

त्रिपुरा विश्वविद्यालय
TRIPURA UNIVERSITY

(केन्द्रीय विश्वविद्यालय / A Central University)

सूर्यमणिनगर, अगरतला / Suryamaninagar, Agartala

त्रिपुरा(प.) / Tripura (W.), पिन / PIN – 799022, भारत / INDIA



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2.6 – Student Performance and Learning Outcomes

2.6.1 – Program outcomes, program specific outcomes and course outcomes for all programs offered by the institution are stated and displayed in website of the institution (to provide the weblink):

The relevant and supporting documents for the criteria as mentioned above have been attached herewith.

Registrar *g/c*
Tripura University
(Dr. K.B. Jamatia)
Registrar (i/c)
Tripura University

TRIPURA UNIVERSITY

**MASTER OF TECHNOLOGY (M.TECH.)
IN
CHEMICAL & POLYMER ENGINEERING**



CURRICULUM STRUCTURE

**FIRST & THIRD SEMESTER: JULY-DEC
SECOND & FOURTH SEMESTER: JAN-JUNE**

**Tripura University (A Central University)
Suryamaninagar, Agartala, Tripura West-799022**

Programme Educational Objectives

The department of Chemical and Polymer Engineering is one of the new teaching departments/schools included under the XII Five Years Plan sanctioned by UGC. This department started functioning in the month of August 2016. The department is offering a 4-semester M.Tech programme with an intake capacity of 15 students with an objective of providing and promoting teaching, industrial consultancy and R&D in the frontier areas of Chemical and Polymer Engineering practice. The course curriculum has been designed taking into consideration the recent developments in the wide areas of chemical and polymer engineering. The Department aims to meet the growing need for well-qualified chemical engineers who will meet the expanding industry's requirements in design, manufacturing, marketing and entrepreneurial segments thereby helping in Nation Building.

Keeping in views the entire scientific and technological development of the student through covering almost all the courses, the M. Tech. in Chemical and Polymer Engineering programme has been designed. The present programme aims to train the students to acquire high level theoretical and experimental knowledge in the direction of technology through learning the designed courses with high quality and significance. However, the main objectives of the programmes are as follows:

- To impart education and training in the fields of Chemical & Polymer Engineering to make the students capable enough to address some of the United Nation's Sustainable Development Goals (UN SDG's) through sustainable and novel research solutions.
- To prepare the students to outshine in academics and research in different motifs of Chemical & Polymer Engineering.
- To train the students with good theoretical and practical knowledge so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.
- To inspire and motivate the students to take laboratory based innovations to the market through various entrepreneurial development activities.
- To acquire high end industry centric skills in the field of Chemical & Polymer Engineering.
- To provide the knowledge of various new techniques by which the students can lead the cutting edge technologies
- To prepare the competent technologists at national and international level
- To provide students with an academic environment aware of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career
- To prepare the students with excellent communication skills, capable of communicating effectively in various context, thus sharing new knowledge with other researchers from other institutions, universities and also industrialists
- To develop gender –neutral attitudes and practices; respect for all races, nations, religions, culture, languages and traditions

- To coach students in professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate the taught subjects to address environmental issues.
- To provide the ideas about environment sustainability and pollution control through exemplary and practical educations
- To impart knowledge of various simulation softwares used in the field of Chemical & Polymer Engineering.
- To prepare Professional Engineer with ethical, social and moral values.

Programme Outcomes

PO1: Knowledge about Technology: Graduates will have an advanced knowledge of fundamental areas of chemical & polymer engineering, such as Heat & Mass Transfer, Advanced Reaction Engineering, Polymer Science & Technology, Rubber Science & Technology etc. and henceforth will be able to solve chemical and polymer engineering problems.

PO2: Planning Abilities: Graduates will be able to communicate ideas, demonstrate efficient planning including time management, resource management and organization skills, reason critically and exercise independence of mind and thought in conducting research.

PO3: Problem analysis ability: Graduates will be able to apply scientific attitude to analyze the society problems and to apply information systematically for the solution. They will have a holistic approach in solving problems and designing systems by applying professional engineering judgment, particularly where there is technical uncertainty and determine process feasibility and viability of the chemical & polymeric processes with respect to economic aspects, environmental safety and social aspects etc.

PO4: Modern Tool usage: Graduates will be able to handle new techniques and advanced tools like DSC, FTIR, FESEM, UV Spectrophotometer etc.

PO5: Leadership Skills: Graduates will be able to have leadership skills with high regard for ethical values and social responsibility through the effective use of flexible CBCS based courses making them eligible to take management related courses.

PO6: Professional Identity: Graduates will be able to show professional identity as competent technologists at national and international level

PO7: Technology and society: Graduates will develop an understanding of how to undertake research, design & development in cutting edge areas, inculcating ethical practices with independent intellectual skill, courage, integrity and sensitive to the social aspects of society.

PO8: Communication: Graduates will possess effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate their course subjects to address environmental issues.

PO9: Environment and sustainability: Understanding about environment sustainability and pollution control through laboratory practices

PO10: Life-long learning & progression: The graduates will possess the knowledge of contemporary issues and ability to engage in life-long learning of new innovative technologies in chemical/polymer and allied fields and pursue advanced studies.

Curriculum Structure

M.Tech. in Chemical & Polymer Engineering

Total Core (C) Credits: 60, Total Elective (E) Credits: 20, Total Credits: 80

M.Tech. First (1 st) Semester – 600 Marks (C credits: 16; E credits: 8)							
Theory Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
		L	T	P			
CP 901C	Advanced Reaction Engineering	4	0	0	4	100	C: Core Course
CP 902C	Polymer Science and Technology	4	0	0	4	100	
CP 903C	Heat and Mass Transfer	4	0	0	4	100	
CP 906E	Rubber Science and Technology	4	0	0	4	100	E: Elective Course (students to select anyone from the list)
CP 907E	Colloids and Interface Science	4	0	0	4	100	
CP 909E	Polymer Composites	4	0	0	4	100	
Elective from another department	-	4	0	0	4	100	Mandatory course for M.Tech. students
Practical Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
CP 904C	Polymer Lab	0	0	2	2	50	
CP 905C	Reaction Engineering Lab	0	0	2	2	50	
SUB TOTAL		20	0	4	24	600	
M.Tech. Second (2 nd) Semester – 600 Marks (C credits: 12; E credits: 12)							
Theory Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
		L	T	P			
CP 1002C	Polymer Characterization and Testing	4	0	0	4	100	C: Core Course
CP 1004C	Fluidization Engineering	4	0	0	4	100	
CP 1004E	Polymer Processing	4	0	0	4	100	
CP 1007E	Advanced Fluid Flow Rheology	4	0	0	4	100	E: Elective Course (students to select anyone from the list)
CP 1008E	Membrane Science and Technology	4	0	0	4	100	
Offered by University centrally	Computer Skill-III	4	0	0	4	100	Mandatory course for M.Tech. students
Practical Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
CP 1003C	Polymer Characterization Lab	0	0	2	2	50	

CP 1005C	Fluidization Engineering lab	0	0	2	2	50	
SUB TOTAL		20	0	4	24	600	
M.Tech. Third (3rd) Semester – 400 Marks (C credits: 16)							
Theory Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
		L	T	P			
CP 1103C	Research Methodology	4	0	0	4	100	
CP 1104C	Project Part-I	0	0	12	12	300	Semester project progress report (150 marks), seminar, and Viva-Voce (150 marks)
SUB TOTAL		4	0	12	16	400	
M.Tech. Fourth (4th) Semester – 400 Marks (C credits: 16)							
Theory Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
		L	T	P			
CP 1203C	Project Part-II	0	0	16	16	400	M.Tech. final thesis (200 marks), Comprehensive seminar and Viva-Voce (200 marks)
SUB TOTAL		0	0	16	16	400	
AGGREGATE (Entire Duration of M.Tech.)		44	0	36	80	2000	

* L - Lecture hrs/week T - Tutorial hrs/week P-Project/Practical/Lab/All other non-classroom academic activities, etc. hrs/week C - Credit Points of the Course E- Elective Points of the Course

Evaluation Scheme for Theory Courses:

Internal Exam	End Semester Exam	Total
30 marks	70 Marks	100 Marks

*For laboratory and all non classroom activities (project, dissertation, presentation seminar, viva voce etc.), the Internal and End-semester assessment breakup shall not exist. Students will be graded on the total marks allocated to the respective project/presentation seminar/presentation etc.

LEARNING OUTCOMES

M.Tech. 1st Semester

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
CP 901C	Advanced Reaction Engineering	4	0	0	4	100

At the end of the course student will be able to:

1. Understand and analyze the various steady and unsteady reactors
2. Design experiments involving chemical reactors, and analyzing and interpreting data
3. Develop the performance equations and solve problems
4. Scale up of the reactors suiting industrial needs
5. Incorporate catalysts and non catalysts in industrial and non-industrial problems
6. Understand mechanism and mathematical modeling of different types of polymerization reactors
7. Understand and solve problems related to flow through porous media and gas solid fluid beds

Course Contents:

Kinetics of Homogenous reactions: Introduction and overview of reaction engineering, the kinetics of homogenous reactions, kinetic models

Stoichiometry and introduction to batch reactors: Stoichiometric considerations for constant and variable volume batch systems, analysis of batch reactor kinetic data, integral and differential method of analysis of batch data

Design for single reactors: Introduction and ideal batch reactor design, ideal mixed flow reactor design, ideal plug flow reactor design, recycle reactor design, reactor size comparisons

Reactor design for multiple reactions: Design for parallel reactors, design for series reactors

Non-ideal reactor design: Non-ideal reactors and Residence Time Distribution, RTD measurements, reactor modeling, Solid Non-Catalytic Reactions, The shrinking Core Model, Case of Pseudo steady-state hypothesis & ash diffusion control

Advanced reactor processes and fundamentals: Design for polymerization reactors, reaction through porous media, application to gas-solid reactions in fluid beds.

Recommended Books:

1. H. Scot Folger: Elements of Chemical reaction engineering Prentice Hall, second edition. 1986.
2. J.M. Smith: Chemical Engineering Kinetics, McGraw Hill, Third Edition, 1981.

TRIPURA UNIVERSITY

Department of Business Management

BBA CBCS Syllabus

Session 2020-21

Bachelor of Business Administration (BBA)

3 year Full Time Programme

Table of Contents

BBA (1st Semester)

BMGT 101C	PRINCIPLES AND PRACTICES OF MANAGEMENT
BMGT 102C	BUSINESS COMMUNICATION
BMGT 103C	BUSINESS STATISTICS
BMGT 104C	FINANCIAL ACCOUNTING
BMBT 105C	MANAGERIAL ECONOMICS

BBA (2nd Semester)

BMGT 201C	COST ACCOUNTING
BMGT 202C	QUANTITATIVE TECHNIQUES FOR MANAGEMENT
BMGT 203C	ORGANISATIONAL BEHAVIOUR- I
BMGT 204C	BUSINESS ENVIRONMENT

COMPUTER SKILL 1 (OUTSIDE DEPARTMENT)

BBA (3rd Semester)

BMGT 301C	ORGANIZATION BEHAVIOR- II
BMGT 302C	BUSINESS LAW
BMGT 303C	FINANCIAL MANAGEMENT
BMGT 304C	MARKETING MANAGEMENT- I
BMGT 305C	HUMAN RESOURCE MANAGEMENT- I

BBA (4th Semester)

BMGT 401C	RESEARCH METHODOLOGY
BMGT 402C	MARKETING MANAGEMENT II
BMGT 403C	HUMAN RESOURCE MANAGEMENT - II
BMGT 404C	OPERATIONS MANAGEMENT
BMGT 405C	ENTREPRENEURSHIP DEVELOPMENT AND SMALL BUSINESS FUNDAMENTALS

BBA (5th Semester) MARKETING MANAGEMENT

BMGT 501C	CONSUMER BEHAVIOR
BMGT 502C	ADVERTISING AND SALES PROMOTION
BMGT 503C	RETAIL MANAGEMENT
BMGT 504C	MARKETING RESEARCH
BMGT 505C	PROJECT REPORT - I (INTERNAL)

A.	FORMAT OF PROJECT REPORT.....
B.	INSTRUCTIONS FOR TYPING/ PRINTING
C.	TITLE OF THE PROJECT REPORT
D.	WRITING THE SUMMER PROJECT REPORT
E.	STUDENT DECLARATION.....
F.	CERTIFICATE FROM THE INSTITUTE GUIDE.....
G.	BIBLIOGRAPHY
H.	ATTENDANCE SHEET

BBA (5th Semester) FINANCIAL MANAGEMENT

BMGT 506C	FINANCIAL STATEMENT ANALYSIS -I
BMGT 507C	INDIAN FINANCIAL SYSTEM
BMGT 508C	BUSINESS TAXATION
BMGT 509C	BANKING MANAGEMENT

BMGT 510C PROJECT REPORT - I (INTERNAL)

A.	FORMAT OF PROJECT REPORT.....
B.	INSTRUCTIONS FOR TYPING/ PRINTING
C.	TITLE OF THE PROJECT REPORT
D.	WRITING THE SUMMER PROJECT REPORT
E.	STUDENT DECLARATION.....
F.	CERTIFICATE FROM THE INSTITUTE GUIDE.....
G.	BIBLIOGRAPHY
H.	ATTENDANCE SHEET

BBA (5th Semester) Human Resource Management

BMGT 511C	HUMAN RESOURCE PLANNING
BMGT 512C	HUMAN RESOURCE DEVELOPMENT -I
BMGT 513C	WAGE AND SALARY ADMINISTRATION
BMGT 513C	LABOUR LAW -I
BMGT 514C	PROJECT REPORT - I (INTERNAL)

A.	FORMAT OF PROJECT REPORT.....
B.	INSTRUCTIONS FOR TYPING/ PRINTING
C.	TITLE OF THE PROJECT REPORT
D.	WRITING THE SUMMER PROJECT REPORT
E.	STUDENT DECLARATION.....

