for characterization

#### **Unit I: Imperfections in Solids** (12 hrs.)

Point Defects: vacancy, substitutional, interstitial, Frenkel and Schottky defects, equilibrium concentration of Frenkel and Schottky defects; Line Defects: slip planes and slip directions, edge and screw dislocations, Burger's vector, cross-slip, glide and climb, jogs, dislocation energy, super & partial dislocations, dislocation multiplication, Frank Read sources; Planar Defects: grain boundaries and twin interfaces; Dislocation Theory – experimental observation of dislocation, dislocations in FCC, HCP and BCC lattice.

#### Unit II: Mechanical Properties (12 hrs.)

Stress Strain Curve; Elastic Deformation: atomic mechanism of elastic deformation and anisotropy of Young's modulus, elastic deformation of an isotropic material; Anelastic and Viscous deformation; Plastic Deformation: Schmid's law, critically resolved shear stress; Strengthening Mechanisms: work hardening, recovery, recrystallization, strengthening from grain boundaries, low angle grain boundaries. yield point. strain aging, solid solution strengthening, two phase aggregates, strengthening from fine particles; Fracture: ideal fracture stress, brittle fracture-Griffith's theory, ductile fracture.

### **Unit III: Microstructure** (12 hrs.)

Solid Solutions and Intermediate Phases: phase rule, unitary & binary phase diagrams, Lever rule, Hume-Rothery rule; Free Energy and Equilibrium Phase Diagrams: complete solid miscibility, partial solid miscibility-eutectic, peritectic and eutectoid reactions, eutectaid mixture; Nucleation, Growth and Overall Transformation Kinetics; Martenstic Transformation; The Iron-Carbon System:

various phases, phase diagram, phase transformations, microstructure and property changes in ironcarbon system; Ceramics: glass transition temperature, glassformers, commercial ceramics, mechanical properties, high temperature properties.

## Unit IV: Materials Processing and Characterization (12 hrs.)

Ion Implantation: introduction, ion implantation process, depth profile, radiation damage and annealing effects of trace-impurities, implantation induced alloying and structural phase transformation; Rutherford Backscattering Spectrometry (RBS): principle, kinematics of elastic collision, shape of the backscattering spectrum, depth profiles and concentration analysis, applications; Elastic Recoil Detection Analysis (ERDA): basic principle, kinematics, concentration analysis, depth profiling, depth resolution, applications; Secondary Ion Mass Spectroscopy (SIMS): basic principle, working, yield of secondary ions and applications.

- 1. Material Science by J. C. Anderson, K. D. Leaver, J. M. Alexander and R. D. Rawlings
- 2. Mechanical Metallurgy by G. E. Dieter
- 3. Ion Implantation by G. Dearnally
- 4. Fundamentals of Surface and Thin Film Analysis by L. C. Feldman and J. W. Mayer
- 5. Surface Analysis Methods in Material Science by D. J. O'Connor, B. A. Sexton and R. St. C. Smart (Eds), Springer Series in Surface Sciences 23

#### PHY 305: Physics Laboratory-III

Credit:8 Max. Marks: 120+40 Time: 5 Hours

**Note:** Unlike the M. Sc. First Year Laboratory, experiments in the Final Year Laboratory are based upon six different specializations. In this course, students shall complete at least seven experiments from one of the two allotted specializations. Experiments corresponding to the second specialization will be undertaken in the 4th semester. Besides continuous assessment of students through internal viva-voce examination of the experiments performed, there shall be end-semester laboratory examination wherein each student will be required to perform at least one experiment as per paper setting by a duly appointed panel of examiners. The evaluation will be made on the basis of performance of students in (i) experiment, (ii) report and analysis of the experiment and (iii) viva-voce examination.

#### **Condensed Matter Physics**

#### **Course Outcomes (COs)**

After successful completion of the course on Physics Laboratory-III (Condensed Matter Physics), a student will be able to:

PHY305.1	Measure the variation in potential drop with temperature for a semiconductor using
	the four probe method, and use it to determine the band gap of semiconductor.
PHY305.2	Establish the type of semiconductor by measuring the Hall coefficient, explore
	temperature dependence of Hall coefficient, and measure the magneto-resistance.
PHY305.3	Ascertain the magnetic nature of a given material by measuring its magnetic susceptibility.
PHY305.4	Observe the electron paramagnetic resonance phenomenon and use it to determine the Lande g-factor.
PHY305.5	Understand the change in magnetization of ferrites with heating by tracing the B-H loops, and determine the Curie temperature.
РНҮ305.6	Record and analyze the XRD pattern of a crystalline substance using a table-top X-ray diffractometer, and find the lattice parameter and Miller indices.
<i>PHY305.7</i>	Simulate the dispersion of lattice vibrations using an electrical analogue of real lattice.

*PHY305.8* Learn and measure the characteristics of a thermo-luminescent material.

- C1 Band Gap of a given semiconductor material using Four-Probe method.
- C2 Study of Hall effect for a bulk semiconducting material.
- C3 Temperature dependence of Hall coefficient.
- C4 Dispersion of lattice vibrations using electrical analogue of real lattice.
- C5 Magnetic susceptibility of hydrated copper sulfate.
- C6 Lattice parameter and Miller Indices using XRD.
- C7 Transition temperature of ferrites.
- C8 Study of the phenomenon of magneto-resistance.
- C9 Electron paramagnetic resonance experiment.
- C10 Thermo-luminescence studies.
- C11 High temperature superconductivity experiment.

C12 Dielectric constant of benzene and dipole moment of acetone.

## **Nuclear Physics**

### **Course Outcomes (COs)**

After successful completion of the course on Physics Laboratory-III (Nuclear Physics), a student will be able to:

PHY305.1	Understand the working of GM Counter and measure its resolving time and hence
	determine the nuclear statistics of source and thickness of given sample.
PHY305.2	Measure the resolving power and efficiency of scintillation detector
PHY305.3	Ascertain range of alpha particles in air using Spark Counter.
PHY305.4	Understand the concept of signal to noise ratio and solid angle in nuclear experiments
DUV205 5	
PHI303.3	Understand the working of dipna ray spectrometer.
<i>PHY305.6</i>	Realize the particle nature of radiation through Compton scattering experiment.
PHY305.7	Observe large angle scattering of alpha particles and analyze the data.
<i>PHY305.8</i>	Calculate wavelength for the characteristic $K_{\alpha}$ and $K_{\beta}$ x-ray radiation of molybdenum
	using the data obtained from a table-top X-ray diffractometer.

- N1 Statistics using G. M. Counter.
- N2 Range of alpha particles in air using Spark Counter.
- N3 Resolving Time of G. M. Counter set-up.
- N4 Signal to noise ratio using Scintillation detector.
- N5 Thickness of Al Sheet using G. M. Counter. (b) Gamma Ray Absorption Experiment.
- N6 Study of Energy Resolution of Gamma Ray Detector as a function of  $E_{\gamma}$ .
- N7 Efficiency Determination of NaI (Tl) Detector.
- N8 Study of Alpha-Spectrometer.
- N9 Compton Scattering Experiment.
- N10 Rutherford Back Scattering Experiment.
- N11 Finding the wavelength for the characteristic  $K_{\alpha}$  and  $K_{\beta}$  x-ray radiation of molybdenum using XRD.
- N12 Solid angle dependence of nuclear counting.

## **Particle Physics**

After successful completion of the course on Physics Laboratory-III (Particle Physics) a student will be able to:

- *PHY305.1* Learn and realize the concept of high energy (GeV) interaction and production of field particles
- PHY305.2 Understand the mechanism of nuclear emulsion as a detector and target both.
- PHY305.3 Learn the concept of internuclear cascading, concept of slow and fast reaction involve in the high energy interaction
- PHY305.4 Analyze the various interaction parameters qualitatively as well as quantitatively.
- *PHY305.5 Mechanism of energy transfer of incident ion in material medium.*
- *PHY305.6* Learn aspects in radiation exposure to material for the preparation of SSNTD.
- *PHY305.7* Understand etching mechanism and statistics involve in nuclear charge particle interaction with material medium.
- *PHY305.8* Understand the relativistic kinematics in high energy interaction.

- PP1 Angular distribution of shower tracks.
- PP2 Mean Multiplicity of shower, grey and black tracks.
- PP3 In-elasticity of an interaction for shower particles.
- PP4 Momentum distribution of shower particles.
- PP5 Classification of Nuclear Interaction Star Tracks and Determination of Excitation energy.
- PP6 Nuclear Statistics using Solid State Nuclear Track Detector.
- PP7 To determine the mean free path for relativistic nucleus-nucleus interactions.
- PP8 To determine fusion to alpha branching ratio in spontaneous emission of ²⁵²Cf.
- PP9 Relativistic Kinematics.
- PP10 Exposure and etching of polymeric sample for the preparation of Solid State Nuclear Track Detector (SSNTD).

### **Computational Physics**

#### **Course Outcomes (COs)**

After successful completion of the course on Physics Laboratory-III (Computational Physics), a student will be able to:

- *PHY305.1* Develop FORTRAN programs to evaluate definite integrals by employing Simpson and Gauss quadrature methods.
- *PHY305.2* Write FORTRAN programs for interpolation and extrapolation by Lagrangian method and curve fitting through least square method.
- PHY305.3 Construct FORTRAN program to solve second order differential equations using Runge-Kutta method and apply the program to find Eigenvalues and eigen functions of a linear harmonic oscillator.
- PHY305.4 Develop FORTRAN programs to find roots of an equation of degree 1, 2 and 3 by using Bisection method.
- *PHY305.5* Write FORTAN program to solve set of Simultaneous Linear Algebraic equations by Gauss-Jordan elimination method and Illustrate Kirchhoff's laws for simple electric circuits.
- *PHY305.6* Develop FORTRAN program to find eigenvalues and eigenvectors of square matrices using power method.
- PHY305.7 Simulate the process of nuclear radioactivity through Monte Carto method by developing a FORTRAN program.
- *PHY305.8* Simulate the chaotic phenomena like damped and driven oscillator and logistic equation through FORTRAN programs.

#### List of experiments²

CP1 Numerical Integration using (a) Simpson 1/3 and (b) Gauss quadrature methods for one and two-dimensional integrals.

Application: Show that the function  $f(x) = \frac{n}{\pi} \frac{1}{1+n^2 x^2}$ 

behaves like the Dirac delta function for large n.

- CP2 Least Square fitting (Linear).
- CP3 Solution of second-order differential equation using Runge-Kutta method. Application: Eigenvalues and eigenfunctions of a linear harmonic oscillator using Runge-Kutta method.
- CP4 To find roots of an equation of degree 1, 2 and 3 by using Bisection method.
- CP5 Solution of Simultaneous Linear Algebraic equations by Gauss-Jordan elimination method.
   Application: Illustration of Kirchhoff's laws for simple electric circuits.
- CP6 Interpretation and Extrapolation by using Lagrangian method.
- CP7 Finding eigenvalues and eigenvectors of square matrices.
- CP8 Simulation of Nuclear Radioactivity by Monte Carlo Technique.
- CP9 Dynamics of logistic equations.
- CP10 Dynamics of damped driven pendulum

### Electronics

### **Course Outcomes (COs)**

After successful completion of the course on Physics Laboratory-III (Electronics), a student will be able to

<i>PHY305.1</i>	Draw and understand the effect of negative feedbacks on frequency response of a RC-coupled amplifier.
<i>PHY305.2</i>	Design and measure h-parameters of an amplifier and pulse width of a mono-stable multivibrator circuit.
PHY305.3	Design and draw V-I characteristics of a FET and determine its important parameters.
PHY305.4	Design and verify truth tables of the 8 bits D/A and A/D converters.
<i>PHY305.5</i>	Design and understand the operations of ripple counter, 4 bit shift resistor, various flip-flops and the Schmitt trigger circuit.
PHY305.6	Measure the important parameters of an OPAMP.
PHY305.7	Design different OPAMP based circuits for various practical applications.
<i>PHY305.8</i>	Understand the operation of 8085 microprocessor and its arithmetic applications.