- F. CERTIFICATE FROM THE INSTITUTE GUIDE.....
- G. BIBLIOGRAPHY
- H. ATTENDANCE SHEET

BBA (6th Semester) Marketing Management

- BMGT 601C SERVICES MARKETING
- BMGT 602C RURAL MARKETING
- BMGT 603C SALES MANAGEMENT AND PERSONAL SELLING
- BMGT 604C INTERNATIONAL MARKETING
- BMGT 605C PROJECT REPORT - II (EXTERNAL)

- A. FORMAT OF PROJECT REPORT.....
- B. INSTRUCTIONS FOR TYPING/ PRINTING
- C. TITLE OF THE PROJECT REPORT
- D. WRITING THE SUMMER PROJECT REPORT
- E. STUDENT DECLARATION.....
- F. CERTIFICATE FROM THE INSTITUTE GUIDE.....
- G. BIBLIOGRAPHY
- H. ATTENDANCE SHEET

BBA (6th Semester) Financial Management

- BMGT 606C MANAGEMENT ACCOUNTING
- BMGT 607C INSURANCE MANAGEMENT
- BMGT 608C INTERNATIONAL BUSINESS FINANCE
- BMGT 609C FINANCIAL STATEMENT ANALYSIS II
- BMGT 610C PROJECT REPORT - II (EXTERNAL)

- A. FORMAT OF PROJECT REPORT.....
- B. INSTRUCTIONS FOR TYPING/ PRINTING
- C. TITLE OF THE PROJECT REPORT
- D. WRITING THE SUMMER PROJECT REPORT
- E. STUDENT DECLARATION.....
- F. CERTIFICATE FROM THE INSTITUTE GUIDE.....
- G. BIBLIOGRAPHY
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BBA (6th Semester) Human Resource Management

- BMGT 611C INDUSTRIAL RELATIONS
- BMGT 612C ORGANISATIONAL DEVELOPMENT

BMGT 613C	LABOUR LAWS II
BMGT 614C	HUMAN RESOURCE DEVELOPMENT II
BMGT 614C	PROJECT REPORT - II (EXTERNAL)
A.	FORMAT OF PROJECT REPORT.....
B.	INSTRUCTIONS FOR TYPING/ PRINTING
C.	TITLE OF THE PROJECT REPORT
D.	WRITING THE SUMMER PROJECT REPORT
E.	STUDENT DECLARATION.....
F.	CERTIFICATE FROM THE INSTITUTE GUIDE.....
G.	BIBLIOGRAPHY
H.	ATTENDANCE SHEET

Programme Outcomes (POs)

On successful completion of the programme the student will be able to

- PO1: Demonstrate the importance of management discipline.
- PO2: Build a strong foundation of knowledge in different areas of management.
- PO3: Develop the necessary professional skills of applying concepts and techniques used in management for real life problems.
- PO4: Develop reading, writing, speaking skills and Business correspondence.
- PO5: Demonstrate ethical factors in the business environment.
- PO6: Discuss and evaluate economic environment of country as well as world.
- PO7: Prepare professional presentations by using technology.
- PO8: Create opportunities for self-employment, incubate new ideas and start their own start-ups.
- PO9: Discover emerging opportunities in the Management Profession.

Programme Specific Outcomes (PSOs)

On successful completion of the Marketing Management Specialization programme the student will be able to

- PSO1: Apply the basic concepts of marketing.
- PSO2: Develop basics and essential skills related to marketing and recent trends in marketing.
- PSO3: Comprehends advanced skills in the areas of interpersonal communications, Motivational techniques essential for a successful sales person.
- PSO4: Comprehends insights into the functional areas of retailing.
- PSO5: Apply the tools and techniques of retailing business with increasing scope of technology and e-business.
- PSO6: Comprehends the knowledge and understanding of importance and functions of advertising.
- PSO7: Demonstrate the features of Sales Promotion techniques.
- PSO8: Face the practical problems in marketing with case studies
- PSO9: Analyse real marketing problems with case study or research

On successful completion of the Financial Management Specialization programme the student Will be able to

- PSO1: Describe the finance related areas like Shares, Debentures, Financial Instruments, Financial Services and Markets etc.
- PSO2: Reproduce the sources of short & long term finance for a business and management of these sources.
- PSO3: Interpret the financial statements effectively & finance structures.
- PSO4: Evaluate the current financial practices followed in the corporate world.
- PSO5: Apply the practical aspects of finance function with case studies.

PSO6: Write an analytical report on finance related topic

PSO7: Subdivide different complications in finance decision making and skills required to deal with them.

On successful completion of the Human Resource Management Specialization programme the student will be able to

PSO1: Apply the theory into practice.

PSO2: Analyze the HR problems and solve it skillfully with case studies.

PSO3: Acquaint with important legal provisions governing the industrial employees.

PSO4: Describe the legal aspects of HR function of a company.

PSO5: Comprehend HRM functions & practices like promotion, appraisal, wages administration etc.

PSO6: Comprehend the HR relations with exposure to cases, events etc.

PSO7: Describe the basic and advanced functions of human resource department.

PSO8: Comprehend human resource processes that are concerned with planning, motivating and developing suitable employees for the benefit of the organization.

Mapping of CO with PO for BACHELOR OF BUSINESS ADMINISTRATION (BBA)

BBA I Semester										BBA VI Semester (Elective) Marketing Management									
COURSES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	COURSES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P
BMGT 101C	√	√	√						√	BMGT 601C	√		√				√	√	√
BMGT 102C	√	√	√	√		√	√			BMGT 602C			√				√	√	√
BMGT 103C	√	√	√	√	√	√	√	√	√	BMGT 603C	√		√			√	√	√	√
BMGT 104C	√	√	√		√	√			√	BMGT 604C			√	√	√	√	√	√	√
BMGT 105C		√	√		√	√		√	√	BMGT 605C	√	√	√				√	√	√
BBA II Semester										BBA VI Semester (Elective) Financial Management									
BMGT 201C	√	√	√			√			√	BMGT 606C			√					√	√
BMGT 202C	√	√	√		√	√			√	BMGT 607C		√	√	√			√	√	√
BMGT 203C	√	√	√		√	√		√	√	BMGT 608C	√	√	√		√	√		√	√
BMGT 204C	√		√		√	√		√	√	BMGT 609C	√		√			√	√	√	√
CSKI	Outside the purview of the Department									BMGT 610C	√	√	√				√	√	√
BBA III Semester										BBA VI Semester (Elective) Human Resource Management									
BMGT 301C	√	√	√		√	√			√	BMGT 611C		√	√	√	√				√
BMGT 302C	√	√	√		√	√			√	BMGT 612C		√	√	√	√				√
BMGT 303C	√	√	√		√	√			√	BMGT 613C	√		√		√				√
BMGT 304C	√	√	√		√	√			√	BMGT 614C		√	√					√	
BMGT 305C	√	√	√	√	√	√			√	BMGT 615C	√	√	√				√	√	√
BBA IV Semester																			
BMGT 401C	√	√	√		√	√			√										
BMGT 402C	√	√	√		√	√	√		√										
BMGT 403C	√	√	√		√	√			√										
BMGT 404C	√	√	√		√	√			√										
BMGT 405C	√	√	√		√	√		√	√										
BBA V Semester (Elective) Marketing Management																			
BMGT 501C			√	√				√	√										
BMGT 502C			√	√				√	√										
BMGT 503C			√					√	√										
BMGT 504C			√				√	√											
BMGT 505C	√	√	√				√	√	√										
BBA V Semester (Elective) Financial Management																			
BMGT 506C			√	√		√	√	√	√										
BMGT 507C		√	√				√	√	√										
BMGT 508C			√		√	√		√	√										
BMGT 509C			√					√	√										
BMGT 510C	√	√	√				√	√	√										
BBA V Semester (Elective) Human Resource Management																			
BMGT 511C			√		√	√		√	√										
BMGT 512C			√		√	√		√	√										
BMGT 513C			√		√			√	√										
BMGT 514C			√	√	√		√	√											
BMGT 515C	√	√	√				√	√	√										

BBA (1st Semester)

BMGT 101C

PRINCIPLES AND PRACTICES OF MANAGEMENT

1. FRAMEWORK OF MANAGEMENT:

- A. Nature of management: management & administration, management science or art, management as a profession, applying management theories in practice, effective management and different managerial effectiveness approaches.
- B. Development of management thoughts: early thinking about management, importance to study management theories, evolution of management theory, scientific management school (Frederick W. Taylor, Henry) classical organization theory school, the behavioral school, relation theories, management science school, the system approach.
- C. Management process & skills: management functions, management roles, levels of management, management skills, and functional areas of management.
- D. Managers & environment: concept of environmental, changing Indian business environment, challenges before Indian managers.
- E. Social & ethical issues in management: social responsibility of managers, social responsibility & business, social responsibility in India, ethical issues in management, values, value system of Indian managers.

2. PLANNING:

- A. Fundamentals of planning: concept, nature, importance, steps, types of planning, barriers in effective planning, planning in Indian organizations.
- B. planning premises & forecasting: concept of planning premises, forecasting, sales & demand forecasting.
- C. Strategic & operational plans: formulation of strategy, strategy implementation, policy procedures, methods, rules, project, budget.
- D. Missions & objectives: formulation of mission statement, hierarchy of objectives, role of objectives, management by objectives, MBO in Indian organizations.
- E. Decision making: types of decisions, decisions making process, individual VS group decision, problem solving, problem solving approaches.

3. ORGANISING:

- A. Fundamentals of organizing: various organization theories, steps in organizing, factors affecting organization structures.

B. Design of organization structure: formal organization informal relationship in formal organization structure, departmentation, span of management & chain of command & decentralisation.

C. Forms of organization structure: line organization structure, line & staff organization, matrix organization structure, team based organization structure (committee organization).

D. Delegation of authority: concept of authority, sources of authority, limits of authority, authority & responsibility, delegation of authority.

4. STAFFING:

A. Fundamentals of staffing: traditional view of staffing, staffing concepts, manpower planning, job analysis, changing human resources management scenario.

B. Recruitment & selection: job & position descriptions, sources of recruitment, legal considerations in selection process, selection tests, interview.

C. Training & development: concept of training & development, training programs, management development programme.

D. Performance appraisal & compensation: informal appraisals, formal systematic appraisals & promotion.

5. DIRECTING AND CONTROLLING:

A. Fundamentals of directing: concept of direction, direction & supervision, directing & human factor.

B. Motivation: concept, theories of motivation, generation gaps & motivational aspects, motivation & small business, motivational applications.

C. Leadership: defining leadership, traits, behavioral & contingency approach to leadership, leadership styles, situational leaderships, leadership development.

D. Fundamentals of controlling: concept, steps & types of controlling, design of effective control system, controlling & management by exception.

E. Operations control techniques: financial control (budgetary control, control through costing, break-even analysis), quality control, inventory control (economic order quantity, selective inventory control techniques).

F. Overall control techniques: management information systems, management audit, management control system an introduction.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Conceptualize the role that management plays in the decision-making process today

CO2: Provide a decision framework to various business problems

CO3: Apply various managerial skills

CO4: Establish the linkages between business analytics and problem statements in various industrial settings.

CO5: Perform logical analysis and apply analytical techniques to study the behavior of people in the system of organization.

SUGGESTED BOOKS:

1. Management- tasks, responsibilities, practices	by C. B. Gupta	TATA McGraw Hill
2. Management- text & cases	by L.M. Prasad	Sultan Chand Publishers
3. Management- text & cases	by V.S.P. Rao	Himalaya Publication
4. Management Tasks, Responsibilities & Practices	by Peter F. Drucker	Allied Publishers
5. Essentials of Management- An Internationals Perspective	by Harold Koontz, Hein Weihrich	TATA McGraw Hill

1. NATURE & PROCESS OF COMMUNICATION:

Defining communication and its nature, Role or purpose of communication, Classification of communication, Process of communication, General problems in communication, Barriers to communication, Conditions for effective communication, Characteristics of successful communication.

2. FUNCTIONAL COMMUNICATION:

a. Effective listening: Meaning & Concept of listening, Contributors to poor listening, Profile of a good listener, how to increase listening efficiency.

b. Effective Presentation: Meaning & Importance of presentation, why presentation is a difficult job, steps towards mastering the art of Oral Presentation.

c. Non-Verbal Communication: Personal Appearance, Posture, Gestures, Facial Expression, Eye-Contact, Space Distancing etc.

3. BUSINESS CORRESPONDENCE I:

a. Meaning & Need for Business Correspondence, Meaning of Business Letter-Purpose, Qualities, Structure, Layout and form. Types of Business Letter, Concept, Principles and Drafting.

b. Notice, Agenda & Minutes: Concept & Meaning, Rules, Principles, Drafting of different types of Notice, Agenda & Minutes.

4. BUSINESS CORRESPONDENCE II:

c. Circulars: Meaning, Principles, difference between Notice and Circular, different purposes of writing Circulars, Drafting of different Circulars.

d. Report Writing: Definition, Principles, Objectives, Importance, Types, Drafting of Letter Reports.

e. Press Release: Meaning, Concept & Rules, Drafting Press Release.

5. ENGLISH PROFICIENCY:

a. English Composition: Editorial Letters/ Paragraph/ Précis Writing.

b. English Comprehension: Answering short/ multiple type questions after perusal of a given passage.

c. General Grammar: Using of Articles, Prepositions, Verbs etc. (to fill in the blanks), Correction of faulty sentences, Selection of appropriate words or its form, selection of wrong Phrase etc.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Apply the business-related communications role in a virtual or traditional environment

CO2: Draft clear, concise, audience centric business documents

CO3: Communicate with confidence in the modern workplace and improve their range and accuracy in communication.

CO4: Integrate both business and communication in a global context

CO5: Improve reading and comprehension skills

SUGGESTED BOOKS:		
1. Business Correspondence & Report Writing	Sharma & Mohan	TATA McGraw Hill
2. Developing Communication Skills	Krishna Mohan & Meera Banerjee	Mc Millan
3. Business Communication Today	Bovee & Hill	Pearson Education
4. Business Communication	C.S.G. Krishnamacharyulu & R. Lalitha	Himalaya Publications

1. STATISTICS: AN OVERVIEW

Reasons for Learning Statistics, Growth and development of statistics, statistics defined, Types of statistical methods, importance and scope of statistics, statistics in business management, limitations of statistics, need for data and sources of data, Classification of data, organizing data using data array, Tabulation of data, graphical representation of data, Types of diagrams,

2. MEASURES OF CENTRAL TENDENCY

Objectives of averaging, Requisites of a measures of a central tendency, Measures of Central Tendency, Mathematical averages, Geometric mean, Harmonic mean, Relationship among AM, GM and HM, Average of position, Partition values-quartiles, deciles and percentiles, Mode, Relationship between mean median and mode, comparison between measures of central tendency

Significance of measuring dispersion, classification of measures of dispersion, distance measures, average deviation measures, Measures of skewness, Kurtosis.

3. FUNDAMENTALS OF PROBABILITY:

Concepts of probability, combinations and permutations, Types of probability, Probability rules, probability under statistical independence, probability under statistical dependence, Point estimates of Probabilities, Bayes' Theorem,

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Develop the ability to extract meaningful information from raw data to make better decisions

CO2: Apply statistical techniques in decision-making situations

CO3: Logically model and analyze diverse decision making scenarios through solving various statistical based problems.

CO4: Conceptualize the fundamental quantitative methods to evaluate various decision alternatives in order to arrive at an optimal decision

CO5: Demonstrate statistical techniques to interpret the results to use it in your personal and professional life

SUGGESTED BOOKS:

1. Fundamentals of Business Statistics	J. K Sharma	1 st Edition, 2010, Pearson
2. Statistics for Management	Richard L Levin & David S. Rubin	PHI
3. Statistical Methods	N. G. Das	M. Das & Co.

UNIT 1: Introduction- Meaning, scope, Merits and limitations of accounting; accounting cycle; double entry book keeping –meaning, merits and demerits, journal, ledger; Distinction between books of original entry and ledger; concept of accounting terminologies Viz. Assets, liabilities, transactions, entity, debtor, and creditor.

UNIT 2: Cash book- Meaning; Problems on Petty cash book; problems on triple column cash book; concept of trade discount and cash discount and their difference.

Unit 3: Preparation of Trial Balance- Concepts, merits and demerits of Trial Balance; errors-disclosed and not-disclosed by trial balance; problems on trial balance.

Unit 4: Bank Reconciliation Statement- Concept; objective and problems on bank reconciliation statement.

UNIT 5: Preparation of Final Accounts-Concept of Final account; preparation of Trading account (concept, objectives and problems), Profit and loss account (concept, objectives and problems), Balance Sheet(concept, objectives and problems); Differentiation between trading and Profit & Loss a/c.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Identify and analyze the contemporary issues in Management Accounting

CO2: Solve specific problems on cost accounting and also guides in decision making

CO3: Apply various management accounting and cost accounting techniques for planning and decision making

CO4: Illustrate the application of various management accounting techniques to all types of organizations for planning, decision making and control purposes in practical situations

Suggested Books:

1. Financial Accounting by Hanif & Mukherjee, Tata McGraw Hill.
2. Financial Accounting for Manager by A.K. Bhattacharya, PHI.
3. Financial Accounting for Manager by A. Gupta, PHI.
4. Financial Accounting by P.C. Tulsian, Pearson Higher Education.

1. BASIC CONCEPTS AND ISSUES IN ECONOMIC THEORY:

Central problems of an economy, elasticity of demand – price, income and cross elasticities, Concept of supply equilibrium.

2. THEORY OF PRODUCTION AND COSTS:

Production function, short-run and long-run production function, different types of cost and shapes of different cost curves.

3. MARKET STRUCTURE:

Perfect, monopoly, monopolistic and oligopoly-determination of price and output, Concept of tax, market failure, New Markets: Scope and Challenges.

4. ANALYSIS AND MEASUREMENTS OF AGGREGATE OUTPUT:

Circular flow of income-concept and measurement of national income-problems of measurement – GDP and welfare (including problems).

5. KEYNESIAN THEORY, BANKING STRUCTURE IN INDIA, INFLATION,

TRADE CYCLE: Classical and Keynesian theory of output and employment determination and their related concepts, banking structure in India and its functions causes and policies to control inflation, nature and characteristics of trade cycles.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Explore how markets work; supply, demand and market equilibrium

CO2: Conceptualize production of goods and services, measures of productivity

CO3: Demonstrate pricing and selling decisions with different types of competitive pressures

CO4: Analyze opportunity costs, different cost concepts, planning for the future

CO5: Articulate investment decisions.

SUGGESTED BOOKS:

1.	Advanced Economic Theory	H.L.Ahuja	S.Chand
2.	Micro Economic Theory & Macro Economic Theory	Joydeb Sarkhel	Dey Book Concern

BBA (2nd Semester)

BMGT 201C

COST ACCOUNTING

1. INTRODUCTION TO COST ACCOUNTING

Meaning, nature and scope of Cost Accounting, Advantages and disadvantages of Cost Accounting, Difference between Cost Accounting and Financial Accounting.

2. COST CONCEPTS, CLASSIFICATION and COST SHEET

Meaning of cost, Nature of cost. Importance of classification of cost. Various types of costs, Meaning, Importance of cost sheet, Items of cost sheet, Method of cost sheet,

3. MARGINAL COSTING AND CVP ANALYSIS.

Marginal costing and CVP analysis, Meaning, nature, advantages and disadvantages of Marginal costing, difference between marginal costing and absorption costing. Marginal cost statements, Relation between cost volume and profit, importance of CVP and BEP analysis, Determination of Contribution, profit volume ratio, margin of safety, angle of incidence.

4. ACCOUNTING FOR MATERIALS AND LABOUR COST.

Meaning of materials cost, Importance of inventory control, ABC analysis, determination of various Stock levels and EOQ, Methods of pricing the issue of materials, Bin cards and Double bin system, meaning of labour cost and structure of wages, Computation of wage with bonus, Labour turn over, causes of Labour turn over, Costing of Labour turn over.

5. CONTRACT COSTING.

Meaning and various terms used in contract costing, Accounting for contract profit or loss of complete and incomplete contracts.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Conceptualize the contemporary issues in Cost Accounting

CO2: Apply various management accounting and cost accounting techniques to for planning and decision making

CO3: Solve specific problems on cost accounting and also guides them in decision making

CO4: Demonstrate the application of various management accounting techniques to all types of organizations for planning, decision making and control purposes in practical situations.

SUGGESTED BOOKS:

1. Cost and Management accounting	Jawaharlal	Tata McGraw Hill
2. Cost Accounting	Asish K. Bhattacharya	PHI
3. Cost Accounting	Jain and Narang	Kalyani Publishers
4. Cost and Management Accounting	M.N. Arora	Himalaya Publishing House

1. PROBABILITY DISTRIBUTION

Probability distribution, Binomial distribution, Poisson distribution, Normal distribution, choosing correct probability distribution.

2. CORRELATION ANALYSIS

Significance of measuring Correlation, Correlation and Causation, Types of Correlations, Methods of Correlation analysis.

3. REGRESSION ANALYSIS

Advantages of Regression analysis, Parameters of simple linear regression model, Methods to determine regression coefficients.

4. TIME SERIES AND FORECASTING

Meaning, Trend analysis, Variation in time series (Cyclical, seasonal, irregular), Forecasting and types.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Perform data analysis and interpretation

CO2: Use computer software to solve statistical problems and management science problems

CO3: Demonstrate the application of tools in real life situations

SUGGESTED BOOKS:

1. Fundamentals of Business Statistics	J. K Sharma	1 st Edition, 2010, Pearson
2. Statistics for Management	Richard L Levin & David S. Rubin	PHI
3. Statistical Methods	N. G. Das	M. Das & Co.

1. INTRODUCTION TO O.B.:

Definition, Elements, Nature, Scope, Contributing Disciplines to O.B., Challenges & Opportunities for O.B.

2. PERSONALITY WITH EMPHASIS ON EMOTION & MOODS:

a. Concept of Personality, Determinants, Types, (Introvert, Extrovert, Type A, Type B), Theories, (Trait, Self, Psychoanalytical, Social theories, Job-Fit), b. Emotion & Moods – Definition, Functions, Sources, Emotional Intelligence, OB Applications of Emotion & Mood.

3. PERCEPTION & MOTIVATION:

a. Concept, Influencing Factors, Process, The link between perception and Individual Decision Making in the organization. b. Motivation – Concept, Contemporary Theories (Vroom's Expectancy, Porter & Lawler theories), Application of Motivation (Employee Involvement).

4. ATTITUDES AND VALUES:

Definition, Importance, Attitude Formation, Major Job Attitudes – Job Satisfaction, Job Involvement, Organisational Commitment with emphasis on Job Satisfaction, Formation of Values; Types (Terminal versus Instrumental)

5. LEARNING:

Concept, Theories (Classical Conditioning, Operant Conditioning, Social Learning), Reinforcement Concept

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Apply the concepts of human behavior in organizations.

CO2: Apply the organizational behavior principles for motivating all the members of an organization to do their best.

CO3: Develop a good team and group cohesion.

CO4: Predict who among the employees have the potential to become leaders.

CO5: Set visions and goals of any organization.

SUGGESTED BOOKS:

1. Organisational Behaviour	S. P. Robbins	Pearson Publication
2. Organisational Behaviour-Text & Cases	Shekharan	Tata Mcgraw Hill
3. Organisational Behaviour	K.Aswathapa	Himalaya Publications

1. INDIAN BUSINESS ENVIRONMENT:

Concepts, Components, Significance of the study of Business Environment, Economic Environment and Economic System.

2. TECHNOLOGICAL, SOCIAL AND NATURAL ENVIRONMENT:

Meaning, Technological factors influencing business, Technology policy of the government, Meaning and Impact of society and culture on Business, Meaning an Impact of natural environment on Business.

3. ECONOMIC TRENDS:

Income, Savings and Investment, Industry, Money, Finance, Price (an overall idea)

4. PROBLEMS OF GROWTH:

Unemployment, Poverty Regional Imbalances, Social Inequality, Inflation, Industrial Sickness.

5. ROLE OF GOVERNMENT:

Monetary and Fiscal Policy, Industrial Policy, Industrial Licensing, Trade Policy Privatization Disinvestment, NITI Aayog.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Analyze the factors which can affect the business decision making and to identify the stakeholders and analyze their behaviour

CO2: Critically analyze situations for forward thinking through innovation

CO3: Identify the nature and complexity of the competitive environment, the technological environment, the dynamic and multifaceted social environment, the legal environment and the political issues that may have a potential impact on business organizations.

CO4: Conceptualize the theories and models that provides a fundamental building block of business as well as blending theory with practical scenarios

CO5: Develop creativity and innovative thinking to make good decisions in a complex global environment by correctly identifying problems and opportunities, analyzing alternatives properly, and making the best choices in a given condition.