- E1 Negative feedback Amplifiers: Measurement of gain vs. frequency
- E2 Determination of h-parameters of transistor
- E3 Monostable Multivibrator: Measurement of pulse width for various time constants
- E4 To study Ripple Counter
- E5 To study Schmitt Trigger using transistor and OPAMP
- E6 FET: Study of static drain characteristics and calculations of various parameters
- E7 To study 4 bit Shift Register
- E8 Flip-Flops: RS, Choked RS, JK, Master slave JK, D and T types
- E9 OPAMP-I: Measurement of various parameters
- E10 OPAMP-II: Applications as Adder, Subtracter, differentiator, integrator and voltage follower
- E11 To study 8085 Microprocessor and its applications
- E12 8 bit A/D converter: Verification of truth table
- E13 8 bit D/A converter: Verification of truth table

### **Material Science**

After successful completion of the course on Physics Laboratory-III (Material Science), a student will be able to:

PHY305.1	Understand four probe method for determining band gap of materials and use it to compute band gap of semiconductor material by measuring the variation in potential drop with temperature.
PHY305.2	Comprehend the concept of Hall Effect and magnetoresistance. Measure Hall coefficient and establish the type of semiconductor and measure the magneto-resistance.
РНҮ305.3	Have understanding of X-ray diffractometer and use it to record and analyze the XRD pattern of a crystalline substance using it. Further use of this technique to compute lattice parameter and Miller indices.
PHY305.4	Ascertain the magnetic nature of a given material by measuring its magnetic susceptibility.
PHY305.5	Understand dielectric materials and measure dielectric constant of given material.
<i>PHY305.6</i>	Grasp the concept of ferroelectricity and study the variation of dielectric constant with temperature for given ferroelectric material.

- PHY305.7 Learn about solar cell and measure its I-V characteristics..
- PHY305.8 Learn and measure the characteristics of a thermo-luminescent material.

- M1 Band Gap of a given semiconductor material using Four-Probe method.
- M2 Study of Hall effect.
- M3 Lattice parameter and Miller Indices using XRD.
- M4 Determination of particle size and lattice strain using XRD.
- M5 Magnetic susceptibility of hydrated copper sulfate.
- M6 Dielectric constant of a given material.
- M7 Solar cell characteristics.
- M8 Transition temperature of a ferroelectric material.
- M9 Study of the phenomenon of magneto-resistance.
- M10 Estimation of effect of sun tracking on energy generation by solar PV module.
- M11 Thermo-luminescence studies.
- M12 High temperature superconductivity experiment.

## M. Sc. Physics (Semester-IV)

## PHY 401: Advanced Quantum Mechanics

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

### **Course Outcomes (COs)**

After successful completion of the course on Electrodynamics and Plasma Physics, a student will be able to:

PHY401.1	Have knowledge of basic laws of relativistic quantum mechanics and ability to solve
	Klein-Gordan equation and Dirac equation.
PHY401.2	Understand the concept of Dirac matrices and their properties for spin half
	relativistic particles.
PHY401.3	Acquire understanding of Classical field and develop Lagrangian and Hamiltonian
	formulations for the same.
PHY401.4	Perform second quantization of a nonrelativistic field to find quantized energy and
	understand the matrix formulation of related operators.
PHY401.5	Implement second quantization of various relativistic fields to determine quantized
	energy.
PHY401.6	Establish scattering matrix using operators and represent various scattering
	processes on Feynman Diagrams.
PHY401.7	Have sound understanding of semi classical theory of radiation and check the
	validity of classical description.
<i>PHY401.8</i>	Develop theoretical understanding of emission and absorption of photons by atoms
	and find basic matrix elements for both processes.

#### Unit I: Relativistic Wave Equations (14 hrs.)

Klein-Gordan equation: Free particle, Charge and Current Densities, Electromagnetic potentials. Energy levels in a Coulomb Field (Hydrogen atom problem). Difficulties of Klein-Gordan equation. Dirac equation: Properties of the Dirac Matrices, Free particle solutions, Charge and Current Densities, Electromagnetic potentials. Dirac equation for a central field: Spin Angular Momentum, Approximate reduction; Spin-Orbit energy, Separation of the equation, The Hydrogen atom, Classification of energy levels, Negative energy States.

#### **Unit II: Field Quantization** (12 hrs.)

Lagrangian Field Theory: Canonical Quantization, Coordinates of the Field, The Classical Field Equations, Functional Derivative, Hamiltonian Formulation, Quantization of the Field, Field with more than One component, Complex Field. Non-relativistic field: Lagrangian and Hamiltonian Equations, Quantization for system of Bosons and Fermions, The N representation, Matrix representation of Creation, Annihilation and Number operators for Bosons and Fermions, Commutators and Anticommutators at Unequal Times.

#### **Unit III: Quantization of Relativistic Fields and Feynman Diagrams** (12 hrs.)

Relativistic Fields, Natural system of units, Quantization of Klein-Gordan field, Quantization of Dirac field,

Quantization of Electromagnetic fields (in vacuum): Lagrangian and Hamiltonian Equations, Quantization Procedure, Quantized field energy. Interacting fields: Feynman Diagrams, Normal product, Dyson and Wick's chronological products, Contraction of field operators, Wick's theorem, Electromagnetic Coupling, The Scattering Matrix, Representation of various Scattering processes on Feynman diagrams up to second order.

### **Unit IV: Quantum theory of Radiation** (12 hrs.)

Classical radiation field: Transversality Condition, Fourier decomposition and radiation oscillators. Creation, Annihilation and Number operators: Quantization of radiation oscillators, Photon states. Quantized Radiation Field: Photons as quantum mechanical excitations of the radiation field, Fluctuations and the uncertainty relation, Validity of the classical description. Emission and Absorption of Photons by Atoms: Basic matrix elements for emission and absorption, Time dependent perturbation theory, Spontaneous emission in dipole approximation.

- 1. Quantum Mechanics by L. I. Schiff (3rd edition)
- 2 Quantum Mechanics by V. K. Thankappan
- 3. Advanced Quantum Mechanics by J. J. Sakurai
- 4. Quantum Mechanics by A. P. Messiah
- 5. The principles of Quantum Mechanics by P. A. M. Dirac
- 6. Relativistic Quantum Mechanics by Schweber

## PHY 402: Atomic and Molecular Physics

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Atomic and Molecular Physics, a student will be able to:

PHY402.1	Have Qualitative as well as Quantitative understanding of origination of atomic physics, analysis of spectral lines
PHY402.2	Capable to understand the change in behavior of atoms in external applied electric and magnetic field on atomic spectral lines, their selection rule
PHY402.3	Construct and Analysis the rotational, vibrational and Raman spectra of molecules.
PHY402.4	Describe the basic principle and instrumentation of IR and Raman spectrometer.
PHY402.5	Understand electronic energy spectroscopy, its rule, spectral range, application in understanding the characteristic feature molecular transition.
<i>PHY402.6</i>	Grasp intensive knowledge of equipment and their working used to analyze the electronic transitions in molecule.
<i>PHY402.7</i>	Understand the theory and description of the nucleus interaction with external field and effect on their spectrum to understand the molecule.
<i>PHY402.8</i>	Understand basic principle and instrumentation of NMR and ESR spectroscopy and formulation used in these spectroscopy.

## Unit I: Atomic Physics (12 hrs.)

Qualitative description of H-atom Spectrum, Physical interpretation of quantum numbers, Pauli principle and the building-up principle, Space Quantization: Stern-Gerlach experiment, spectrum of He-atom: its quantum mechanical description and Heisenberg resonance, LS and jj Coupling, Terms for equivalent & non-equivalent electron atom, Branching rule, Normal & anomalous Zeeman effect, Stark Effect, Paschen – Back effect; Intensities of spectral lines: General selection rule; Hyperfine structure of Spectra lines: Isotope effect and effect of Nuclear Spin.

## Unit II: Molecular Physics (12 hrs.)

Rotation of molecules: Classification of molecules, Interaction of radiation with rotating molecules, Rotational spectra of rigid diatomic molecules, Isotope effect in rotational spectra, Intensity of rotational lines, Non rigid rotator, Information derived from rotational spectra; Infrared spectroscopy: The vibrating diatomic molecule, The diatomic vibrating-rotator spectra of diatomic molecules, Infrared spectrophotometer; Raman Spectroscopy: Introduction, Pure rotational Raman spectra, Vibrational Raman Spectra, Nuclear Spin and intensity alternation in Raman spectra, Isotope effect, Raman Spectrometer.

## Unit III: Electronic Spectra of diatomic molecules and Fluorescence spectroscopy (12 hrs.)

Born Oppenheimer approximation, Vibrational coarse structure of electronic bands, Progression and sequences, Intensity of electronic bands-Frank Condon Principle, Dissociation and pre-dissociation, Dissociation energy; Rotational fine structure of electronic bands, The Fortrat parabole, Electronic structure of diatomic molecules; UV-Visible Absorption spectroscopy, Lambert-Beer law, Absorption spectrometer, Fluorescence spectroscopy: Fluorescence and Phosphorescence, Kasha''s rule, Quantum Yield, Non-radiative transition, Jablonski Diagram, Spectrofluorometer, Time resolved fluorescence and determination of excited state lifetime.

## Unit IV: Resonance Spectroscopy (12 hrs.)

NMR: Basic principles, Classical and quantum mechanical description, Bloch equations, Spin-spin and spin-lattice relaxation times, Chemical shift, isotropy and anisotropy in chemical shift and coupling constant, NMR spectrometer, Experimental methods – Single coil and double coil methods, High resolution methods; ESR: Basic principles, ESR spectrometer, nuclear interaction and hyperfine structure, relaxation effects, g-factor, Characteristics, Free radical studies and biological applications.

- 1. Concepts of Modern Physics by Arthur Beiser (McGraw-Hill Book Company, 1987).
- 2. Atomic spectra & atomic structure, Gerhard Hertzberg: Dover publication, New York.
- 3. Molecular structure & spectroscopy, G. Aruldhas; Prentice Hall of India, New Delhi.
- 4. Fundamentals of molecular spectroscopy, Colin N. Banwell & Elaine M. McCash, Tata McGraw –Hill publishing company limited.
- 5. Introduction to Atomic spectra by H.E. White
- 6. Spectra of diatomic molecules by Gerhard Herzberg
- 7. Principles of fluorescence spectroscopy by Joseph R. Lakowicz

## PHY 403A: Condensed Matter Physics-II

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Condensed Matter Physics-II, a student will be able to:

- *PHY403A.1* Explicate response of band electrons to an external electric field and their scattering, and calculate currents in bands.
- *PHY403A.2* Develop a semi-classical description of electrical and thermal transport in metals using the Boltzmann approach, and explain different thermoelectric effects.
- *PHY403A.3* Distinguish nanostructures from bulk materials and learn principle of different imagining techniques for nanostructures.
- *PHY403A.4* Calculate the electronic structure of nano-scale 1D, 0D solids in effective mass approximation, and use it to explain the electrical transport in these solids.
- *PHY403A.5* Treat the electron-electron interactions in Hartree and Hartree-Fock approximations using the variational principle and apply these to calculate electronic properties of simple metals.
- PHY403A.6 Learn the concept of screening and calculate the screened potential using the Thomas-Fermi and Lindhard approaches.
- *PHY403A.7* Transform the Schrodinger equation for a many-particle system (bosons as well as fermions) to the second quantized form, and construct field operators for one- and two-body operators.
- *PHY403A.8* Apply the second-quantized method to a degenerate homogenous electron gas for calculating the first-order ground-state energy.

## Unit I: Electron Transport Phenomenon (12 hrs.)

Motion of electrons in bands and the effective mass tensor (semi-classical treatment); Currents in bands and holes; Scattering of electrons in bands (elastic, inelastic and electron-electron scatterings); The Boltzmann equation, Relaxation time *ansatz* and linearized Boltzmann equation; Electrical conductivity of metals, Temperature dependence of resistivity and Matthiesen's rule; Thermoelectric effects, Thermopower, Seebeck effect, Peltier effect, Thomson effect, The Wiedemann-Franz law.