SUGGESTED BOOKS:

1. Essentials of Business Environment	K. Aswathappa	Himalaya Publishing House
2. Economic Environment of Business	M. Adhikary	Sultan Chand & Sons
3. Business Environment	Shaikh Saleem	Pearson
4. Business Ethics & Professional Values	A. B. Rao	Excel Books

Basic Computer Skill I	CSK I
3 - 0 - 1: 4 Credits	Prerequisites: None

Course Outcomes:

On successful completion of the course students will be able to

CO1: Apply the knowledge of computer architecture and its functioning

CO2: Apply the knowledge of Hardware, Software, Programming languages, Peripheral devices, Internet and utilization of computes in our modern society.

CO3: Apply the knowledge of computer network and networking devices.

CO4: Use Office Packages to organize, compute, manage and present data and information in academic as well as commercial purpose.

Course Content:

- a. History of Computers, evaluation of computers, Generations of computers
- b. Structure of computers (H/w and S/w), types
- c. Applications of computers
- d. Idea of algorithm
- e. Basics of Programming language
- f. Internet
- g. Office Package (Word/Excel/Power point):
 - i. Word - Features, word menu, table, page setup, background, font, paragraph, formatting, symbol, equation, formatting of numbers, Mail-merge, protected document.
 - ii. Excel- Features, cell, worksheet, workbook, excel menu, simple formulas with basic functions - avg, sum, min, max, if, sqrt, mod etc, sorting, chart.
 - iii. Power point - Features, ppt menu, creation of slides, animation, slide transition, auto presentation and mouse click presentation.
- h. Introduction to open-source software

Text book: 1. 'Introduction to Computer Science', IITL Education Solutions Limited, 2nd Edition, Pearson publication

2. 'Fundamentals of Computers' by P.K. Sinha, BPB publication

BBA (3rd Semester)

BMGT 301C

ORGANIZATIONAL BEHAVIOR 2

1. STUDY OF GROUP BEHAVIOUR:

Definition of Group, Classification, Importance, Stages of Group Development, Group Properties, Group Decision Making.

2. COMMUNICATION & LEADERSHIP:

a. Communication: Concept, Functions, Process, Direction of Communication, Interpersonal and Organizational Communication. b. Leadership: Concept, Styles, Theories (Trait and Behavioral Ohio State Studies, Michigan Studies), Concept of Managerial Grid.

3. STUDY OF ORGANIZATION:

Concept, Types, Importance, Organizational Designs (Simple, Bureaucracy and Matrix), New Designs (Team Structure, Virtual Organization)

4. ORGANISATIONAL CHANGE AND DEVELOPMENT:

An Overview of Organizational Effectiveness, Change and Development, Approaches to Manage Organizational Change and Development (Lewin 3 Stage Model, Action Research, OD), organizational Change and Development in Indian Scenario.

5. SOME WELL KNOWN STUDIES:

Hawthorn study, Lippit and White, Coch and French and practicing few case studies from Indian perspective.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1. Apply the concepts of human behavior in organizations.

CO2. Apply organizational behavior principles for motivating all the members of an organization to do their best.

CO3. Apply organizational behavior in developing a good team.

CO4. Interpret the organizational behavior patterns predicting who among the employees have the potential to become leaders.

CO5. Apply the expertise of achieving highest productivity in realizing the visions and goals of any organization.

SUGGESTED BOOKS:

1. Organisational Behaviour	S. P. Robbins	Pearson Publication
2. Organisational Behaviour	Robbins, Judge, Sangchi	Pearson Publication
3. Organisational Behaviour-Text & Cases	Shekharan	Tata Mcgraww Hill
4. Organisational Behaviour	K. Aswathapa	Himalaya Publications
5. Understanding Organisational Behaviour	Udai Pareek	Oxford University Press

1. INDIAN CONTRACT ACT, 1872:

Introduction, essentials of a valid contract, classification of contract according to their enforceability, Formation and Performance, offer and Acceptance, consideration, capacity to contract, Free consent - Coercion, Undue influence, void voidable unenforceable and illegal Agreements', discharge of contract termination of contract, Breach of contract - Remedies, Damages, Indemnity, guarantee.

2. SALE OF GOODS ACT, 1930:

Formation of contracts of sale, goods and their classification, price, conditions and warranties, transfer of property in goods, performance of the contract of sale, unpaid seller and his rights, sale by auction, hire purchase agreement, Sales & Agreement to Sale.

3. NEGOTIABLE INSTRUMENTS ACT, 1881:

Definitions and features of different types of negotiable instruments (promissory note, bill of exchange and cheque), parties to a negotiable instrument and their capacity, holder and holder in Due course, crossing of a cheque, types of crossing, Banker and Customer, negotiation, Dishonour and discharge of negotiable instrument.

4. COMPANIES ACT, 2013:

Nature and kind of companies, formation, Memorandum and Articles of Association - contents, procedures for allegation, prospectus, capital shares, debentures, borrowing powers, minimum subscription, etc.

5. LAWS RELATING TO PATENTS, TRADEMARKS AND COPYRIGHTS:

A general idea

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Conceptualize the India Legal System.

CO2: Devise the important business laws, the knowledge of which is essential for modern Business.

CO3: Apply the expertise of law on different business decisions and situations.

CO4: Apply legal knowledge that will help business leaders attain a competitive edge and promote long-term success.

CO6: Evaluate the legal system that may affect a business setting, particularly in the areas of

Contract law, Sales of goods act, Company act and government regulation of business.

SUGGESTED BOOKS:

1. Commercial and Industrial Law	Dr. N. D. Kapoor	S. Chand and Sons
2. Company Law		Taxman
3. Business Law	P.S.H Pillai, Bagavathi	S.Chand and Co. Ltd
4. Business Law	Bulchandani	Himalaya Publishing House
5. Business Law	S.N.Maheshwari	Himalaya Publishing House

UNIT 1: Introduction to Financial Management- Meaning, Need and ;objectives of Financial Management; Goal of a Firm; Profit Maximization V/s Wealth Maximization; Concept of Valuation; Valuation of Equity Share; Valuation of Preference; Valuation of Debenture. **Time Value of Money-** Basic concept viz. compounding, discounting; Present Value of a Single Amount; present Value of an annuity; Future value of a Single Amount; Future value of an annuity.

UNIT 2: Capital Structure- Meaning and Importance of Capital Structure; Factors determining capital structure; Theories of Capital Structure viz. Net Income Approach, Net Operating Income Approach, Traditional Approach, Modigliani and Miller Approach; Factors influencing capital structure; EBIT& EPS analysis; Leverages (Operating Leverage, Financial Leverage, Combined Leverage).

UNIT 3: Cost of Capital and Capital Budgeting-Meaning and significance of cost of capital; Calculating cost of debt, Preference shares, equity capital, and retained earnings; Combined (weighted) cost of capital; Capital expenditure decisions; Pay-back period; return on investment; discounted cash flow.

UNIT 4: Working Capital Management- Nature, Significance and classification of Working Capital; operating cycle and factors determining of working capital requirements (including problems); Management of working capital – cash, receivables, and inventories (Problems).

UNIT 5: Dividend Policies- Meaning and concept, Determination of dividend policy, Dividend Policy Models viz. Walter’s model, M.M. Hypothesis, Gordon’s Model (Problems).

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Apply finance related skills in business enterprises.

CO2: Apply optimal strategies for the management of working capital and satisfaction of long term financing requirements.

CO3: Apply the tools and techniques which help in making financial decisions of the business and there by lead to achieving the goal of business-‘Wealth Maximisation’.

CO4: Evaluate valuation, investment decisions, leverage and dividend decisions, and working capital management.

CO5: Identify and analyze financial sources, instruments, and markets.

CO6: Apply the tools and techniques for capital budgeting, capital structure, time value of money, valuation of shares, working capital, and capital asset pricing models.

Suggested Books:

- i. Financial Management: I.M.Pandey, Vikas Publications.
- ii. Basic Financial Management: Khan & Jain, Tata McGraw Hill.
- iii. Financial Management (Text and cases): Khan & Jain, Tata McGraw Hill.

1. MARKETING PRINCIPLES AND SOCIETY:

Definition of Marketing, Importance, Scope, Core Marketing Concepts – Needs, Wants and Demands, Various concepts of Marketing, Integrated Marketing, Analyzing Macro Marketing Environment, Environmental Scanning.

2. MARKETING RESEARCH AND MARKETING INFORMATION SYSTEMS:

Meaning of Marketing Research, Process, Barrier in Marketing Research, Marketing Information System.

3. MARKETING PSYCHOLOGY & CONSUMER BUYING BEHAVIOUR:

Creating customer value, Satisfaction & Loyalty, Model of Consumer Behavior, Consumers use or Disposal of Products, Business Buying Process.

4. IDENTIFYING MARKET SEGMENTS AND TARGETS:

Segment Marketing, Niche Marketing, Local Marketing, Individual Marketing, Consumer Market Segmentation Bases, Business Market Segmentation Bases, Market Targeting, Market Fragmentation and Consolidation.

5. DEALING WITH COMPETITION:

Identifying Competitors, Analyzing Competitors, Competitive Strategies for Market Leaders, Other Competitive Strategies.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Identify and analyze marketing problems.

CO2: Apply critical judgement in solving marketing related problems.

CO3: Identify and apply new ideas, methods and ways of thinking.

CO4: Analyze marketing information and research to identify marketing opportunities and/or solve marketing problems.

CO5: Identify consumer behaviour, buying decision process and factors affecting the process and apply this knowledge for finding the factors to boost sales for the organizations.

CO6: deal with competitive challenges.

CO7: Demonstrate and apply marketing management tools and techniques.

SUGGESTED BOOKS:

1. Marketing Management	Kotler, Keller, Koshi and Jha
2. Marketing	Paul Baines, Chris Fill, Kelly Page
3. Marketing Management	Ramaswamy, Namakumari
4. Marketing Management	Tapan K. Panda
5. Marketing 3.0	Kotler, Kartajaya, and Setiawan

1. CONCEPT OF HUMAN RESOURCE MANAGEMENT:

Meaning, Definition, Nature, Scope, Objectives, Importance, Functions, Qualities and Role of HR Manager, HRM- A Line or Staff Function, Difference between Personnel Management & Human Resource Management.

2. HUMAN RESOURCE PLANNING:

Meaning, Definition, Objectives, Importance, Levels of HRP, Process, Barriers to HRP, Requisites for successful HRP.

3. JOB ANALYSIS AND DESIGN:

Meaning, Uses, Process, Methods of Data collection, Concept of Job Design, Techniques.

4. RECRUITMENT AND SELECTION:

Recruitment: Definition, Factors affecting Recruitment, Sources, Process; Selection: Meaning, Definition, Process.

5. TRAINING & DEVELOPMENT:

Placement, Induction, Socialization, Training and Development: Concept, Objectives, Benefits, Need, Steps, Methods.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Apply the knowledge of human resource management in various organizations.

CO2: Apply various HR tools and techniques to solve HR related issues.

CO3: Analyze the strategic issues related to HR

CO4: Apply the strategies to select and develop manpower resources.

SUGGESTED BOOKS:

1.	Human Resource Management (Text & Cases)	K.Asathappa	Tata Mcgraw Hill
2.	Human Resource Management	N.K.Singh	Excel Books
3.	Human Resource Management	P.Subba Rao	Himalaya Publications
4.	Human Resource Management	Saiyadain	Tata Mcgraw Hill

BBA (4th Semester)

BMGT 401C

RESEARCH METHODOLOGY

1. INTRODUCTION TO RESEARCH METHODOLOGY:

Meaning, Objectives, Types of Research, Importance, Approaches, Research Process, criteria of a good Research.

Features of a good Design, Different Research, Designs, and Basic Principles of Experimental Designs.

2. SAMPLING DESIGN:

Census Vs Sample survey, steps in sampling Design, Criteria for selecting a sampling procedure, Types of Sample Design, Simple Vs Complex Random sampling Designs & Techniques.

3. MEASUREMENT & SCALING TECHNIQUES:

Measurement in Research, Measurement Scales, Errors in Measurement, Measurement Tools, Meaning of Scaling, Scale classification Bases, Scale Construction Techniques.

4. METHODS OF DATA COLLECTION:

Types of data, Collection of Primary Data, Difference between questionnaires & schedules, some other methods of data collection, Collection of Secondary data, Selecting Appropriate data collection method, Guideline for Constructing questionnaire/ Schedule, Guideline for successful interviewing, Difference between survey & Experiment.

5. TESTING OF HYPOTHESES AND REPORT WRITING:

Definition Hypotheses, Testing of Hypotheses, Procedure for hypothesis Testing, Measuring the Power of a Hypothesis Test, Important Parametric Test: Student's T test, ANOVA, Chi-Square test.

Meaning of Interpretation, Technique of interpretation, Precaution in Interpretation, Significance of Report writing, Different steps for Report writing, layout of the Research Report, Precautions for writing Research Report, Role of Computer in Research.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Determine the basic research techniques, which are expected to be implemented during on the job training (OJT).

CO2: Analyze business problems, identify and develop appropriate research designs, and use appropriate statistical techniques.

CO3: Identify a business problem and solve a business research problem using qualitative and quantitative techniques.

CO4: Analyze the problems using various statistical tools and techniques with the help of statistical softwares such as Statistical Package for the Social Science (SPSS).

CO5: Write reports and present effectively.

SUGGESTED BOOKS:

1. Research Methodology	C.R. Kothari	New Age
2. International Business Research Methods	Zikmund, Berry, Babin	South Western
3. Statistics for Management	Richard L Levin, David S Rubin	PHI

1. PRODUCTS, SERVICES AND BRANDING DECISIONS:

Product Levels, Classifications of Product, Product Life-Cycles and Marketing Strategies, New Product Development Process, New Product Adoption Process, Product Mix and Product Mix Decisions Branding: Definition of Brand, Types of Brands, Branding Strategies, Brand Equity, Brand Equity Models, Building Brand Equity, Managing Brand Equity, Packaging, Labelling, Brand Positioning.

2. DEVELOPING PRICING STRATEGIES AND PROGRAMS:

Pricing and Product Costs, Relationship between them. Setting Price, Adopting the Price, Responding to Price Changes.

3. DESIGNING AND MANAGING INTEGRATED MARKETING CHANNELS:

Definition of Marketing Channel, Importance, Hybrid Marketing Channel, Channel Functions and Flows, Channel Levels, Channel Design Decisions, Channel Management, Channel Integration, Retailing, Wholesaling, Market Logistics.

4. DESIGNING AND MANAGING INTEGRATED MARKETING COMMUNICATIONS:

IMC to Build Brand Equity, Communication Process Models, Developing Effective Communication, Marketing Communications Mix and Implementation of IMC Tools.

5. MARKETING ETHICS:

Ethics and Marketing, Ethical Decision Making Process, Distribution Management and Ethics, Promotion and Ethics, Products and Ethics, Pricing and Ethics.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Demonstrate the consumer behavior, buying decision process and factors affecting the process and apply this knowledge for finding the factors to boost sales for the organizations.

CO2: Deal with competitive challenges.

CO3. Evaluate the 4 Ps Product, Price, Place and Promotion (marketing mix)

CO4: Apply various marketing management tools and techniques.

SUGGESTED BOOKS:

1. Marketing Management	Kotler, Keller, Koshi and Jha
2. Marketing	Paul Baines, Chris Fill, Kelly Page
3. Marketing Management	Ramaswamy, Namakumari
4. Marketing Management	Tapan K. Panda
5. Marketing 3.0	Kotler, Kartajaya, and Setiawan

1. PERFORMANCE AND POTENTIAL APPRAISAL:

Meaning, Objectives, Process, Methods, Problems, Making Performance Appraisal Effective, Steps to Appraise Potential.

2. WORKERS PARTICIPATION IN MANAGEMENT (WPM):

Definition, Meaning, Objectives, Levels, Forms, Why WPM fails? Making WPM Effective.

3. EMPLOYEE GRIEVANCES MANAGEMENT:

Employee Discipline: Concept, Features, Objectives, Types, Causes of Indiscipline, Approaches, Disciplinary Actions, Code of Discipline. Employee Grievances: Concept, Form, Causes, Effects, Model Grievance Procedure, Guideline for handling Grievances, Absenteeism; Causes and Control.

4. INDUSTRIAL DISPUTES MANAGEMENT:

Industrial Relations: Concept, Scope, Objectives, Importance, Causes for Poor Industrial Relations, Developing Sound Industrial Relations; Industrial Disputes: Concept, Forms, Causes, Prevention, Settlement.

5. JOB STRESS, COUNSELLING MENTORING:

Meaning, Nature, Symptoms, Causes & Management of Stress, Introduction, Objectives, Benefits of Counselling, Mentoring.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Deal with competitive challenges.

CO2. Apply the knowledge of human resource management in the organization.

CO3. Solve the issues of disputes and grievances among the employees.

SUGGESTED BOOKS:

1.	Human Resource Management (Text & Cases)	K.Asathappa	Tata Mcgraw Hill
2.	Human Resource Management	N.K.Singh	Excel Books
3.	Human Resource Management	P.Subba Rao	Himalaya Publications
4.	Human Resource Management	Saiyadain	Tata Mcgraw Hill

1. OPERATIONS MANAGEMENT: TRENDS AND ISSUES

Manufacturing trends in India, Services as part of Operations Management, Operations management: A system perspective, challenges in operations management
Determinants of Process Characteristics in Operations, Types of Processes and operations Systems, Layout Planning, Implications of layout planning, Types of layouts, Design of Process Layout, Design of product layouts.

2. TOTAL QUALITY MANAGEMENT

The quality revolution, Quality Gurus, Definitions of quality, Total Quality Management, Quality management tools, Quality certifications and Awards, Design of quality assurance systems.

3. FACILITIES LOCATION

Globalization of operations, Factors Affecting Location Decisions, Location Planning Methods.

4. INVENTORY PLANNING AND SIX-SIGMA

Inventory Planning for independent Demand Items, Types of inventory, Inventory Costs, Inventory Control for Deterministic Demand Items, Handling uncertainty in Demand, Inventory control systems, Selective control inventory, Inventory Planning for Single-period Demand.

The Six-Sigma approach to Quality Control Management, Defects Per million Opportunities (DPMO), Organizations for Six-Sigma Quality, Process Control Fundamentals, Setting up a process Control System, Process improvement in the Long run, Six sigma and the process capability.

5. SCHEDULING OF OPERATIONS

The Need for Scheduling, Scheduling : Alternative Terms, The Loading of Machines, The Scheduling Context, Scheduling of Flow shops, Scheduling of Job shops, Input-Output Control.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Articulate the analysis, decision making and implementation issues of managing the operational aspects of any organization.

CO2: Apply the tools necessary to effectively manage manufacturing operations of an organization.

CO3: Design strategies for managing and executing the operational aspects of an organization.

CO4: Apply the techniques of Total Quality Management (TQM), Six Sigma, Lean and Maintenance Management.

CO5: Design manufacturing processes and service systems and carry out the inventory planning & control.

CO6: Perform production planning and carry out forecasting, capacity management.

SUGGESTED BOOKS:

1.	Operations Management: Theory & Practice	B. Mahadevan	Pearson Education
2.	Operations Management	Heizer	Dorling Kindersley
3.	Operations Management for Competitive Advantage	Chase-Jacobs-Aquilano	TMH

BMGT 405C ENTREPRENEURSHIP DEVELOPMENT AND SMALL BUSINESS FUNDAMENTALS

ENTREPRENEURSHIP DEVELOPMENT:**1. ENTREPRENEURSHIP:**

Concept, Entrepreneurial qualities and desirable characteristics of an effective Entrepreneur, Types of Entrepreneur, Significance of Entrepreneur in economic growth, Functions of an Entrepreneur, Scope and Importance of Entrepreneurship as career, Theories of Entrepreneurship,

2. ENTREPRENEURIAL SYSTEM:

Search for business ideas, Idea processing, Role of Innovation in Entrepreneurship, Entrepreneurial motivation, factors determining entrepreneurial growth

SMALL BUSINESS FUNDAMENTALS:**3. SMALL BUSINESS:**

Introduction, Definition as per MSMED Act, 2006, Characteristics, Objectives, Significance, Problems and Present position, Sickness in Small Business.

4. LEGAL AND TAX CONSIDERATIONS:

Registration, Provisional Registrations, Permanent Registrations, Licensing. Tax Benefits under Different Act with Special reference to North East Industrial Investment Promotion Policy (NEIIPP), 2007

5. GOVERNMENT AND NON-GOVERNMENT ASSISTANCE AND POLICIES:

National Policies and Incentives including subsidies by Central and State Governments; Role of IDBI, IFCI, SFC, NABARD, KVIC, SIDBI, SIDO, NSIC, DIC, IIE.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Develop and apply working knowledge of the principles of entrepreneurship to analyze and solve the problems.

CO2: Start, create, manage a venture or Business.

CO3: Identify and apply the elements of entrepreneurship and entrepreneurial processes.

CO4: Write a business plan that involves creating and starting a new venture.

SUGGESTED BOOKS:

1.	Management and Entrepreneurship, 1/e	Kanishka Bedi	Oxford University Press
2.	Competing through innovation: Essential Strategies for Small and Medium – sized firms.	Bertrand Bellon, Graham Whittington	PHI
3.	Exploring Entrepreneurship: Practices and Perspective, 1/e	Richard Blundel & Nigel Lockett	Oxford University Press
4.	Small scale Industries and Entrepreneurship	Vasant Desai	Himalaya Publishing

BBA (5th Semester) MARKETING MANAGEMENT

BMGT 501C

CONSUMER BEHAVIOR

1. INTRODUCTION TO CONSUMER BEHAVIOUR:

Introduction, Evolution of Consumer Behaviour, Factors affecting Consumer Behaviour, Scope & Application, Models of Consumer Behaviour (Nicosia, Howard-Sheth Model), Communication & Consumer Behaviour.

2. THE INFLUENCING FACTORS ON CONSUMER:

Personality: Nature, Theories (Freudian, Neo- Freudian, Trait), Brand Personality.

Motivation: Introduction, Dynamics of Motivation, Hierarchy of Need Theory, Motivational Research.

Learning: Elements, Theories (Classical Conditioning, Operant Conditioning, Observational Learning), Measurement of Consumer Learning.

Perception: Elements, Dynamics, Product Positioning, Perceived Price - Quality Relationship, Perceived Risk.

Attitude: Introduction, Models (Tri-component Attitude Model, Attitude – Towards - The – Ad – Model), Attitude Formation.

3. CONSUMER IN THEIR SOCIAL & CULTURAL SETTING:

Culture: Introduction, How Cultures are learned, Measurement of Culture.

Social: Introduction, Different Social classes in India, Measurement of Culture.

Situational: Introduction, Types of Situation (Purchase, Consumption, Communication), Situational influences on Consumer Behavior.

4. CONSUMER DECISION MAKING PROCESS:

Introduction, Levels, Model of Consumer Decision Making, Gifting Behavior, Post Purchase Behavior.

5. CURRENT & RELATED ISSUES:

Organisational Buying Behavior: Introduction, organizational Buyer Characteristics, Process; Consumerism; e-Commerce & Consumer Behavior.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Evaluate and analyze various psychological factors in shaping consumers purchase behavior

CO2: Evaluate and analyze socio-logical factors in shaping consumer behavior

CO3: Evaluate and analyze factors affect consumer's purchase decision making process

CO4: Evaluate and analyze the sequential process a consumer undergoes while purchasing various goods and

services based on their level of involvement in a purchase process

5. Evaluate and analyze latest changes in technological space that is affecting consumer decision making process

SUGGESTED BOOKS:

1. Consumer Behaviour	Schiffman and Kanuk	PHI
2. Consumer Behaviour and Marketing Action	Henry Assael	Cengage Learning
3. Consumer Behaviour in Indian Context	P.C.Jain and Monika Bhatt	S.Chand
4. Consumer Behaviour-Text & Cases	Satish K. Batra & S. H. H. Kazmi	Excel Books

ADVERTISING

1. Introduction, Nature and Importance, Different Advertising Functions, Types of Advertising, Economic Aspects of Advertising, Legal and Ethical Aspects of Advertising, Criticism of Advertising, Setting Advertising Objectives and Budget.
Advertising and Communication (Communication Model – Basic and Advertising Communication Model), Role of Source, Encoding & Decoding of Messages, Media, Audience, Feedback, Noise.
2. Creative aspects of Advertising: Introduction, The Planning and Managing Creative Strategy, Copy (Concept, How to Write Copy for Print and Broadcast Media), Advertising Appeals, Layout Planning.
3. Advertising Media and Planning: Introduction, Different Types of Media, Media Planning and Scheduling, Advertising Campaign Planning.
Roles of Advertising Agency: Introduction, Types, Function, Layout, Advertising Agency and Client Relationship
Impact of Advertising: Consumer Behavior and Advertisement: Introduction, Cultural, Social and Behavioral Influence on Consumer Decision

SALES PROMOTION

1. Introduction, Concept, Nature, Function, Limitations of Sales Promotion, Reasons for Rapid Growth, Types of Sales Promotion Schemes.
Sales Promotion Objectives, Pull and Push Strategies, Sales Promotion and Consumer Behavior: Theories (Classical Conditioning, Instrumental Conditioning, Dissonance Theory), Consumer Decision Making Related to Sales Promotion
2. Sales Promotion Design: Promotion Choice, Approaches, Product Choice, Market Areas, Timing, Duration and Frequency;
Sales Promotion Budget: Concept, Various Techniques of Fund Allocation; Characteristics Successful Sales Promotion; Sales Promotion Effectiveness
Sales Promotion Schemes: Sample, Coupon, Price Off, Premium, Contests, POP, Trade Fairs and Exhibitions, Internet Promotion

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Demonstrate persuasive communication and influence consumer buying decision making

CO2: Apply the role of various communication sources in shaping consumers purchase decision making

CO3: Apply and design persuasive communication to lure consumers

CO5: Evaluate latest changes in technological space that is affecting consumer decision making process

SUGGESTED BOOKS:		
1. Advertising Principles and Practice	Wells, Moriarty, Burnett	Pearson Publication
2. Advertising Management	Jethwaney and Jain	Oxford University Press
3. Advertising and Sales Promotion	Kazmi and Batra	Excel Books
4. Advertising and Promotion	Belch and Belch	Tata McGraw Hill

1. INTRODUCTION TO RETAILING:

Definition, An overview of Indian Retail Industry, Global Concept, Functions performed by the Retailers, Changing Retail Land space, Growth of Retail in India, Opportunities & Challenges ahead.