#### Unit II: Nanostructures and Electron Transport (14 hrs.)

Nanostructures; Imaging techniques for nanostructures (principle): Electron microscopy (TEM, SEM), Optical microscopy, Scanning tunneling microscopy, Atomic force microscopy; Electronic structure of 1D systems: 1D sub-bands, Van Hove singularities; 1D metals- Coulomb interactions and lattice couplings; Electrical transport in 1D: Conductance quantization and the Landauer formula, Two barriers in series- Resonant tunneling, Incoherent addition and Ohm's law, Coherence-Localization; Electronic structure of 0D systems (Quantum dots): Quantized energy levels, Semiconductor and metallic dots, Optical spectra, Discrete charge states and charging energy; Electrical transport in 0D- Coulomb blockade phenomenon.

## **Unit III: Beyond the independent electron approximation** (12 hrs.)

The basic Hamiltonian in a solid: Electronic and ionic parts, The Born-Oppenheimer Approximation; The Hartree method, Connection with variational principle; Exchange: The Hartree-Fock approximation, Koopmans' theorem; Application of Hartree and Hartree-Fock methods to homogeneous electron gas- One-electron energy, Band width, DOS, Effective mass, Ground-state energy, Exchange energy; Concept of correlation energy; Screening in a free electron gas: The dielectric function, Thomas-Fermi theory of screening, Calculation of Lindhard response function, Lindhard theory of screening, Friedel oscillations, Frequency dependent Lindhard screening (no derivation).

## **Unit IV: Many-particle physics: Second quantization formulation** (14 hrs.)

Many-particle systems; The Schrodinger equation in first quantization, Expansion of wave function in basis of single-particle wave functions, Symmetry of expansion coefficients, Normalized symmetric and anti-symmetric wave functions; Second quantization: Transformation of Schrodinger equation to occupation number representation for bosons and fermions, Many-particle Hilbert space, and creation and destruction operators, Second-quantized Hamiltonian; Fields, Hamiltonian and number-density operators in terms of field operators; Application to degenerate homogeneous electron gas: First and second-quantized Hamiltonian operators,  $r_s$  parameter, Ground-state energy in first-order perturbation theory, Contact with the Hartree-Fock result, Exchange energy.

- 1. Solid State Physics: An Introduction to Principles of Materials Science (4th Ed.) by H. Ibach and H. Luth
- 2. Introduction to Solid State Physics (8th Ed.) by Charles Kittel
- 3. Solid State Physics by Neil W. Ashcroft and N. David Mermin
- 4. Electronic Structure of Materials by Rajendra Prasad
- 5. The Wave Mechanics of Electrons in Metals by Stanley Raimes
- 6. Electronic Structure: Basic Theory and Practical Methods by Richard M. Martin
- 7. Quantum Theory of Many-particle Systems by A. L. Fetter and J. D. Walecka
- 8. Many-body Quantum Theory in Condensed Matter Physics by H. Bruus and K. Flensberg

## PHY 403B: Nuclear Physics-II

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After completing the course on Nuclear Physics-II, a student will be able to:

- *PHY403B.1* Learn basics of nuclear liquid drop model, nuclear fission process and nuclear shell model.
- *PHY403B.2 Predict ground state properties like spin, parity, magnetic dipole moment, electric quadrupole moment of nuclei by employing nuclear shell model.*
- PHY403B.3 Understand types of multipole deformations and surface vibrations in heavy nuclei.
- *PHY403B.4* Apply nuclear collective model in predicting low lying rotational and vibrational excited states of nuclei.
- *PHY403B.5* Acquire conceptual understanding of the general theory of nuclear scattering and reactions.
- *PHY403B.6* Analyze the cross sections for compound and direct nuclear reactions.
- *PHY403B.7* Understand the key features of nuclear reactions involving weakly bound nuclei and heavy induced ion reactions.
- *PHY403B.8* Appreciate the importance of recent research activities being carried out by using beams of rare isotopes.

#### Unit I: Nuclear Models-I (12 hrs.)

Liquid drop model, Outlines of Bohr and Wheeler theory of nuclear fission, Concept of magic numbers, The properties of magic nucleus, Nuclear Shell Model, Predictions of shell closure on the basis of harmonic oscillator potential, Need of introducing spin-orbit coupling to reproduce magic numbers. Extreme single particle model and its predictions regarding ground state spin parity, magnetic moment and electric quadrupole moments.

#### Unit II: Nuclear Models-II (12 hrs.)

Nuclear surface deformations, General parameterization, Types of multipole deformations, Quadrupole deformations, Symmetries in collective space, Surface vibrations, Vibrations of a classical liquid drop, The Harmonic quadrupole oscillator, The collective angular momentum operator, The collective quadrupole operator, Quadrupole vibrational spectrum, Rotating nuclei, The rigid rotor, The symmetric rotor, The asymmetric rotor.

#### Unit III: Nuclear Reaction Theory (12 hrs.)

Nuclear reactions and cross sections, Resonance : Breit-Wigner dispersion formula for  $\ell = 0$ , Breit-Wigner dispersion formula for all values of  $\ell$ , The compound nucleus, Continuum theory of cross section , Statistical theory of nuclear reactions, Evaporation probability and cross sections for specific reactions, Kinematics of the stripping and pick-up reactions, Theory of stripping and pick-up reactions.

## Unit IV: Heavy Ion Reactions and Exotic Nuclei (12 hrs.)

Nuclear phenomena in heavy ion collisions: Coulomb excitation, Quasielastic reactions, fusion reactions, Deep inelastic reactions.

Semi classical description of scattering: Role of classical deflection function, Special features: Interference, Rainbow scattering, Glory effect, Spiral scattering, Elastic scattering of alpha particles by atomic nuclei.

Exotic nuclei: Production of rare isotopes, Breakup mechanisms of weakly bound nuclei, Halo and Borromean nuclei. Fusion mechanisms of weakly bound nuclei, Single channel description of fusion, Hill-Wheeler formula, Wong formula, barrier distribution, threshold anomaly.

- 1. R. R. Roy and B. P. Nigam, "Nuclear Physics: Theory and Experiment", Wiley Eastern Limited, 1993.
- 2. M. K. Pal, "Theory of Nuclear Structure", Affiliated East-West Press, New Delhi.
- 3. W. Greiner and J. A. Maruhn, "Nuclear Models", Springer, 1996
- 4. R. A. Broglia and A. Winther, "Heavy Ion Reactions (Lecture Notes)", Benjamin/Cummings Publishing Company, Inc., 1981
- 5. Ford and Wheeler, Annals of Physics, Vol. 7 (1959) 259.
- 6. C. A. Bertulani, M. Hussein and G Muenzenberg, "Physics of Radioactive Beams", Nova Science, NY, 2002.
- 7. L. F. Canto et al., Physics Reports, Vol. 424 (2006) 1.

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Particle Physics-II, a student will be able to:

PHY403C.1	Realize the Weak interaction, Leptons fundamentals their decay.
<i>PHY403C.2</i>	Understand the concept of Helicity, Higgs field and existence of Higgs Bosons.
PHY403C.3	Understand of the relativistic kinematics and its importance in calculations at
	relativistic energies.
PHY403C.4	Construct Analysis of the decay energy in various high energy reactions.
PHY403C.5	Understand the interaction of charge particles with matter and will be able to
	calculate the dynamics of high energy particles.
РНҮ403С.6	Learn the quantitative and qualitative analysis of Energy loss and Straggling
<i>PHY403C.7</i>	Understand radiations mechanism at relativistic velocities.
<i>PHY403C.8</i>	<i>Grasp details of particle accelerators for the creation of high energy particles will be provided.</i>

## Unit I: Weak Interactions (10 hrs.)

Classification of weak interactions- Leptonic, semi-leptonic and non-leptonic decays; Concept of Helicity. Helicity conservation, Helicity assigned to neutrino and antineutrino, Helicity assigned to other particles involved in these decays, helicity of neutrino and anti-neutrino, C-P invariance and violation in K₀ decay,  $\pi \rightarrow \mu$  and  $\pi \rightarrow e$  branching ratios and its outcome, weak decay of strange particles- selection rules for non-leptonic and semi-leptonic decays, suppression of  $\Delta S=1$  transitions in comparison to  $\Delta S=0$  transitions- Cabibbo theory, Introduction to Higg^{*}s boson.

## Unit II: Relativistic Kinematics (12 hrs.)

Lorentz transformation, Concept of 4-vector notation and its importance, Calculation of centre of mass energy for two particles colliding in lab frame, advantage of colliding beam experiments in comparison to fixed target experiments, derivation of expression to calculate threshold energy of the projectile hitting a stationary target resulting in production of additional particles (examples like  $pp \rightarrow pppp$ ,  $pp\pi$ ,  $ppk_+k_-ppk_0 k_0$ ,  $\Sigma_+k_0 p$  etc.), calculation of energies of the decay products in the rest frame of the decaying particle from the two body decay like  $A \rightarrow B+ C$ .

## **Unit III: Passage of Charged Particles Through Matter** (12 hrs.)

Ionization loss of charged particles, derivation of stopping power equation for electronic loss based on impact parameter approach, Bethe-Bloch formula (no derivation), concept of effective charge, Shell and Density effect corrections, scaling law and its importance, nuclear energy Loss, radiation loss of electrons- Bremsstrahlung process, emission of Cerenkov radiations at relativistic velocities, stopping power in compounds- Bragg"s additivity rule, concept of energy loss stragglingcollisional and charge exchange straggling.

## **Unit IV: Particle Detectors and Accelerators** (14 hrs.)

Nuclear emulsion detector- principle and mechanism for charged particle detection, nuclear emulsion as a  $4\pi$  detector, advantage of nuclear emulsion in relativistic hadron-nucleus interactions (multiplicity, momentum, energy distributions of produced particles); Solid state nuclear track detectors- principle and mechanism of detection of nuclear charged particles, Ion-explosion spike model and its predictions, restricted energy loss model for organic detectors; Basic principle of working of cloud chamber, bubble chamber, Cerenkov counter; Calorimeters- formation of electromagnetic and hadron showers; Principle of neutrino detection Accelerators: Principle and important features of Linear accelerator (LINACs), cyclic accelerator (synchrotrons): electron synchrotron, colliding beam machine, Introduction to Large Hadron collider,

- 1. Introduction to High Energy Physics (2nd and 4th edition): D. H. Perkins.
- 2. Solid State Nuclear Tracks Detection, 'Principle Methods and Applications: S. A. Durrani and
- 3. R. K. Bull.
- Nuclear Tracks in Solids: Principles and Applications (1975): R. L. Fleischer, P. B. Price and R. M. Walker.
- 5. Introduction to Particle Physics: M. P. Khanna.
- 6. Elementary Particle Physics: Yorikiyo Nagashima.
- 7. Symmetry Principles in Elementary Particle Physics: W. M. Gibson and B. R. Pollard.
- 8. Particle Physics: Anwar Kamal
- 9. Nuclear Physics and Interaction of Particles with Matter: Academician D. V. Skobel'tsyn

## PHY 404A: Computational Physics-II

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

### **Course Outcomes (COs)**

After successful completion of the course on Computation Physics-II, a student will be able to:

- *PHY404A.1* Apply various numerical methods for finding differentiation and integration appearing in physical problems.
- PHY404A.2 Find numerically double integration and integration of singular integrals.
- PHY404A.3 Solve ordinary and partial differential equations using numerical methods.
- *PHY404A.4* Understand hydrogen atom problem more conspicuously by solving the concerned Schrodinger equation numerically.
- *PHY404A.5* Understand the concept of random numbers and generate sequence of random numbers by employing various methods.
- *PHY404A.6* Apply random number sequences in the simulation of random processes like nuclear radioactivity and chaotic systems.
- PHY404A.7 Learn the fundamental concepts involved in simulation of simple physical phenomena.
- PHY404A.8 Develop algorithms to simulate physical processes like LR, LC, LCR circuits, Rutherford scattering etc.