Evolution of Retail Formats, Theories of Retail Development, Retail Lifecycle, Classification of Retail Stores, Franchising – A dynamic Retail opportunity

2. RETAIL STORE LOCATION:

Importance of Store Locations, Types of Locations, Steps in choosing a Retail Location, Legal considerations in Location Decisions, Trade Area Analysis.

3. RETAIL MERCHANDISING AND MERCHANDISE BUYING:

Definition, Evolution, Factors affecting Merchandising function, Functions of Merchandise Manager, Functions of a Buyer, Merchandise Planning.

Merchandise Buying process, Branding strategies, Category Management.

4. RETAIL PRICING & MERCHANDISE PERFORMANCE:

Considerations in setting Retail Price, Developing a Pricing Strategy, Price Adjustments, Pricing to increase sales, Analyzing Merchandise Performance, Gross Margin Return on Investment (RMROI)

5. STORE LAYOUT, DESIGN AND VISUAL MERCHANDISING:

Importance of Store design, Objectives of Store design, Store Layouts, Space Management, Visual Merchandising, Atmospherics, and Website Design Considerations.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Apply various formats in which the business of retailing can be conceptualized

CO2: Evaluate operational nuisance involved in managing multiple formats of retail business

CO3: Demonstrate the role of retail tools (e.g., visual merchandising, atmospherics, display, space management, in-store promotion etc.) play in shaping consumers retail purchase decision.

CO4: Evaluate the skills a retail professional must possess to become an entrepreneur in various store/non-store based retail formats

CO5: Apply technology for shaping retail business in the changing consumer behavior

SUGGESTED BOOKS:

1. Retailing Management	Michael Levy, Barton A Weitz, Ajay Pandit	The McGraw Hill
2. Retailing Management – Text & Cases	Swapna Pradhan	Tata McGraw Hill
3. Retail Management – A Strategic Approach	Barry Berman, Joel R. Evans	Pearson Education

BMGT 504C MARKETING RESEARCH

1. MARKETING RESEARCH FUNDAMENTALS:

Introduction to Marketing Research, Overview of Research, Application and Limitations of Marketing Research, Threats of Marketing Research, Marketing Information System, Marketing Decision Support System

2. MARKETING RESEARCH MANAGEMENT:

Importance of Research Management, Qualities of a Marketing Research Manager, Organizing Marketing Research Function, Evaluation and Control of Marketing Research, Market Research versus Marketing Research, Marketing Research and Marketing Management

3. DATA COLLECTION, SAMPLING AND INTERVIEWING:

a. Secondary Data (Evaluating Secondary Data, Sources of Secondary Data) b. Collection of Primary Data (Observation, Methods of Observation, Questionnaire, Designing questionnaire, Choice of Survey Method) c. Sampling Designs (Some Basic Terms, Estimation and Testing of Hypothesis, Advantages & Limitations of Sampling. The Sampling Process, Types of Sample Design, Characteristics of a Good Sample Design) d. Interviewing: Conditions for a successful Interview, Selection for Interviewers, Training of Interviewers, Qualitative Research

4. DATA PROCESSING, RESEARCH ANALYSIS AND REPORTING:

Data Processing, Data Analysis – Measures of Central Tendency, Testing of Hypothesis, Factor Analysis

5. SELECTED APPLICATIONS OF MARKETING RESEARCH:

a. Sales Analysis and Forecasting: Sales Analysis, the Concept of Market Potentials, Methods of Estimating Current Demand b. New Product Development and Test Marketing: New Product Development, Process and Test Marketing c. Advertising Research: Importance of Advertising, Need for Advertising Research

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Apply the meaning and significance of marketing research.

CO2: Identify and evaluate the significance of marketing research in the firm's overall marketing and strategic planning process.

CO3: Examine the process of designing marketing research, and use of a variety of techniques for analyzing data and its use for managerial decision making.

CO4: Present research findings to key stakeholders.

SUGGESTED BOOKS:

1. Marketing Research	G. C. Berry	Tata McGraw Hill
2. Marketing Research	Luck, D. J. & Rubin, R. S.	Prentice Hall
3. Marketing Research	Naresh K. Malhotra	Prentice Hall

A. FORMAT OF PROJECT REPORT**With general guidelines on how to write a Project Report**

- Consult your Guide from time to time, as well as whenever necessary, carry out suggested changes by your guide and then proceed for the next step.
- Do take the signature of your project guide as required on your progress report sheet.
- Work regularly with commitment and ensure you are following Project Report Activity Completion Schedule and avoid last minute's hustle.

Note: For any query contact your respective Project Guide / Class coordinator

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Solve any issue existing in an industry/sector by applying various scientific rigor

CO2: Analyze and interpret various problem specific data with a meaningful recommendation

CO3: Apply various statistical tools and techniques for data analysis

CO4: Apply various scientific methods (e.g., qualitative, empirical, experimental) through which a problem can be solved

CO5: Write the overall report of an enquired problem

**Schedule for Project Completion
Department of Business
Management Summer Training
Project Report**

S. No.	Activities to be Completed.	Signature with Date
1.	Initial discussions & finalization of title.	
2.	Finalization of chapter scheme.	
3.	Finalization of chapter 1 & 2	
4.	Finalization of chapter 3	
5.	Finalization of chapter 4 & 5	
6.	Final Draft	
7.	Approved draft shall go for binding	
8.	Final submission of report	

B. INSTRUCTIONS FOR TYPING/ PRINTING

The project report should be strictly prepared according to the following guidelines.

- **Finalization of the Project Report**
Student should obtain clearance from their respective guide before final printing of the final project report.
- **Paper**
The size of the paper sheet: A4
Typing should be done on one side of the paper.
- **Font**
Type: Times New Roman
Size: 12
- **Line Spacing**
Body of the text: 1.5 lines
List of tables/ graphs/ charts/ bibliography: Single Line
- **Alignment**
Title page: Centre
Chapter heading: Centre
Subheading: Left
Body of Text: Justify
- **Margins**
At the binding edge (Left): not less than 3 cm
Other margins (Right, Top, Bottom): not less than 2 cm.
- **Titles**
All titles and subtitles should be printed in BOLD.
All the Tables/ Graphs/ Charts/ should have appropriate titles.
- **Numbering of the Tables/Graphs/Charts**
Tables/ Graphs/ Charts should be numbered in the following fashion. Second table/ Graph/ Chart in Second Chapter should be numbered as Table/ Graph/ Chart No 2.02 where first digit stands for Chapter No. and digits after (.) period stand for serial number of Table/ Graph/ Chart in that chapter. Same numbering system should be followed for other chapters. Tables/ Graphs/ Charts must be followed by proper explanation and analysis.
- **Pagination**
The title page should not carry any page number.
For initial pages (i.e. from student's declaration to Executive Summary) numbers should be given in small Roman Numbers. (Like i, ii,iii,iv etc.)
Report should contain main page numbers (i.e.1, 2.....) after Executive Summary.

Main page numbers should start from first page of Chapter 1 and will continue until last page of the report.

Page numbers are to be given at the center of bottom of the page.

Pages separating Chapters should not be numbered but be counted.

- **Binding of the report**

The project should be hard bound with golden embossing as per the standard format

- **Number of copies to be prepared**

2 Hard copies and 1 soft copy (C.D.)

- **Before submission**

Students must sign Declaration and Acknowledgement before putting for the signature of the Guide.

C. TITLE OF THE PROJECT REPORT

Title of the Project Report (14, Title Case, Bold)

Submitted in Partial Fulfilment for the Award of the

Degree of Bachelor in Business Administration YYYY-YYYY (14, Bold)

Under the Guidance of: (14, Bold)

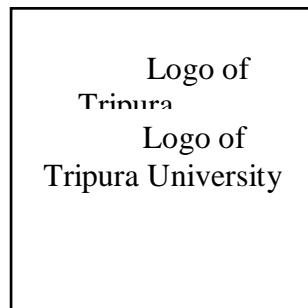
Name of the Guide from Institute (14 size)

Designation (14 size)

Submitted By: (14, Bold)

Name of the Student (14 size)

University Enrolment No. (14 size)



Department of Business Management (14, Bold)

Tripura University (A Central University) (14 size)

Suryamaninagar, Agartala, Tripura (W), Pin-799022 (14 size)

D. WRITING THE SUMMER PROJECT REPORT

- Student's Declaration
- Certificate from the Company
(Mandatory if the Project is External. Otherwise required only for the students who are doing their Internal Projects in any outside organization/ Company)
- Certificate from the Guide
- Acknowledgements
- Executive Summary
- List of Tables
- List of Charts
- List of Graphs

Table of Contents

Chapter 1 - Introduction to the topic

About the company/ topic (include details like product mix, marketing mix, HR policies, etc) according to the need of the project

Chapter 2 - Methodology

Research Design (Exploratory, Analytical etc.)

Data Collection

Primary and Secondary data

Instruments for Data Collection (Questionnaire, Inventories, Interview etc.)

Method for Data Collection (Shopping Mall Intercept, Telephone, E-mail etc.)

Chapter 3

Findings & Analysis Chapter 4

Conclusions

Chapter 5 Recommendations / Suggestions

Chapter 6 Limitations of the Study

- Bibliography
- Annexure
 - 1. Questionnaire (If Applicable)
 - 2. Miscellaneous :
- Schedule for Project completion.

E. STUDENT DECLARATION

STUDENT DECLARATION

(On plain paper)

This is to certify that I have completed the Summer Project titled “(title of the project)” under the guidance of “(name of the guide)” in partial fulfilment of the requirement for the award of Degree of Bachelor of Business Administration at Department of Business Management, Tripura University (A Central University), Suryamaninagar, Agartala, Tripura (W). This is an original piece of work & I have not submitted it earlier elsewhere.

Date:

Signature:

Place:

Name:

University Enrollment No.:

F. CERTIFICATE FROM THE INSTITUTE GUIDE

CERTIFICATE FROM THE INSTITUTE GUIDE

This is to certify that the summer project titled “_____” is an academic work done by “_____” submitted in the partial fulfilment of the requirement for the award of the degree of Bachelor of Business Administration at Department of Business Management, Tripura University (A Central University), Suryamaninagar, Agartala, Tripura (W), under my guidance & direction.

To the best of my knowledge and belief the data & information presented by him/ her in the project has not been submitted earlier.

Signature:

Name of the Faculty:

Designation:

G. BIBLIOGRAPHY

Word or list of the words referred in a text or consulted by you for writing report. It should be arranged in alphabetical order by name of the authors.

For books

Name of the author (last name first) Title of the book, Edition, year of publication, No of Vol. (if any) Name and place of publisher.

Example:

Kothari, C.R. Research methodology, 3rd edition, 1997, Vikas Publishing House Pvt. Ltd, New Delhi.

For Research Papers, Published articles, Magazines, Periodicals, Journals, Newspaper etc. Name of the author (last name first), Title of the article, (in quotation mark) Name of the Journals/ Periodicals/ Magazines etc in italics, Volume number, year, Page numbers.

Example: Wortman, Maxs (Jr.) “Entrepreneurship: An Integrating Typology and Evaluation of the Empirical Research in the field”, *Journal of Management*, Vol.13 (2), 1967, pp 259-279.

Online published material on World Wide Web (Alphabetically arranged Webliography)

Name of the Website, Date and time of referring the Website, Name of the Author, Title/ Topic

H. ATTENDANCE SHEET

DEPARTMENT OF BUSINESS MANAGEMENT TRIPURA UNIVERSITY (A CENTRAL UNIVERSITY)

Attendance Sheet

Name of the Student : _____

University Enrolment No. : _____

Name of the Supervisor from the Industry : _____

S. No	Date	Time	Progress Report	Signature of the student	Signature of Supervisor (Institute)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

***Minimum (8 out of 10) 80% attendance compulsory.**

BBA (5th Semester) FINANCIAL MANAGEMENT

BMGT 506C

FINANCIAL STATEMENT ANALYSIS 1

1. INTRODUCTION:

Nature and Components of Financial Statement; Meaning and need for Financial Statement Analysis (FSA), Traditional and Modern Approaches to FSA, Parties interested in FSA, Limitations of Financial Statements

2. ANNUAL REPORT:

Contents and Structure, Additional Discussion and Analysis, Environment Report, Social Report, Shareholders' Information, Stock Market Data.