#### Unit I: Differentiation and Integration (12 hrs.)

Differentiation: Taylor series method, Numerical differentiation using Newton's forward difference formula, Backward difference formula, Stirling's formula, Cubic splines method, Drawbacks of numerical differentiation, Integration: Trapezoidal rule, Trapezoidal rule from Lagrange linear interpolation, Simpson's 1/3 rule, Simpson's 3/8th rule, error in integration (Simpson and Trapezoidal), Gaussian Quadrature, Legendre–Gauss Quadrature, Numerical double integration, Numerical integration of singular integrals, Debye model.

#### **Unit II: Solution of Differential Equations** (12 hrs.)

Numerical solution of ordinary differential equations: Single step method, multi-step method, Taylor's series method, Euler's method, Modified Euler's method, Fourth-order Runge Kutta method, Cubic splines method; Second order differential equations: Initial and boundary value problems, Numeric solution of radial Schrodinger equation for Hydrogen atom using Fourth-order Runge-Kutta method (when eigenvalue is given), Numerical Solutions of Partial Differential Equations using Finite Difference Method, Stability of numerical methods.

### **Unit III: Random Numbers and Chaos** (12 hrs.)

Random numbers: Random sequences, Random number generators, Seeding, Mid-square methods, Multiplicative congruential method, Mixed multiplicative congruential methods, Modeling radioactive decay. Hit and miss Monte-Carlo methods, Monte-Carlo calculation of  $\pi$ , Monte-Carlo

evaluation of integration, Evaluation of multidimensional integrals; Chaotic dynamics: Some definitions, The simple pendulum, Potential energy of a dynamical system. Portraits in phase space: Undamped motion, Damped motion, Driven and damped oscillator.

Elementary probability theory, Binomial, Poisson and normal distributions, Central limit theorem.

### **Unit IV: Simulation of selected physics problems** (12 hrs.)

Algorithms and programs to simulate interference and diffraction of light, Simulation of charging and discharging of a capacitor, current in LR and LCR circuits, Computer models of LR and LCR circuits driven by sine and square functions, Computer model of Rutherford scattering experiment, Simulation of electron orbit in  $H_2$  ion.

- 1. R C Desai, Fortran Programming and Numerical methods, Tata McGraw Hill, New Delhi.
- 2. P B Patil and U. P. Verma, Numercal Computational Methods, Narosa Publishing House
- 3. M L De Jong, Introduction to Computation Physics, Addison-Wesley publishing company.
- 4. R C Verma, P K Ahluwalia and K C Sharma, Computational Physics an Introduction, New Age International Publisher.
- 5. S S Sastry Introductory methods of numerical Analysis, Prentice Hall of India Pvt. Ltd.
- 6. C Balachandra Rao and C K Santha, Numerical Methods, University Press
- 7. K E Atkinson, An introduction to numerical analysis, John Wiley and Sons.

#### PHY 404B: Electronics-II

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

### **Course Outcomes (COs)**

After successful completion of the course on Electronics-II, a student will be able to:

- *PHY404B.1* Understand the fabrication processes for devices and ICs like crystal growth, Oxidation, pattern transfer, diffusion, etching, ion-implantation and epitaxial growth.
- PHY404B.2 Gain knowledge of inter-connections, packaging and the processing of compound semiconductors.
- *PHY404B.3* Obtain a fair understanding of the steps involved in the fabrication of electronic devices like BJT, MOSFET, FET, CMOS, Schottky diodes, IC diodes, capacitors and resistances.
- PHY404B.4 Know the need of Clean rooms & their classifications.
- *PHY404B.5* Gain a fair understanding of the operation and applications of decoders, demultiplexers, multiplexers, encoders and flip-flops.
- *PHY404B.6* Comprehend the operation and applications of RAMs, ROMs, 555 IC timer, D/A and A/D converters.
- PHY404B.7 Describe the operation and important applications of half and full adders, and shift-resistors.
- *PHY404B.8 Explain operation and important applications of asynchronous and synchronous counters.*

#### **Unit I: IC Fabrication-I** (12 hrs.)

Silicon planar process, crystal growth, wafer production, thermal oxidation, high pressure oxidation, concentration enhanced oxidation, chlorine oxidation, lithography & pattern transfer, etching process, factors affecting the etching process, HF-HNO₃ system, dopant addition, ion implantation, diffusion, diffusion in concentration gradient, Fick's Laws, diffusivity variation, Segregation, chemical vapor deposition techniques.

#### Unit II: IC Fabrication-II (12 hrs.)

Epitaxial and non-epitaxial films, inter connection and packaging, compound semiconductors processing, monolithic IC technology, BJT fabrication, PNP transistor, multi-emitter Schottky transistor, superbeta transistor fabrication, fabrication of FET/NMOS enhancement as well as depletion transistors, fabrication of CMOS devices, monolithic diodes, IC resistors and capacitors, Clean rooms & their classifications.

#### **Unit III: Digital electronics** (12 hrs.)

QM method for the simplification of Boolean functions (upto 4 variables), Decoder, Demultiplexer, Multiplexer and Encoder. Flip-flops: RS, JK, master-slave-JK, D-Type and T-type flip-flops, ROM and its applications in look-up tables, sequence generator, seven-segment display, character generator and combinational logic, programmable ROM (PROM) and erasable PROM (EPROM), random access memory (RAM), D/A Converters: weighted resister, R-2R ladder, A/D converter; the 555 IC timer as mono and astable multivibrators.

#### **Unit IV: Combinational logic design** (12 hrs.)

Half adders, full adders and their use as substractors, shift resistor, applications of shift registers as digital

delay line, serial-to-parallel converter, parallel-to-serial converter, ring counter, twisted ring counter, sequence generator; ripple (asynchronous) counters: up-down counter, divided-by-N counter, synchronous counter design, up-down synchronous counter with parallel carry, Asynchronous versus synchronous sequential circuits, Applications of counters.

- 1. Integrated Electronics by J Millman & CC Halkias.
- 2. Theory and Application of Micro Electronics by SK Gandhi.
- 3. Micro Electronics by J Millman & A Grabel.
- 4. Digital Computer Electronics by AP Malvino.
- 5. Device Electronics for Integrated Circuits by RS Muller & TI Kamins.
- 6. VLSI Fabrication Principal & Practice by SK Gandhi.
- 7. Semiconductor Devices Physics & Technology by SM Sze.
- 8. Modern Digital Electronics by RP Jain
- 9. Introduction to semiconductor Materials and Devices by MS Tyagi

## PHY 404C: Material Science-II

Credit: 4 Max. Marks: 60+20 Time: 3 Hours

**Note:** Nine questions will be set and students will attempt five questions. Question No. 1 will be compulsory and will consist of 4-6 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be four units in the question paper with each unit consisting of two questions taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks. Each question will carry 12 marks.

## **Course Outcomes (COs)**

After successful completion of the course on Material Science-II, a student will be able to:

- PHY404C.1 Comprehend various tests (Tension test, hardness tests, Impact test, fatigue test, creep test) used for measuring the mechanical properties of materials
- PHY404C.2 Realize the difference between strength and hardness of materials. Compute various strength and ductility measures from engineering stress-strain curve and true stress-strain curves
- *PHY404C.3* Understand magnetic processes, Diamagnetism, Paramagnetism, density of states curves for a metal;
- PHY404C.4 Grasp the concepts of Ferromagnetism, exchange interactions, domain structure; Antiferromagnetism, Ferrimagnetism and Ferrites
- *PHY404C.5* Elucidate the physics describing dielectrics and ferroelectric materials, with focus on the functionality.
- *PHY404C.6 Describe the optical properties of insulators*
- *PHY404C.7* Understanding of the surface and concepts of salvage depth.
- *PHY404C.8* Grasp the concept, working and applications of different electron and photon based surface analysis techniques.

## **Unit I: Material Testing** (12 hrs.)

The Tension Test: engineering stress-strain curve, true stress-strain curve, instability in tension, Considere's construction, ductility measurement, effect of strain rate on flow properties, strain rate sensitivity; notch tensile test; The Hardness Test: Brinell hardness, Meyer hardness, Vicker's hardness number and test, Rockwell hardness test, Knoop hardness number and test; The Impact Test: brittle fracture problem, notched bar impact tests-Carpy and Izod Impact tests; The Fatigue Test: fatigue failures, stress cycles, the S-N curve, fatigue limit; The Creep Test: creep curve, primary, secondary and tertiary creep, effect of temperature and stress on the creep curve.

## **Unit II: Magnetic Materials** (12 hrs.)

Magnetic Processes: Larmor frequency; Diamagnetism, magnetic susceptibility, Langevin's diamagnetism equation; Paramagnetism, Curie constant, density of states curves for a metal; Ferromagnetism, Curie temperature, Curie-Weiss law, exchange interactions, domain structure; Antiferromagnetism and magnetic susceptibility of an antiferromagnetic material; Ferrimagnetism and Ferrites; Paramagnetic, ferromagnetic and cyclotron-resonance.

## **Unit III: Dielectric, Optical and Ferroelectric Materials** (12 hrs.)

Introduction, Energy bands, dielectric constant, complex permittivity, dielectric loss factor, polarization, mechanism of polarization, classification of dielectrics-frequency dependence of

dielectric constant; Optical Phenomena in Insulators Colour of crystals - Excitons - weakly bound and tightly bound excitons. Colour centers – F-centers and other electronic centers in alkali halides. Ferroelectrics: General characteristics - piezoelectric, pyroelectric and ferroelectric materials . Classification of ferroelectrics and representative materials. Ferroelectric domains. polarization catastrophe, Landau theory of first and second-order phase transitions, Antiferroelectric materials

## Unit IV: Solid Surfaces and Analysis (12 hrs.)

Surface and its importance, selvedge depths of surface; Methods of Surface Analysis: Auger Electron spectroscopy (AES)- basic principle, methodology, composition analysis and depth profiling; X-ray photoelectron spectroscopy (XPS) or ESCA: principle, methodology and quantitative analysis; Glancing angle X-ray Diffraction (GXRD), basic concept, methodology and structural analysis; Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM): Principle, methodology and Applications in surface analysis; Atomic Force Microscopy (AFM): Basic principle, Methodology, applications in structural analysis.

- 1. Material Science, J.C. Anderson, K.D. Leaver, J. M. Alexander and R. D. Rawlings
- 2. Mechanical Metallurgy, G.E. Dieter.
- 3. Electronic Processes in Materials, L. V. Azaroff and J. J. Brophy
- 4. Fundamentals of Surface and Thin Film Analysis, L.C. Feldman and J. W. Mayer
- 5. Surface Analysis Methods in Material Science, D. J. O'Connor, B. A. Sexton and R. St. C Smart (Eds), Springer Series in Surface Sciences 23
- 6. Solid State Physics A J Dekker (McMillan, 1971)
- 7. Materials Science and Engineering by William D. Callister

## PHY 405: Physics Laboratory-IV

Credit:8 Max. Marks: 120+40 Time: 5 Hours

**Note:** Unlike the M. Sc. First Year Laboratory, experiments in the Final Year Laboratory are based upon six different specializations. In this course, students shall complete at least seven experiments from the second specialization. Course outcomes, pattern of evaluation and list of specialization-wise experiments is already given in the course PHY 305. Students opting for project will be evaluated on the basis of project report (60 marks) and Project Presentation cum viva-voce (60 marks) by a committee consisting of project supervisor, one internal faculty member as nominated by the Chairperson and an external expert as nominated by PGBOS while the component of internal assessment (40 marks) in the project shall be assessed by the respective project supervisor.

## PHY 406: Seminar

**Note:** Each student will deliver one seminar on the topic to be allotted by the departmental seminar committee in both  $1^{st}$  and  $2^{nd}$  year of the M. Sc. Physics Course as per the schedule drawn in the beginning of each year. The marks will be awarded by the seminar committee on the basis of performance in the seminar and the seminar report submitted by the student.

### **Course Outcomes (COs)**

After successful completion of the course on seminar a student will be able to:

PHY406.1	Achieve effective communication skills.
PHY406.2	Understand the concepts involved in the topic of seminar.
PHY406.3	Acquire skills for working in team.
PHY406.4	Develop confidence for facing audience.
PHY406.5	Learn to write effectively a report on a particular topic.
PHY406.6	Know the techniques of responding to the questions posed by audience.
PHY406.7	Enhance the presentation abilities.
PHY406.8	Improve interpersonal skills.

## **OE-208: Elements of Nano Science and Nano Technology**

Credit:2 Max. Marks: 35+15 Time: 1:30 Hours

**Note:** Five questions will be set and students will attempt three questions. Question No. 1 will be compulsory and comprise 7 marks; it will consist of 3-5 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be two units in the question paper with each unit consisting of two questions of 14 marks each taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks.

### **Course Outcomes (COs)**

After successful completion of the course on Elements of Nano Science and Nano Technology, a student will be able to:

OE208.1	Understand the basics of nanoscience.
OE208.2	Describe the various techniques to fabricate nanostructure.
OE208.3	Comprehend the principles and working of characterization tools for analyses of
OE208.4	Grasp the concepts of various physical properties of nanostructures.

## UNIT I

Introduction to Nanomaterials: Bottom up and Top Down approach, Classification of nanostructures: Zero dimension, one dimension and two dimensional nanostructures, Smart materials.

Nanostructure fabrication by Physical Methods: Physical Vapor deposition: evaporation, Molecular beam epitaxy, sputtering, comparison of evaporation and sputtering, Lithography: Photolithography, Electron Beam Lithography, X-ray lithography

## UNIT II

Structural characterization: X-ray diffraction, small angle X-ray scattering, Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, Scanning Tunneling Microscopy, Spectroscopic Techniques: UV-Visible Spectroscopy, Photo-luminescence spectroscopy, Infra-red spectroscopy, Raman Spectroscopy,

Physical properties of nanomaterials: Melting points and lattice constants, Mechanical properties, Optical properties, Electrical conductivity, Superparamagnetism

- 1. Introduction to Nanotechnology Charles P. Poole Jr. and Frank J. Owens, Wiley India Pvt. Ltd., 2007.
- 2. Nanomaterials Guozhong Cao, Imperial College Press, 2004.

## **OE-308: Radiation Physics**

Credit:2 Max. Marks: 35+15 Time: 1:30 Hours

**Note:** Five questions will be set and students will attempt three questions. Question No. 1 will be compulsory and of 7 marks; it will consist of 3-5 conceptual questions uniformly distributed over the whole syllabus. In addition to Question No. 1, there will be two units in the question paper with each unit consisting of two questions of 14 marks each taken from the corresponding units of the syllabus. Students will select one question from each unit. The question paper is expected to contain problems to the extent of 20% of total marks.

After successful completion of the course on Radiation Physics, a student will be able to:

OE308.1 Understand about various sources of radiation.
OE308.2 Describe units used for measuring radiation.
OE308.3 Comprehend the biological effects of radiation exposure.
OE308.4 Realize the importance of radiation protection and safe disposal of radioactive

## UNIT – I

Radiation and need for its measurement, Physical features of radiation, Conventional sources of radiation.

Exposure to natural radiation: external to the body, Radiation from cosmic rays and solar radiation, Internal exposure to the body, Radioactivity arising from technological development: Possible health hazards from nuclear and laser radiations

Maximum permissible level of radiation. Radiation quantities and units of energy flux, energy fluence, cross-section.

## UNIT – II

Biological effects of radiation: Dose - response characteristics, Direct and indirect action, Acute effects, Delayed effects, Cumulative effect, Accidental exposure, Radiation induced chemical changes in tissues, Radiation protection procedures (diagnostics and therapy).

Basic radiation safety criteria, Protection from direct radiation, Energy deposition, Effect of distance and shielding, Protection from contamination, Preparation of a safe radiation area,

Radioactive waste disposal and management: Type of radioactive waste, Airborne waste, Solid and liquid waste, Assessment of Hazard.

- 1. Introduction to Radiobiology and Radiation Dosimetery F.H. Aurix, John Wiley.
- 2. Techniques of Radiation Dosimetery Eds K. Mahesh and DR Vij Wiley Eastern Limited.
- 3. Nuclear Energy Raymond L. Murray Pergamon Press, N.Y.

Mapping: Mapping is a process of representing the correlation between COs and POs, Cos and PSOs in the scale of 1 to 3 as follows (Table-1)

## Table -1: Scale of mapping between COs and POs

Scale	
1	If the content of the course have low correlation ( i.e. in agreement with the
	particular PO to a small extent) with the particular program outcome.
2	If the contents of course have medium correlation ( i.e. in agreement with the
	particular PO to a reasonable extent) with the particular program outcome.
3	If the contents of course have strong correlation ( i.e. in agreement with the
	particular PO to a large extent) with the particular program outcome.

Same scale has been used to define the correlation between COs and PSOs

## **CO-PO mapping Matrices**

COs #	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	<b>PO9</b>	PO10	PO11
PHY101.1	3	2	2	3	2	2	2	2	3	3	2
PHY101.2	3	2	2	3	2	2	2	2	3	3	2
PHY101.3	3	2	2	3	2	2	2	2	3	3	2
PHY101.4	3	2	2	3	2	2	2	2	3	3	2
PHY101.5	3	2	2	3	2	2	2	2	3	3	2
PHY101.6	3	2	2	3	2	2	2	2	3	3	2
PHY101.7	3	2	2	3	2	2	2	2	3	3	2
PHY101.8	3	2	2	3	2	2	2	2	3	3	2
Average	3	2	2	3	2	2	2	2	3	3	2

## **<u>CO-PO matrix for the course PHY101 (Mathematical Physics)</u>**

## **<u>CO-PO matrix for the course PHY102 (Classical Mechanics)</u>**

COs #	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY102.1	3	2	3	3	2	2	2	2	3	3	3
PHY102.2	3	2	3	3	2	2	2	2	3	3	3
PHY102.3	3	2	3	3	2	2	2	2	3	3	3
PHY102.4	3	2	3	3	2	2	2	2	3	3	3
PHY102.5	3	2	3	3	2	2	2	2	3	3	3
PHY102.6	3	2	3	3	2	2	2	2	3	3	3
PHY102.7	3	2	3	3	2	2	2	2	3	3	3
<b>PHY102.8</b>	3	2	3	3	2	2	2	2	3	3	3
Average	3	2	3	3	2	2	2	2	3	3	3

COs #	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	<b>PO9</b>	<b>PO10</b>	PO11
PHY103.1	3	3	2	3	2	2	2	1	2	2	1
PHY103.2	3	2	2	3	2	2	2	1	2	2	1
PHY103.3	3	2	2	3	2	2	2	1	2	2	1
PHY103.4	3	3	2	3	2	1	2	1	2	2	1
PHY103.5	3	2	2	3	2	1	2	1	2	2	1
PHY103.6	3	2	2	3	2	1	2	1	2	2	1
PHY103.7	3	3	2	3	2	2	2	1	2	2	1
PHY103.8	3	2	2	3	2	2	2	1	2	2	1
Average	3	2.38	2	3	2	1.63	2	1	2	2	1

## **<u>CO-PO matrix for the course PHY 103 (Quantum Mechanics-I)</u></u>**

# **<u>CO-PO matrix for the course PHY:104 (Electronics Devices and Circuits-I)</u></u>**

COs #	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	<b>PO9</b>	<b>PO10</b>	PO11
PHY104.1	3	2	3	3	2	3	3	3	3	2	3
PHY104.2	3	2	3	3	2	3	3	3	3	2	3
PHY104.3	3	2	3	3	2	3	3	3	3	2	3
PHY104.4	3	2	3	3	2	3	3	3	3	2	3
PHY104.5	3	2	3	3	2	3	3	3	3	2	3
PHY104.6	3	2	3	3	2	3	3	3	3	2	3
PHY104.7	3	2	3	3	2	3	3	3	3	2	3
PHY104.8	3	2	3	3	2	3	3	3	3	2	3
Average	3	2	3	3	2	3	3	3	3	2	3

## **<u>CO-PO matrix for the course PHY:105 (Physics Laboratory-I)</u></u>**

COs #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PHY105.1	3	2	3	3	2	3	3	3	3	2	3
PHY105.2	3	2	3	3	2	3	3	3	3	2	3
PHY105.3	3	2	3	3	2	3	3	3	3	2	3
PHY105.4	3	2	3	3	2	3	3	3	3	2	3
PHY105.5	3	2	3	3	2	3	3	3	3	2	3
PHY105.6	3	2	3	3	2	3	3	3	3	2	3
PHY105.7	3	2	3	3	2	3	3	3	3	2	3
PHY105.8	3	2	3	3	2	3	3	3	3	2	3
Average	3	2	3	3	2	3	3	3	3	2	3

COs #	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
PHY201.1	3	3	2	3	2	2	3	1	2	2	2
PHY201.2	3	2	2	3	2	1	2	1	2	2	2
PHY201.3	3	2	2	3	2	1	2	1	2	2	2
PHY201.4	3	3	2	3	2	2	3	1	2	2	2
PHY201.5	3	3	2	3	2	2	3	1	2	2	2
PHY201.6	3	2	2	3	2	2	2	1	2	2	2
PHY201.7	3	3	2	3	2	2	3	1	2	2	2
PHY201.8	3	2	2	3	2	1	1	1	2	2	2
Average	3	2.5	2	3	2	1.63	2.38	1	2	2	2

## **<u>CO-PO matrix for the course PHY 201 (Quantum Mechanics-II)</u></u>**

# **<u>CO-PO matrix for the course PHY202 (Nuclear and Particle Physics)</u>**

COs #	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY202.1	3	3	3	2	2	3	3	3	3	2	2
PHY202.2	3	3	3	3	2	3	3	3	3	2	2
PHY202.3	3	3	2	2	2	3	2	2	3	2	2
PHY202.4	3	3	2	3	2	3	3	2	3	2	1
PHY202.5	3	3	3	2	2	3	2	2	3	2	2
PHY202.6	3	3	3	3	2	3	2	3	3	2	2
PHY202.7	3	3	3	3	2	3	2	2	3	-	-
PHY202.8	3	3	2	3	2	3	2	2	3	-	-
Average	3	3	2.62	2.62	2	3	2.37	2.38	3	2	1.83

## **<u>CO-PO matrix for the course PHY 203 (Solid State Physics)</u>**

COs #	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY203.1	3	3	2	3	2	3	2	1	1	2	2
PHY203.2	3	3	2	3	2	3	2	1	1	2	2
PHY203.3	3	3	2	2	2	3	2	1	1	2	2
PHY203.4	3	2	2	2	2	2	2	1	1	2	2
PHY203.5	3	3	2	3	2	3	2	1	1	2	2
PHY203.6	3	2	2	2	2	2	2	1	1	2	2
PHY203.7	3	2	2	2	2	2	2	1	1	2	2
PHY203.8	3	2	2	2	2	2	2	1	1	2	2
Average	3	2.5	2	2.38	2	2.5	2	1	1	2	2

COs #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PHY204.1	3	2	3	3	2	3	3	3	3	2	3
PHY204.2	3	2	3	3	2	3	3	3	3	2	3
PHY204.3	3	2	3	3	2	3	3	3	3	2	3
PHY204.4	3	2	3	3	2	3	3	3	3	2	3
PHY204.5	3	2	3	3	2	3	3	3	3	2	3
PHY204.6	3	2	3	3	2	3	3	3	3	2	3
PHY204.7	3	2	3	3	2	3	3	3	3	2	3
PHY204.8	3	2	3	3	2	3	3	3	3	2	3
Average	3	2	3	3	2	3	3	3	3	2	3

# **<u>CO-PO matrix for the course PHY:204 (Electronics Devices and Circuits-II)</u></u>**

# **<u>CO-PO matrix for the course PHY:205(Physics Laboratory-II)</u></u>**

COs #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PHY205.1	3	2	3	3	2	3	3	3	3	2	3
PHY205.2	3	2	3	3	2	3	3	3	3	2	3
PHY205.3	3	2	3	3	2	3	3	3	3	2	3
PHY205.4	3	2	3	3	2	3	3	3	3	2	3
PHY205.5	3	2	3	3	2	3	3	3	3	2	3
PHY205.6	3	2	3	3	2	3	3	3	3	2	3
PHY205.7	3	2	3	3	2	3	3	3	3	2	3
PHY205.8	3	2	3	3	2	3	3	3	3	2	3
Average	3	2	3	3	2	3	3	3	3	2	3