3. DISCLOSURE REQUIREMENTS AND NOTES TO FINANCIAL STATEMENTS:-

Regulatory framework of Corporate Financial Reporting, Director's Report, Auditor's Report, Notes to Accounts, Full Disclosure.

4. TECHNIQUES OF FINANCIAL STATEMENT ANALYSIS:

Income Analysis, Expenses Analysis, Comparative Statements, Common Size Statements, Trend Analysis, Accounting Ratios for FSA (Preparation and Interpretation).

5. FUNDS FLOW & CASH FLOW ANALYSIS:

Funds Flow Analysis: Different concepts of Fund, whether Depreciation is a Source of Funds or not, Preparation and Interpretation; Cash Flow Analysis: Meaning, Objectives, Merits and Limitations, Preparation and Interpretation of Cash Flow Statements (as per AS-3).

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Review and analyze company's financial statements and accounts to make better economic decision
CO2: Interpret income statement, statement of cash flows and fund flows for appropriate company decision towards profitability and sustainability

CO3: Evaluate organizational risks, performance and financial health.

CO4: Present financial situation of a firm in front of various stakeholders like investors, the government, the public and other decision makers.

CO5: Identify ethical issues in preparing and maintaining standards of various financial health analysis tools like balance sheet, cash and funds flow etc.

SUGGESTED BOOKS:

1.	Financial Statement Analysis	S.K.Paul	New Central Book Agency
2.	Financial Statement Analysis	G. Foster	PHI
3.	Financial Statement Analysis and reporting	.K.Gupta and R.K.Sharma	Kalyani Publishers.
4.	Students guide to Accounting Standards	R.S.Rawat	Taxmann Publication.

1. INDIAN FINANCIAL SYSTEM:

Meaning, nature and functions of financial system, Structure of Indian financial system, Components of Indian financial system

2. BASICS OF MONEY MARKET :

Meaning and Feature of money market, Participants in money market operations, Function of money market, Money market instruments: C-Paper, T-Bill, C-Deposits.

3. BASICS OF CAPITAL MARKET:

Meaning and feature and function of capital market, Instruments of capital market, Types of capital market and issue procedure, Stock exchange operations in India, Currents issues.

4. REGULATORS OF FINANCIAL MARKETS.

Role of RBI in promoting money market, Current scenario and issues.

Role of SEBI in promoting capital market and protecting the interests of investors, Current issues.

5. BASICS OF MUTUAL FUNDS OPERATIONS (MF).

Meaning, feature and importance of mutual funds, Organisation structure of mutual fund, Classification of mutual funds, Mutual fund operations in India, Current issues.

Course outcome and Objectives:

At the end of the course student will be able to

CO1: Analyze Indian financial markets including money markets and capital markets

CO2: Evaluate various money market avenues (organised and unorganised) like indigenous money lenders, RBI, commercial banks, and cooperative banking systems

CO3: Identify and evaluate various money market instruments like securities and insurance

CO4: Explore and evaluate the primary and secondary capital market avenues

CO5: Apply various means to raise finance

SUGGESTED BOOKS:

1.	Indian Financial System	M. Y. Khan	Tata McGrawHill
2.	The Indian Financial System	Bharti V. Pathak	Pearson Education
3.	Financial Institutions and Markets,	Meir Kohn	Oxford University Press
4.	Chanakya Niti - A Perspective to Investing in Shares	B L Mittal Ravi Kant Sharma	Taxmann Publication.

UNIT 1: Basic Concept and Definitions: Meaning and purpose of Income Tax; Nature of Income Tax; Assessee; Person; Assessment Year; Previous Year; Sources of Income; Heads of Income; Earned Income; Unearned Income; Gross Total Income; Total Income; Tax Evasion; Tax Avoidance; Rebate Relief.

UNIT 2: Residential Status, Tax incidence and Exempted Income: Residential status of all persons except company; Incidence of Tax; Exempted Income [U/S 10(11), 10(12), 10(11A), 10(12A), 10(13A), 10(23B), 10(23AAB), 10(23D), 10(25)].

UNIT 3: Profits and Gains of Business or Profession including Depreciation: Meaning of Business and Profession; Depreciation of Block of Assets as per IT rules; Computation of Business Income; Computation of Professional Income; Valuation of stock.

UNIT 4: Capital Gains: Meaning; Capital Assets; Types of Capital Assets; Period of holding of capital assets; Transfer not regarded as transfer; Computation of short term capital Gain and computation of long term capital gain (including exemption us 54).

UNIT 5: Introduction to Goods and Service Tax: Meaning of GST; Advantages and limitation of VAT-GST as preferred tax structure; salient features of GST model; Major advantages of IGST Model; Interstate Goods and Service Tax with illustration.

Note: The assessment year immediately prior to the current assessment year will be considered (e.g. if the examination is held on 2019-20, the assessment year to be considered for the purpose is 2018-19).

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Evaluate the taxes business must pay in performing a business operation.

CO2: Analyze business taxes like gross-receipts tax, excise tax, goods and services tax etc.

CO3: Calculate and analyze Income Tax

CO4: Evaluate tax evasion and possible consequences

CO5: Analyze the availing of various tax concessions

Suggested Readings:

1. Direct Tax & Law, Singhania and Singhania, Taxman.
2. Direct and Indirect Taxes, S.K.Roy, ABS publishing House.
3. GST Ready Reckoner, V.S. Datey, Taxman's.

1. Introduction:

Evolution, Meaning and Definition of Banking, Features, Classification of Banks, Banking System.

2. Reserve Bank of India:

Management and Administration, Functions, Monetary Policy, Credit Control and Methods of Credit Control

3. Nationalization of Banks in India:

Nationalization of major Commercial Banks, Reasons for Nationalization, Criticism and Achievements

4. Banking system in India: Commercial Banks:

Functions, Balance Sheet, Off Balance Sheet Items, Window Dressing, Investment Policy; Private and Foreign Banks: Importance, Recent Trends; Cooperative Banking, Regional Rural Banks (RRBs): Structure and Sponsorship, Objectives, Difficulties, Suggested Measures

5. Banking Functions:

Debit Card and Credit Card, Fund Management, Deposits and Liquidity Management, Management of Bank Loans, Non-Performing Assets (NPA)

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Analyze the role of regulators in functioning of Indian banking and insurance sector

CO2: Analyze the varied aspects of bank operations

CO3: Solve various ethical issues in banking and insurance operations including sales and marketing

CO4: Analyze the role of banking and Insurance sector in Indian economy

Suggested Readings:

1. Bank Management Vasant Desai Himalaya Publishing
2. Indian Banking S.Natatrajan & R. Parneswaram S.Chand & Sons

A. FORMAT OF PROJECT REPORT**With general guide lines on how to write a Project Report**

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Department of Business
Management Summer Training
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For initial pages (i.e. from student's declaration to Executive Summary) numbers should be given in small Roman Numbers. (Like i, ii,iii,iv etc.)
Report should contain main page numbers (i.e.1, 2.....) after Executive Summary.

Main page numbers should start from first page of Chapter 1 and will continue until last page of the report.

Page numbers are to be given at the center of bottom of the page.

Pages separating Chapters should not be numbered but be counted.

Binding of the report

The project should be hard bound with golden embossing as per the standard format

Number of copies to be prepared

2 Hard copies and 1 soft copy (C.D.)

Before submission

Students must sign Declaration and Acknowledgement before putting for the signature of the Guide.

C. TITLE OF THE PROJECT REPORT

Title of the Project Report (14, Title Case, Bold)

Submitted in Partial Fulfilment for the Award of the

Degree of Bachelor in Business Administration YYYY-YYYY (14, Bold)

Under the Guidance of: (14, Bold)

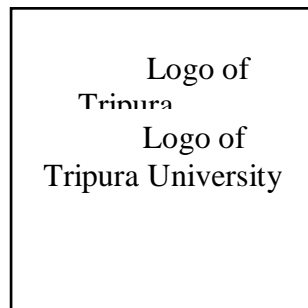
Name of the Guide from Institute (14 size)

Designation (14 size)

Submitted By: (14, Bold)

Name of the Student (14 size)

University Enrolment No. (14 size)



Department of Business Management (14, Bold)

Tripura University (A Central University) (14 size)

Suryamaninagar, Agartala, Tripura (W), Pin-799022 (14 size)

D. WRITING THE SUMMER PROJECT REPORT

- Student's Declaration
- Certificate from the Company
(Mandatory if the Project is External. Otherwise required only for the students who are doing their Internal Projects in any outside organization/ Company)
- Certificate from the Guide
- Acknowledgements
- Executive Summary
- List of Tables
- List of Charts
- List of Graphs

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About the company/ topic (include details like product mix, marketing mix, HR policies, etc) according to the need of the project

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Research Design (Exploratory, Analytical etc.)

Data Collection

Primary and Secondary data

Instruments for Data Collection (Questionnaire, Inventories, Interview etc.)

Method for Data Collection (Shopping Mall Intercept, Telephone, E-mail etc.)

Chapter 3

Findings & Analysis Chapter 4

Conclusions

Chapter 5 Recommendations / Suggestions

Chapter 6 Limitations of the Study

- Bibliography
- Annexure
 - 1. Questionnaire (If Applicable)

○ 2. Miscellaneous :

➤ Schedule for Project completion.

E. STUDENT DECLARATION

STUDENT DECLARATION

(On plain paper)

This is to certify that I have completed the Summer Project titled “(title of the project)” under the guidance of “(name of the guide)” in partial fulfilment of the requirement for the award of Degree of Bachelor of Business Administration at Department of Business Management, Tripura University (A Central University), Suryamaninagar, Agartala, Tripura (W). This is an original piece of work & I have not submitted it earlier elsewhere.

Date:

Signature:

Place:

Name:

University Enrolment No.:

F. CERTIFICATE FROM THE INSTITUTE GUIDE

CERTIFICATE FROM THE INSTITUTE GUIDE

This is to certify that the summer project titled “_____” is an academic work done by “_____” submitted in the partial fulfilment of the requirement for the award of the degree of Bachelor of Business Administration at Department of Business Management, Tripura University (A Central University), Suryamaninagar, Agartala, Tripura (W), under my guidance & direction.

To the best of my knowledge and belief the data & information presented by him/ her in the project has not been submitted earlier.

Signature:

Name of the Faculty:

Designation:

G. BIBLIOGRAPHY

Word or list of the words referred in a text or consulted by you for writing report. It should be arranged in alphabetical order by name of the authors.

For books

Name of the author (last name first) Title of the book, Edition, year of publication, No of Vol. (if any) Name and place of publisher.

Example:

Kothari, C.R. Research methodology, 3rd edition, 1997, Vikas Publishing House Pvt. Ltd, New Delhi.

For Research Papers, Published articles, Magazines, Periodicals, Journals, Newspaper etc. Name of the author (last name first), Title of the article, (in quotation mark) Name of the Journals/ Periodicals/ Magazines etc in italics, Volume number, year, Page numbers.

Example: Wortman, Maxs (Jr.) “Entrepreneurship: An Integrating Typology and Evaluation of the Empirical Research in the field”, *Journal of Management*, Vol.13(2), 1967,pp 259-279.

Online published material on World Wide Web (Alphabetically arranged Webliography)

Name of the Website, Date and time of referring the Website, Name of the Author, Title/ Topic

H. ATTENDANCE SHEET

DEPARTMENT OF BUSINESS MANAGEMENT TRIPURA UNIVERSITY (A CENTRAL UNIVERSITY)

Attendance Sheet

Name of the Student : _____

University Enrolment No. : _____

Name of the Supervisor from the Industry : _____

S. No	Date	Time	Progress Report	Signature of the student	Signature of Supervisor (Institute)
1					
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3					
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5					
6					
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8					
9					
10					

***Minimum (8 out of 10) 80% attendance compulsory.**

BBA (5th Semester) Human Resource Management

BMGT 511C – Human Resource Planning

- 1. Human Resource Planning:** Introduction, Definition, Objectives, Need, Importance, Barriers, Suggestions.
Strategic Human Resource Planning: Concept, Characteristics, Levels, Process, Requirements, and Benefits.
- 2. Job Analysis and Design:** Job Analysis – Meaning, Need, Process, Factors, Techniques of Data Collection, Uses & Limitations, Job Description & Job Specification, Job Design – Approaches, Process, Job Enrichment.
Job Evolution: Concept, Objectives, Procedure, Advantages, Drawback, Methods, Essentials of successful Job Evaluation Programme.
- 3. Recruitment and Selection:** Definition, Factors affecting Recruitment, Sources, Process. Selection-Meaning, Definition, Process, Methods of Recruitment and Selection.
- 4. Placement, Induction, Socialization, Dislocation, Relocation:** Meaning, Definition, Different Phases, Causes, Problems, solutions in regard to dislocation and relocation.
- 5. Internal Mobility and Separation:** Promotion, Transfer, Demotion, Separations.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Nurture and fit challenging organizational positions and judge and enhance competency in a human

CO2: Apply integration of character with competence for organizational success.