## CO-PO matrix for the course PHY 206 (Seminar)

COs #	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	<b>PO9</b>	<b>PO10</b>	PO11
PHY206.1	3	2	3	2	3	2	3	3	3	3	3
PHY206.2	3	2	3	2	3	2	3	3	3	3	3
PHY206.3	3	2	3	2	3	2	3	3	3	3	3
PHY206.4	3	2	3	2	3	2	3	3	3	3	3
PHY206.5	3	2	3	2	3	2	3	3	3	3	3
PHY206.6	3	2	3	2	3	2	3	3	3	3	3
PHY206.7	3	2	3	2	3	2	3	3	3	3	3
PHY206.8	3	2	3	2	3	2	3	3	3	3	3
Average	3	2	3	2	3	2	3	3	3	3	3

COs#.	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11
PHY301.1	3	2	3	3	2	2	3	2	3	3	3
PHY301.2	3	2	3	3	2	2	3	2	3	3	3
PHY301.3	3	2	3	3	2	2	3	2	3	3	3
PHY301.4	3	2	3	3	2	2	3	2	3	3	3
PHY301.5	3	2	3	3	2	2	3	2	3	3	3
PHY301.6	3	2	3	3	2	2	3	2	3	3	3
PHY301.7	3	2	3	3	2	2	3	2	3	3	3
PHY301.8	3	2	3	3	2	2	3	2	3	3	3
Average	3	2	3	3	2	2	3	2	3	3	3

# **<u>CO-PO matrix for the course PHY301 (Electrodynamics and Plasma Physics)</u>**

# **<u>CO-PO matrix for the course PHY 302 (Statistical Mechanics)</u>**

COs #	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11
PHY302.1	3	3	3	3	3	3	2	3	3	2	3
PHY302.2	3	3	3	3	2	3	2	3	3	2	3
PHY302.3	3	3	3	3	2	3	2	2	3	2	2
PHY302.4	3	3	3	3	2	3	2	2	3	2	2
PHY302.5	3	3	2	3	2	3	2	2	3	2	3
PHY302.6	3	3	2	3	2	3	2	2	3	2	2
PHY302.7	3	3	2	3	2	3	2	2	3	2	2
PHY302.8	3	3	2	3	1	3	2	2	3	2	1
Average	3	3	2.5	3	2	3	2	2.25	3	2	2.25

# CO-PO matrix for the course PHY 303A (Condensed Matter Physics-I)

COs #	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY303A.1	3	2	2	2	2	2	2	1	1	2	2
PHY303A.2	3	3	2	2	2	3	2	1	1	2	2
PHY303A.3	3	2	2	3	2	2	2	1	1	2	2
PHY303A.4	3	3	2	2	2	3	2	1	1	2	2
PHY303A.5	3	2	2	2	2	2	2	1	1	2	2
PHY303A.6	3	2	2	2	2	2	2	1	1	2	2
PHY303A.7	3	3	2	3	2	2	2	1	1	2	2
PHY303A.8	3	2	2	3	2	2	2	1	1	2	2
Average	3	2.38	2	2.38	2	2.25	2	1	1	2	2

COs#	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	PO9	PO10	PO11
PHY303B.1	3	3	3	2	2	3	3	3	3	2	3
PHY303B.2	3	3	3	3	2	3	3	3	3	2	3
PHY303B.3	3	3	2	2	2	3	3	3	3	2	3
PHY303B.4	3	3	2	3	2	3	3	2	3	2	3
PHY303B.5	3	3	3	2	2	3	3	3	3	2	3
PHY303B.6	3	3	3	3	2	3	3	3	3	2	3
PHY303B.7	3	3	3	3	2	3	1	2	3	2	2
PHY303B.8	3	3	2	3	2	3	1	2	3	2	1
Average	3	3	2.62	2.62	2	3	2.5	2.67	3	2	2.67

CO-PO matrix for the course PHY303B (Nuclear Physics-I)

# CO-PO matrix for the course PHY 303C (Particle Physics-I)

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PHY303C.1	3	3	3	3	3	3	3	3	2	2	3
PHY303C.2	3	3	3	3	2	3	2	2	2	2	3
РНУ303С.3	3	3	3	3	2	3	2	2	2	2	3
РНУ303С.4	3	3	3	3	2	3	2	2	3	2	3
PHY303C.5	3	3	3	3	2	3	2	2	2	2	3
PHY303C.6	3	3	3	3	2	3	2	2	2	2	3
PHY303C.7	3	3	3	3	2	3	2	2	2	2	3
PHY303C.8	3	3	3	3	2	3	1	1	2	2	3
Average	3	3	3	3	2.17	3	2	2.17	2.17	2	3

# **<u>CO-PO matrix for the course PHY304A (Computational Physics-I)</u></u>**

COs#.	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11
PHY304A.1	3	2	2	3	2	2	2	2	3	3	1
PHY304A.2	3	2	2	3	2	2	2	2	3	3	1
PHY304A.3	3	2	2	3	2	2	2	2	3	3	1
PHY304A.4	3	2	2	3	2	2	2	2	3	3	1
PHY304A.5	3	2	2	3	2	2	2	2	3	3	1
PHY304A.6	3	2	2	3	2	2	2	2	3	3	1
PHY304A.7	3	2	2	3	2	2	2	2	3	3	1
PHY304A.8	3	2	2	3	2	2	2	2	3	3	1
Average	3	2	2	3	2	2	2	2	3	3	1

CO-PO matrix for the course PHY304B (Electronics-I)

COs#	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY304B.1	3	2	3	3	2	3	3	3	3	2	3
PHY304B.2	3	2	3	3	2	3	3	3	3	2	3
PHY304B.3	3	2	3	3	2	3	3	3	3	2	3
PHY304B.4	3	2	3	3	2	3	3	3	3	2	3
PHY304B.5	3	2	3	3	2	3	3	3	3	2	3
PHY304B.6	3	2	3	3	2	3	3	3	3	2	3
PHY304B.7	3	2	3	3	2	3	3	3	3	2	3
PHY304B.8	3	2	3	3	2	3	3	3	3	2	3
Average	3	2	3	3	2	3	3	3	3	2	3

# CO-PO matrix for the course PHY 304C (Material Science-I)

COs#	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY304C.1	3	3	3	3	3	3	3	3	3	2	3
PHY304C.2	3	3	3	3	3	3	3	3	3	2	3
PHY304C.3	3	2	3	3	2	3	3	3	3	2	3
PHY304C.4	3	2	3	3	2	3	3	3	3	2	3
PHY304C.5	3	2	3	2	2	3	3	3	3	2	2
PHY304C.6	3	2	3	2	2	3	3	3	3	2	2
PHY304C.7	3	3	3	3	3	3	3	3	3	2	3
PHY304C.8	3	3	3	3	3	3	3	3	3	2	3
Average	3	2.5	3	2.75	2.5	3	3	3	3	2	2.75

## CO-PO matrix for the course PHY 305 (Physics Laboratory-III)

COs#	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY305.1	3	3	2	2	2	3	3	2	2	2	1
PHY305.2	3	3	2	2	2	3	3	2	2	2	1
PHY305.3	3	3	2	2	2	3	3	2	2	2	1
PHY305.4	3	3	2	2	2	3	3	2	2	2	1
PHY305.5	3	3	2	2	2	3	3	2	2	2	1
PHY305.6	3	3	2	2	2	3	3	2	2	2	1
PHY305.7	3	3	2	2	2	3	3	2	2	2	1
PHY305.8	3	3	2	2	2	3	3	2	2	2	1
Average	3	3	2	2	2	3	3	2	2	2	1
COs #	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11
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PHY401.1	3	2	3	3	2	2	3	2	3	3	2
PHY401.2	3	2	3	3	2	2	3	2	3	3	2
PHY401.3	3	2	3	3	2	2	3	2	3	3	2
PHY401.4	3	2	3	3	2	2	3	2	3	3	2
PHY401.5	3	2	3	3	2	2	3	2	3	3	2
PHY401.6	3	2	3	3	2	2	3	2	3	3	2
PHY401.7	3	2	3	3	2	2	3	2	3	3	2
PHY401.8	3	2	3	3	2	2	3	2	3	3	2
Average	3	2	3	3	2	2	3	2	3	3	2

## **<u>CO-PO matrix for the course PHY401 (Advanced Quantum Mechanics)</u>**

### **<u>CO-PO matrix for the course PHY 402 (Atomic and Molecular Physics)</u>**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11
PHY402.1	3	3	3	3	3	3	2	3	2	3	3
PHY402.2	3	3	3	3	3	3	2	3	2	3	3
PHY402.3	3	3	3	3	3	3	2	3	2	3	2
PHY402.4	3	3	3	3	3	3	3	3	2	2	2
PHY402.5	3	3	3	3	3	3	3	3	2	2	2
PHY402.6	3	3	3	3	3	3	2	3	2	2	3
PHY402.7	3	3	3	3	3	3	2	3	2	2	2
PHY402.8	3	3	3	3	3	3	2	3	2	2	2
Average	3	3	3	3	3	3	2.25	3	2	2.37	2.37

### CO-PO matrix for the course PHY 403A (Condensed Matter Physics-II)

COs#	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY403A.1	3	3	2	3	2	3	2	1	1	2	2
PHY403A.2	3	3	2	3	2	3	2	1	1	2	2
PHY403A.3	3	3	2	2	2	3	2	1	1	2	2
PHY403A.4	3	3	2	3	2	2	2	1	1	2	2
PHY403A.5	3	3	2	3	2	3	2	1	1	2	2
PHY403A.6	3	2	2	2	2	2	2	1	1	2	2
PHY403A.7	3	3	2	3	2	2	2	1	1	2	2
PHY403A.8	3	2	2	2	2	2	2	1	1	2	2
Average	3	2.75	2	2.63	2	2.5	2	1	1	2	2

COs#.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PHY403B.1	3	3	2	3	2	3	2	2	3	3	1
PHY403B.2	3	3	2	3	2	3	2	2	3	3	1
PHY403B.3	3	3	2	3	2	3	2	2	3	3	1
PHY403B.4	3	3	2	3	2	3	2	2	3	3	1
PHY403B.5	3	3	2	3	2	3	2	2	3	3	1
PHY403B.6	3	3	2	3	2	3	2	2	3	3	1
PHY403B.7	3	3	2	3	2	3	2	2	3	3	1
PHY403B.8	3	3	2	3	2	3	2	2	3	3	1
Average	3	3	2	3	2	3	2	2	3	3	1

### **<u>CO-PO matrix for the course PHY403B (Nuclear Physics-II)</u></u>**

## CO-PO matrix for the course PHY403C (Particle Physics-II)

COs#	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	<b>PO11</b>
PHY403C.1	3	3	3	3	3	3	3	3	2	2	2
PHY403C.2	3	3	3	3	3	3	3	3	2	2	2
PHY403C.3	3	3	3	3	3	2	3	2	2	2	2
PHY403C.4	3	3	3	3	3	2	2	2	2	2	2
PHY403C.5	3	3	3	3	3	2	2	2	2	2	2
PHY403C.6	3	3	3	3	3	2	2	2	2	2	2
PHY403C.7	3	3	3	3	3	2	2	2	2	2	2
PHY403C.8	3	3	3	3	3	1	2	2	2	2	2
Average	3	3	3	3	3	2.12	2.37	2.25	2	2	2

## **<u>CO-PO matrix for the course PHY404A (Computational Physics-II)</u></u>**

COs#	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	PO7	PO8	PO9	PO10	PO11
PHY404A.1	3	2	2	3	2	2	2	1	3	3	1
PHY404A.2	3	2	2	3	2	2	2	1	3	3	1
PHY404A.3	3	2	2	3	2	2	2	1	3	3	1
PHY404A.4	3	2	2	3	2	2	2	1	3	3	1
PHY404A.5	3	2	2	3	2	2	2	1	3	3	1
PHY404A.6	3	2	2	3	2	2	2	1	3	3	1
PHY404A.7	3	2	2	3	2	2	2	1	3	3	1
PHY404A.8	3	2	2	3	2	2	2	1	3	3	1
Average	3	2	2	3	2	2	2	1	3	3	1

COs#	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY404B.1	3	2	3	3	2	3	3	3	3	2	3
PHY404B.2	3	2	3	3	2	3	3	3	3	2	3
PHY404B.3	3	2	3	3	2	3	3	3	3	2	3
PHY404B.4	3	2	3	3	2	3	3	3	3	2	3
PHY404B.5	3	2	3	3	2	3	3	3	3	2	3
PHY404B.6	3	2	3	3	2	3	3	3	3	2	3
PHY404B.7	3	2	3	3	2	3	3	3	3	2	3
PHY404B.8	3	2	3	3	2	3	3	3	3	2	3
Average	3	2	3	3	2	3	3	3	3	2	3

# CO-PO matrix for the course PHY:404B (Electronics-II)

## CO-PO matrix for the course PHY404C (Material Science-II)

COs#	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	<b>PO10</b>	PO11
PHY404C.1	3	3	3	3	3	3	3	3	3	2	3
PHY404C.2	3	3	3	3	3	3	3	3	3	2	3
PHY404C.3	3	2	3	3	2	3	3	3	3	2	3
PHY404C.4	3	2	3	3	2	3	3	3	3	2	3
PHY404C.5	3	2	3	2	2	3	3	3	3	2	3
PHY404C.6	3	2	3	2	2	3	3	3	3	2	3
PHY404C.7	3	3	3	3	3	3	3	3	3	2	3
PHY404C.8	3	3	3	3	3	3	3	3	3	2	3
Average	3	2.5	3	2.75	2.5	3	3	3	3	2	3

### CO-PO matrix for the course PHY 405 (Physics Laboratory-III)

COs#	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY405.1	3	3	2	2	2	3	3	2	2	2	1
PHY405.2	3	3	2	2	2	3	3	2	2	2	1
PHY405.3	3	3	2	2	2	3	3	2	2	2	1
PHY405.4	3	3	2	2	2	3	3	2	2	2	1
PHY405.5	3	3	2	2	2	3	3	2	2	2	1
PHY405.6	3	3	2	2	2	3	3	2	2	2	1
PHY405.7	3	3	2	2	2	3	3	2	2	2	1
PHY405.8	3	3	2	2	2	3	3	2	2	2	1
Average	3	3	2	2	2	3	3	2	2	2	1

COs#	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY406.1	3	2	3	2	3	2	3	3	3	3	3
PHY406.2	3	2	3	2	3	2	3	3	3	3	3
PHY406.3	3	2	3	2	3	2	3	3	3	3	3
PHY406.4	3	2	3	2	3	2	3	3	3	3	3
PHY406.5	3	2	3	2	3	2	3	3	3	3	3
PHY406.6	3	2	3	2	3	2	3	3	3	3	3
PHY406.7	3	2	3	2	3	2	3	3	3	3	3
PHY406.8	3	2	3	2	3	2	3	3	3	3	3
Average	3	2	3	2	3	2	3	3	3	3	3

CO-PO matrix for the course PHY 406 (Seminar)

### **CO-PSO Mapping Matrices**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY101.1	3	2	2	2	3
PHY101.2	3	2	2	2	3
PHY101.3	3	2	2	2	3
PHY101.4	3	2	2	2	3
PHY101.5	3	2	2	2	3
PHY101.6	3	2	2	2	3
PHY101.7	3	2	2	2	3
PHY101.8	3	2	2	2	3
Average	3	2	2	2	3

## **<u>CO-PSO matrix for the course PHY101 (Mathematical Physics)</u>**

## **CO-PSO matrix for the course PHY102 (Classical Mechanics)**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY102.1	3	2	2	3	3
PHY102.2	3	2	2	3	3
PHY102.3	3	2	2	3	3
PHY102.4	3	2	2	3	3
PHY102.5	3	2	2	3	3
PHY102.6	3	2	2	3	3
PHY102.7	3	2	2	3	3
PHY102.8	3	2	2	3	3
Average	3	2	2	3	3

### **<u>CO-PSO matrix for the course PHY 103 (Quantum Mechanics-I)</u></u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY103.1	3	3	1	3	3
PHY103.2	3	3	1	2	2
PHY103.3	3	3	1	2	3
PHY103.4	3	3	1	2	3
PHY103.5	3	3	1	2	2
PHY103.6	3	3	1	2	2
PHY103.7	3	3	1	3	3
PHY103.8	3	3	1	2	2
Average	3	3	1	2.25	2.5

# CO-PSO matrix for the course PHY:104 (Electronics Devices and Circuits-I)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY104.1	2	2	3	3	3
PHY104.2	2	2	3	3	3
PHY104.3	2	2	3	3	3
PHY104.4	2	2	3	3	3
PHY104.5	2	2	3	3	3
PHY104.6	2	2	3	3	3
PHY104.7	2	2	3	3	3
PHY104.8	2	2	3	3	3
Average	2	2	3	3	3

### **<u>CO-PSO matrix for the course PHY:105 (Physics Laboratory-I)</u></u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY105.1	2	2	3	3	3
PHY105.2	2	2	3	3	3
PHY105.3	2	2	3	3	3
PHY105.4	2	2	3	3	3
PHY105.5	2	2	3	3	3
PHY105.6	2	2	3	3	3
PHY105.7	2	2	3	3	3
PHY105.8	2	2	3	3	3
Average	2	2	3	3	3

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY201.1	3	3	1	3	3
PHY201.2	3	2	2	2	2
PHY201.3	3	2	1	2	2
PHY201.4	3	2	1	2	2
PHY201.5	3	3	1	3	3
PHY201.6	3	3	1	2	2
PHY201.7	3	3	2	2	3
PHY201.8	3	2	1	2	2
Average	3	2.5	1.25	2.25	2.38

### **<u>CO-PSO matrix for the course PHY 201(Quantum Mechanics-II)</u></u>**

## **<u>CO-PSO matrix for the course PHY 202(Nuclear and Particle Physics)</u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY202.1	3	3	2	2	3
PHY202.2	3	3	2	2	3
PHY202.3	3	3	2	2	3
PHY202.4	3	3	2	2	3
PHY202.5	3	3	2	2	3
PHY202.6	3	3	2	2	3
PHY202.7	3	3	2	2	3
PHY202.8	3	3	2	2	3
Average	3	3	2	2	3

# CO-PSO matrix for the course PHY 203 (Solid State Physics)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY203.1	3	3	1	3	3
PHY203.2	3	3	3	3	3
PHY203.3	2	3	2	3	3
PHY203.4	2	3	1	2	2
PHY203.5	3	3	1	3	3
PHY203.6	2	3	1	2	2
PHY203.7	2	3	2	2	2
PHY203.8	2	3	2	2	2
Average	2.38	3	1.63	2.5	2.5

#### **<u>CO-PSO matrix for the course PHY:204(Electronics Devices and Circuits-II)</u></u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY204.1	2	2	3	3	3
PHY204.2	2	2	3	3	3
PHY204.3	2	2	3	3	3
PHY204.4	2	2	3	3	3
PHY204.5	2	2	3	3	3
PHY204.6	2	2	3	3	3
PHY204.7	2	2	3	3	3
PHY204.8	2	2	3	3	3
Average	2	2	3	3	3

## CO-PSO matrix for the course PHY:205(Physics Laboratory-II)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY205.1	2	2	3	3	3
PHY205.2	2	2	3	3	3
PHY205.3	2	2	3	3	3
PHY205.4	2	2	3	3	3
PHY205.5	2	2	3	3	3
PHY205.6	2	2	3	3	3
PHY205.7	2	2	3	3	3
PHY205.8	2	2	3	3	3
Average	2	2	3	3	3

### **<u>CO-PSO matrix for the course PHY:206(Seminar)</u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY206.1	3	2	2	3	3
PHY206.2	3	2	2	3	3
PHY206.3	3	2	2	3	3
PHY206.4	3	2	2	3	3
PHY206.5	3	2	2	3	3
PHY206.6	3	2	2	3	3
PHY206.7	3	2	2	3	3
PHY206.8	3	2	2	3	3

### **<u>CO-PSO matrix for the course PHY301 ((Electrodynamics and Plasma Physics)</u></u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY301.1	3	2	2	3	3
PHY301.2	3	2	2	3	3
PHY301.3	3	2	2	3	3
PHY301.4	3	2	2	3	3
PHY301.5	3	2	2	3	3
PHY301.6	3	2	2	3	3
PHY301.7	3	2	2	3	3
PHY301.8	3	2	2	3	3
Average	3	2	2	3	3

### **CO-PSO matrix for the course PHY 302 (Statistical Mechanics)**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY302.1	3	3	2	3	3
PHY302.2	3	3	3	3	3
PHY302.3	3	3	3	3	3
PHY302.4	3	3	3	3	3
PHY302.5	3	3	3	2	2
PHY302.6	3	3	3	2	2
PHY302.7	3	2	2	2	2
PHY302.8	3	2	2	3	2
Average	3	2.75	2.63	2.63	2.5

## CO-PSO matrix for the course PHY 303A (Condensed Matter Physics-I)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY303A.1	2	2	2	3	2
PHY303A.2	3	3	2	3	3
PHY303A.3	3	3	1	2	3
PHY303A.4	3	3	2	2	3
PHY303A.5	2	2	1	3	2
PHY303A.6	2	3	1	3	3
PHY303A.7	3	3	1	3	3
PHY303A.8	2	3	2	3	2
Average	2.5	2.75	1.5	2.75	2.63

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY303B.1	3	3	3	3	3
PHY303B.2	3	3	3	3	3
PHY303B.3	3	3	3	3	3
PHY303B.4	3	3	3	3	3
PHY303B.5	3	3	3	3	3
PHY303B.6	3	3	3	3	3
PHY303B.7	3	3	1	2	2
PHY303B.8	3	3	1	2	1
Average	3	3	2.5	2.75	2.62

#### CO-PSO matrix for the course PHY 303B (Nuclear Physics-I)

### CO-PSO matrix for the course PHY 303C (Particle Physics-I)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY303C.1	2	3	3	3	2
PHY303C.2	2	3	3	3	2
PHY303C.3	3	3	3	3	2
PHY303C.4	2	3	3	3	2
PHY303C.5	2	3	3	3	2
PHY303C.6	3	3	3	3	2
PHY303C.7	2	3	3	3	2
PHY303C.8	2	3	3	3	2
Average	2.25	3	3	3	2

## **<u>CO-PSO matrix for the course PHY304A (Computational Physics-I)</u></u>**

COs#.	PSO1	PSO2	PSO3	PSO4	PSO5
PHY304A.1	3	2	3	3	2
PHY304A.2	3	2	3	3	2
PHY304A.3	3	2	3	3	2
PHY304A.4	3	2	3	3	2
PHY304A.5	3	2	3	3	2
PHY304A.6	3	2	3	3	2
PHY304A.7	3	2	3	3	2
PHY304A.8	3	2	3	3	2
Average	3	2	3	3	2

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY304B.1	2	2	3	3	3
PHY304B.2	2	2	3	3	3
PHY304B.3	2	2	3	3	3
PHY304B.4	2	2	3	3	3
PHY304B.5	2	2	3	3	3
PHY304B.6	2	2	3	3	3
PHY304B.7	2	2	3	3	3
PHY304B.8	2	2	3	3	3
Average	2	2	3	3	3

### **<u>CO-PSO matrix for the course PHY304B (Electronics-I)</u></u>**

### CO-PSO matrix for the course PHY304C(Material Science-I)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY304C.1	3	3	3	3	3
PHY304C.2	3	3	3	3	3
PHY304C.3	3	3	3	3	3
PHY304C.4	3	3	3	3	3
PHY304C.5	3	2	2	3	3
PHY304C.6	3	2	2	3	3
PHY304C.7	3	3	3	3	3
PHY304C.8	3	3	3	3	3
Average	3	2.75	2.75	3	3

## **CO-PSO matrix for the course PHY 305 (Physics Laboratory-III)**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY305.1	2	3	3	3	3
PHY305.2	2	3	3	3	3
PHY305.3	2	3	3	3	3
PHY305.4	2	3	3	3	3
PHY305.5	2	3	3	3	3
PHY305.6	2	3	3	3	3
PHY305.7	2	3	3	3	3
PHY305.8	2	3	3	3	3
Average	2	3	3	3	3

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY401.1	3	3	2	3	3
PHY401.2	3	3	2	3	3
PHY401.3	3	3	2	3	3
PHY401.4	3	3	2	3	3
PHY401.5	3	3	2	3	3
PHY401.6	3	3	2	3	3
PHY401.7	3	3	2	3	3
PHY401.8	3	3	2	3	3
Average	3	3	2	3	3

### **<u>CO-PSO matrix for the course PHY401 (Advanced Quantum Mechanics)</u></u>**

## **<u>CO-PSO matrix for the course PHY402 (Atomic and Molecular Physics)</u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY402.1	2	3	3	3	3
PHY402.2	3	3	3	3	3
PHY402.3	2	3	3	3	3
PHY402.4	2	3	3	2	3
PHY402.5	2	3	3	3	3
PHY402.6	2	3	3	2	3
PHY402.7	2	3	3	3	3
PHY402.8	2	3	3	2	3
Average	2.12	3	3	2.63	3

### **<u>CO-PSO matrix for the course PHY 403A (Condensed Matter Physics-II)</u></u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY403A.1	2	3	2	3	3
PHY403A.2	3	3	2	3	3
PHY403A.3	2	3	2	3	2
PHY403A.4	3	3	1	3	2
PHY403A.5	3	3	1	3	3
PHY403A.6	2	2	1	2	3
PHY403A.7	3	3	1	3	3
PHY403A.8	3	3	1	2	3
Average	2.63	2.88	1.38	2.75	2.75

COs#.	PSO1	PSO2	PSO3	PSO4	PSO5
PHY403B.1	3	3	2	3	3
PHY403B.2	3	3	2	3	3
PHY403B.3	3	3	2	3	3
PHY403B.4	3	3	2	3	3
PHY403B.5	3	3	2	3	3
PHY403B.6	3	3	2	3	3
PHY403B.7	3	3	2	3	3
PHY403B.8	3	3	2	3	3
Average	3	3	2	3	3

### **<u>CO-PSO matrix for the course PHY403B (Nuclear Physics-II)</u></u>**

### CO-PSO matrix for the course PHY403C (Particle Physics-II)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY403C.1	3	3	2	3	3
PHY403C.2	3	3 3	2	3	3
PHY403C.3	3	3	3	3	3
PHY403C.4	3	3	2	3	3
PHY403C.5	3	3	2	3	3
PHY403C.6	3	3	2	3	3
PHY403C.7	3	3	2	3	3
PHY403C.8	3	3	3	3	3
Average	3	3	2.25	3	3

### **<u>CO-PSO matrix for the course PHY404A (Computational Physics-II)</u></u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY404A.1	3	2	3	3	2
PHY404A.2	3	2	3	3	2
PHY404A.3	3	2	3	3	2
PHY404A.4	3	2	3	3	2
PHY404A.5	3	2	3	3	2
PHY404A.6	3	2	3	3	2
PHY404A.7	3	2	3	3	2
PHY404A.8	3	2	3	3	2
Average	3	2	3	3	2

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY404B.1	2	2	3	3	3
PHY404B.2	2	2	3	3	3
PHY404B.3	2	2	3	3	3
PHY404B.4	2	2	3	3	3
PHY404B.5	2	2	3	3	3
PHY404B.6	2	2	3	3	3
PHY404B.7	2	2	3	3	3
PHY404B.8	2	2	3	3	3
Average	2	2	3	3	3

#### **CO-PSO matrix for the course PHY404B (Electronics-II)**

### **<u>CO-PSO matrix for the course PHY404C (Material Science-II)</u></u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY404C.1	3	3	3	3	3
PHY404C.2	3	3	3	3	3
PHY404C.3	3	3	3	3	3
PHY404C.4	3	3	3	3	3
PHY404C.5	3	2	2	3	3
PHY404C.6	3	2	2	3	3
PHY404C.7	3	3	3	3	3
PHY404C.8	3	3	3	3	3
Average	3	2.75	2.75	3	3

## **<u>CO-PSO matrix for the course PHY 405 (Physics Laboratory-III)</u></u>**

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY405.1	2	3	3	3	3
PHY405.2	2	3	3	3	3
PHY405.3	2	3	3	3	3
PHY405.4	2	3	3	3	3
PHY405.5	2	3	3	3	3
PHY405.6	2	3	3	3	3
PHY405.7	2	3	3	3	3
PHY405.8	2	3	3	3	3
Average	2	3	3	3	3

<b>CO-PSO</b>	matrix for	the course PHY	[′] 406 (	Seminar)

COs#	PSO1	PSO2	PSO3	PSO4	PSO5
PHY406.1	3	2	2	3	3
PHY406.2	3	2	2	3	3
PHY406.3	3	2	2	3	3
PHY406.4	3	2	2	3	3
PHY406.5	3	2	2	3	3
PHY406.6	3	2	2	3	3
PHY406.7	3	2	2	3	3
PHY406.8	3	2	2	3	3
Average	3	2	2	3	3

### **CO-PO-PSO** mapping Matrix

Course code	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	PO6	<u>PO7</u>	<u>PO8</u>	<u>PO9</u>	PO10	PO11	PSO1	PSO2	PSO3	PSO4	PSO5
PHY101	3	2	2	3	2	2	2	2	3	3	2	3	2	2	2	3
PHY102	3	2	3	3	2	2	2	2	3	3	3	3	2	2	3	3
PHY103	3	2.38	2	3	2	1.63	2	1	2	2	1	3	3	1	2.25	2.5
PHY104	3	2	3	3	2	3	3	3	3	2	3	2	2	3	3	3
PHY105	3	2	3	3	2	3	3	3	3	2	3	2	2	3	3	3
PHY201	3	2.5	2	3	2	1.63	2.38	1	2	2	2	3	2.5	1.25	2.25	2.38
PHY202	3	3	2.62	2.62	2	3	2.37	2.38	3	2	1.83	3	3	2	2	3
PHY203	3	2.5	2	2.38	2	2.5	2	1	1	2	2	2.38	3	1.63	2.5	2.5
PHY204	3	2	3	3	2	3	3	3	3	2	3	2	2	3	3	3
PHY205	3	2	3	3	2	3	3	3	3	2	3	2	2	3	3	3
PHY206	3	2	3	2	3	2	3	3	3	3	3	3	2	2	3	3
PHY301	3	2	3	3	2	2	3	2	3	3	2	3	3	2	3	3
PHY302	3	3	2.5	3	2	3	2	2.25	3	2	2.25	3	2.75	2.63	2.63	2.5
PHY303A	3	2.38	2	2.38	2	2.25	2	1	1	2	2	2.5	2.75	1.5	2.75	2.63
PHY303B	3	3	2.62	2.62	2	3	2.5	2.67	3	2	2.67	3	3	2.5	2.75	2.62
PHY303C	3	3	3	3	2.17	3	2	2.17	2.17	2	3	2.25	3	3	3	2
PHY304A	3	2	2	3	2	2	2	2	3	3	1	3	2	3	3	2
PHY304B	3	2	3	3	2	3	3	3	3	2	3	2	2	3	3	3
PHY304C	3	2.5	3	2.75	2.5	3	3	3	3	2	2.75	3	2.75	2.75	3	3
PHY305	3	3	2	2	2	3	3	2	2	2	1	2	3	3	3	3
PHY401	3	2	3	3	2	2	3	2	3	3	3	3	2	2	3	3
PHY402	3	3	3	3	3	3	2.25	3	2	2.37	2.37	2.12	2	2	3	3
PHY403A	3	2.75	2	2.63	2	2.5	2	1	1	2	2	2.63	2.88	1.38	2.75	2.75
PHY403B	3	3	2	3	2	3	2	2	3	3	1	3	3	2	3	3
PHY403C	3	3	3	3	3	2.12	2.37	2.25	2	2	2	3	3	2.25	3	3
PHY404A	3	2	2	3	2	2	2	1	3	3	1	3	2	3	3	2
PHY404B	3	2	3	3	2	3	3	3	3	2	3	2	2	3	3	3

### CO-PO-PSO mapping matrix for all courses of M.Sc. Physics

PHY404C	3	2.5	3	2.75	2.5	3	3	3	3	2	3	3	2.75	2.75	3	3
PHY405	3	3	2	2	2	3	3	2	2	2	1	2	3	3	3	3
PHY406	3	2	3	2	3	2	3	3	3	3	3	3	2	2	3	3
Average	3	2.42	2.59	2.77	2.17	2.55	2.529	2.224	2.57	2.31	2.26	2.63	2.48	2.35	2.83	2.79

### **Attainment of COs**

The attainments 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 as shown in the following table.

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

#### CO Attainment levels for internal assessment

### CO Attainment levels for End Semester Examination (ESE)

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

#### **Overall CO Attainment level of a course**

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

Overall CO attainment level=50% of CO attainment level in internal assessment+ 50% of CO attainment level in End Semester Examination.

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

	<b>PO1</b>	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	PO11
PHY101											
PHY102											
PHY103											
PHY104											
PHY105											
PHY201											
PHY202											
PHY203											
PHY204											
PHY205											
PHY206											
PHY301											
PHY302											
PHY303A											
PHY303B											
PHY303C											
PHY304A											
PHY304B											
PHY304C											
PHY305											
PHY401											
PHY402											
PHY403A											
PHY403B											
PHY403C											
PHY404A											
PHY404B											
PHY404C											
PHY405											
PHY406											
Direct PO											
attainment											

#### **PO Attainment Values using Direct Methods**

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

#### For PHY101-PO1 Cell:

PO1 attainment value=(Mapping factor for PHY101-PO1 From CO-PO-PSO table x Overall CO attainment value for the course PHY101)/3

Similarly values for each cell of the above table 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 the following table. 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 x average attainment value for PO1 using direct method+ 0.2 x average response of outgoing students for PO1

Similarly overall attainment value can be obtained for each PO.

# Questionnaire for indirect measurement of PO attainment (for outgoing students)

	F	Please tick any o	one
Capable of demonstrating comprehensive disciplinary	3	2	1
knowledge gained during course of study			
Capability to ask relevant/appropriate questions for	3	2	1
identifying, formulating and analyzing the research			
problems and to draw conclusion from the analysis			
Ability to communicate effectively on general and scientific	3	2	1
topics with the scientific community and with society at			
large			
Capability of applying knowledge to solve scientific and	3	2	1
other problems			
Capable to learn and work effectively as an individual, and	3	2	1
as a member or leader in diverse teams, in multidisciplinary			
settings.			
Ability of critical thinking, analytical reasoning and	3	2	1
research based knowledge including design of experiments,			
analysis and interpretation of data to provide conclusions			
Ability to use and learn techniques, skills and modern tools	3	2	1
for scientific practices			
Ability to apply reasoning to assess the different issues	3	2	1
related to society and the consequent responsibilities			
relevant to the professional scientific practices			
Aptitude to apply knowledge and skills that are necessary	3	2	1
for participating in learning activities throughout life			
Capability to identify and apply ethical issues related to	3	2	1
one's work, avoid unethical behaviour such as fabrication of			
data, committing plagiarism and unbiased truthful actions in			
all aspects of work			
Ability to demonstrate knowledge and understanding of the	3	2	1
scientific principles and apply these to manage projects			
3: Strongly Agree; 2: Agree; 1:	Average	1	

# **Overall PO attainment values**

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