CO3: Apply the skill of various on-the-job and off-the-job training.

CO4: Play the role of leadership in nurturing future talents.

CO5: Analyze live cases on successful talent moulding initiatives in various firms.

SUGGESTED BOOKS:

1. Manpower Management	Dwivedi, R. S.	PHI
2. Human Resource Planning	D.K.Bhattacharya	Excel Books

BMGT 512C – Human Resource Development - 1

- 1. Human Resource Development - An Introduction:** Historical Development, Concept, Characteristics, Objectives, Need, Functions of HRD, HRD & Personnel Management.
- 2. HRD System:** Process of Designing HRD System, Principles in Designing HRD Systems, Factors Affecting HRD System Designing.
- 3. HRD Mechanism:** Prerequisite for HRD, Variable in HRD Mechanism, HRD Process, HRD Outcomes, Organisational Effectiveness.
- 4. HRD Climate & Culture:** Concept of Climate, Factors Affecting HRD Climate, Indian Culture and HRD, The Development Dimensions.
- 5. Behavioural Factors:** Personality, Attitudes, Values, Perception, Job Satisfaction, Frustration, Helping Behaviour, Co-operation, Competition, Conflict, HRD/ OD Interventions.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Nurture talent to fit challenging organizational positions.

CO2: Judge and enhance competency in a human.

CO3: Integrate character with competence for organizational success.

CO4: Apply the skills of various on-the-job and off-the-job training.

CO5: Play the role of leadership in nurturing future talents.

CO6: Analyze live cases on successful talent moulding initiatives in various firms.

Suggested Books:

1.	Human Resource Development	D.K Bhattacharya	Himalaya Publishing House
2.	Successful Application to HRD	IswarDayal	New Concept
3.	Management of change through HRD	Maheshwari, B.L. &Sinha, Dharni P.	Tata Mcgraw Hill

BMGT 513C - Wages and Salary Administration

1. **Wages Concepts:** Definition, Piece Rates, Cash a Kind; Salary, Earning, Compensation, Fringe Benefits, Dearness Allowance, Real Wages, Basic Wages, Labour Cost.
2. **Wage Administration:** Composition of Wages, Minimum Wages, Wage Structure, Wage Differentials
3. **National Income:** National Wage Structure
4. **Labour Economics:** Wage Theories, Supply, Demand and Wages; Labour Institutions and their effects on National Income
5. **Wage Fixation:** Criteria of Wage Fixation, Committees on Wages (Minimum Wage, Fare Wages and Living Wages)– need based minimum Wage Formula. Productivity Cost of Living, Capacity to Pay, Wage Comparison.
6. **Wage Machinery:** Employee Role; Tribunal Wage Board, Collective Bargaining

Course outcome and learning objectives:

At the end of the course student will be able to

- CO1: Evaluate the constituents of wage and salary and how these two are conceptually different.
- CO2: Perform salary fixation for deserving talents to ensure minimum turnover and attract more talents.
- CO3: Apply laws and regulations governing fixation of Wages and Salary.
- CO4: Fix salary for various positions in an organization based on skill required and challenges involved.
- CO5: Analyze ethical issues which need to be taken into account while fixing salaries of deserving talents.

Suggested Books:

1.	Understanding Waging System	A.M.Sharma	Himalaya Publishing House
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BMGT 514C –Labour Laws – 1

1. Introduction to Labour Legislation:

- a. Philosophy of Labour Law
- b. Labour Laws – Concept, Origin, Objectives
- c. International Labour Organisation
- d. Indian Constitution & Labour Legislation

2. The Factories Act 1948

3. Industrial Dispute Act 1947

4. Shops and Establishment Act

5. The Employee’s State Insurance Act 1948, Employee’s Provident Fund and Miscellaneous Provisions Act 1952

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Correct the imbalance of power between the worker and the employer;

CO2: Prevent the employer from dismissing the worker without good cause;

CO3: Set up and preserve the processes by which workers are recognized as 'equal' partners in negotiations about their working conditions.

CO4: Evaluate the judicial setup of Labour Laws.

CO5: Apply the salient features of welfare and wage Legislations.

CO6: Apply the laws relating to Industrial Relations, Social Security and Working conditions.

CO7: Apply the laws related to working conditions in different settings.

Suggested Books:

1.	Handbook of Industrial Law	Dr. N. D. Kapoor	Sultan Chand & Sons
2.	Industrial & Labour Law	S. N. Mishra	
3.	Industrial Laws (Bare Acts)		Taxmann Publication
4.	Industrial Relations & Labour Laws	B. D. Singh	

BMGT 515C – Project Report-I (Internal)

A. FORMAT OF PROJECT REPORT

With general guide lines on how to write a Project Report

- Consult your Guide from time to time, as well as whenever necessary, carry out suggested changes by your guide and then proceed for next step.
- Do take signature of your project guide as required on your progress report sheet.
- Work regularly with commitment and ensure you are following Project Report Activity Completion Schedule and avoid last minute's hustle.

Note: For any query contact your respective Project Guide / Class coordinator

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Solve any issue existing in an industry/sector by applying various scientific rigour

CO2: Analyze and interpret various problem specific data with a meaningful recommendation

CO3: Apply various statistical tools and techniques for data analysis

CO4: Apply various scientific methods (e.g., qualitative, empirical, experimental) through which a problem can be solved

CO5: Write the overall report of an enquired problem

Schedule for Project Completion Department of Business Management Summer Training Project Report

S. No.	Activities to be Completed.	Signature with Date
1.	Initial discussions & finalization of title.	
2.	Finalization of chapter scheme.	
3.	Finalization of chapter 1 & 2	
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B. INSTRUCTIONS FOR TYPING/PRINTING

The project report should be strictly prepared according to the following guidelines.

- Finalization of the Project Report**
Student should obtain clearance from their respective guide before final printing of the final project report.
- Paper**
The size of the paper sheet: A4
Typing should be done on one side of the paper.
- Font**
Type: Times New Roman
Size:12
- Line Spacing**
Body of the text:1.5 lines
List of tables/graphs/charts/bibliography: Single Line
- Alignment**
Title page: Centre Chapter
heading: Centre
Subheading: Left
Body of Text: Justify
- Margins**
At the binding edge (Left): not less than 3 cm
Other margins (Right, Top, Bottom): not less than 2 cm.
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Binding of the report

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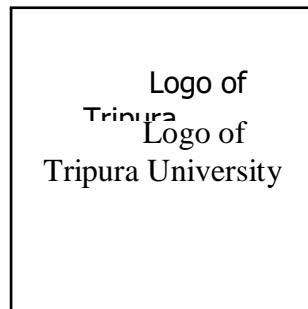
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Submitted By: (14, Bold) Name
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Department of Business Management (14, Bold) Tripura
University (A Central University) (14 size) Suryamaninagar,
Agartala, Tripura (W), Pin-799022 (14 size)

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Date:

Signature:

Place:

Name:

University Enrolment No.:

F. CERTIFICATE FROM THE INSTITUTE GUIDE

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To the best of my knowledge and belief the data & information presented by him/ her in the project has not been submitted earlier.

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Word or list of the words referred in a text or consulted by you for writing report. It should be arranged in alphabetical order by name of the authors.

For books

Name of the author (last name first) Title of the book, Edition, year of publication, No of Vol. (if any) Name and place of publisher.

Example:

Kothari, C.R. Research methodology, 3rd edition, 1997, Vikas Publishing House Pvt. Ltd, New Delhi.

For Research Papers, Published articles, Magazines, Periodicals, Journals, Newspaper etc. Name of the author (last name first), Title of the article, (in quotation mark) Name of the Journals/Periodicals/ Magazines etc. in italics, Volume number, year, Page numbers.

Example: Wortman,Maxs (Jr.) “Entrepreneurship: An Integrating Typology and Evaluation of the Empirical Research in the field”, *Journal of Management*, Vol.13(2), 1967,pp 259-279.

Online published material on World Wide Web (Alphabetically arranged Webligraphy)

Name of the Website, Date and time of referring the Website, Name of the Author, Title/Topic

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University Enrolment No. : _____

Name of the Supervisor from the Industry : _____

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8					
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10					

***Minimum (8 out of 10) 80% attendance compulsory.**

BBA (6th Semester) Marketing Management

BMGT 601C

SERVICES MARKETING

1. INTRODUCTION TO SERVICE INDUSTRY:

Concept, Nature, Types, Importance, Difference between Goods & Service, Factors responsible for growth of service sector, Service Marketing Triangle, Service Marketing Environment, Service Market Segmentation, Problem areas in Segmentation, Targeting & Positioning.

2. UNDERSTANDING SERVICE INDUSTRY:

Current Trends in Service Industry, Customer Relationship Marketing, Service Quality: Concept, Dimensions, GAP model of service quality delivery, Measurement of service quality, Total Quality Management & Quality Circle, Consumer Behaviour: concept, models of Consumer Behaviour in Service Industry (EKB & GAP model), Customer Expectation & Perception, Factors affecting customer expectation & perception.

3. SERVICES MARKETING MIX–I:

- a. The Service Product: Introduction, New Service Development, Service Life Cycle
- b. Pricing Strategies: Introduction, Pricing Objectives, Methods of Pricing Services
- c. Managing Distribution Channels: Introduction, Factors Affecting Choice of Distribution Channel, Managing Distribution Channels
- d. Promotional Strategies: Introduction, promotion Objectives, Promotion Planning & Strategy.

4. SERVICES MARKETING MIX –II:

- a. People: Introduction, Challenges of Managing People, Measuring Productivity of people in Service Organization
- b. Physical Evidence: Introduction, Servicescape, Managing Physical Evidence
- c. Process: Introduction, Service Blueprinting, Managing Demand & Supply.

5. APPLICATIONS OF SERVICE MARKETING:

Marketing of Financial, Hospitality, Medicare, Educational Sectors and Tourism

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Evaluate the current issues in services marketing and customer service strategies

CO2: Apply the effective customer relationship management and key service delivery elements

CO3: Evaluate service recovery strategies that lead to the successful implementation of a customer focus in service-based businesses

CO4: Interpret service behavior and service consumption in the light of service-dominant marketing logic and apply this knowledge to in designing and developing services

CO5: Analyze practical problems which come in delivery of services, and to apply the understanding of the strategies in overcoming these problems

SUGGESTED BOOKS:

1. Service Marketing-Text and Cases	Rajendra Nargundkar	Tata Mcgraw Hill
2. Service Marketing	Govind Apte	Oxford University Press
3. Service Marketing-The Indian Perspective	Ravishankar	Excel Books
4. Service Marketing-Text and Cases	Verma	Pearson
5. Service Marketing	S.N.Jha	Himalaya Publishing

1. RURAL MARKETING: INTRODUCTION

Defining rural markets, rural myths, The rural marketing mix: challenges, the evolving rural consumer, The evolution of rural marketing, the rural environment, the rural economic environment, the rural infrastructure, The rural Boom, The way forward, Rural Dividend

Telecommunication in Rural India, Information and Telecommunication technology (ICT) in rural areas, Financial Services in Rural India, Cloud Computing for Rural banking, Rural Healthcare services.

2. RURAL CONSUMER BEHAVIOR

The Consumer buying behavior model, the buyer decision Process, The product adoption process.

3. SEGMENTING AND TARGETING RURAL MARKETS

Segmentation, Targeting, Positioning.

4. PRODUCT AND PRICING STRATEGIES FOR RURAL MARKET

The product concept and the classification of Rural Products, Product decision and strategies, Product branding in rural markets, Packaging for rural markets, Product warranty and after sales service, New product development in rural markets.

Pricing for Rural India, Setting the price for rural products and services, price setting strategies.

5. DISTRIBUTION AND COMMUNICATION STRATEGIES FOR RURAL MARKETS

Availability: The Challenge and the Dilemma, Distribution channels, the rural retail environment. Channel behavior in rural areas.

Challenges for Rural Communication, The communication process: An overview, developing effective rural Communication

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Identify the rural consumer and rural market opportunities

CO2: Take decision relating to rural marketing mix and communication strategy

CO3: Identify the consumption habits of people in rural region

CO4: Identify the characteristics of rural market and evaluate the requirement of rural consumers

CO5: Develop specific approaches of marketing to the rural consumers

SUGGESTED BOOKS:

1. Rural Marketing	Pradeep Kashyap	PEARSON
2. Rural Marketing (Text and Cases)	C.S.J Krishnamacharyulu, lalitha Ramakrishnan	PEARSON
3. Introduction to Rural Marketing	R. Krishnamurthy	Himalaya Publishing House

1. DEVELOPMENT & ROLE OF SELLING IN MARKETING:

Nature & Role of Selling, Characteristics of Modern Selling, Success factor for Professional Sales People, Types of Selling, Nature & Role of Sales Management, Relationship between Sales & Marketing.

Environmental & Managerial Force Imparting Sales, Sales Channel, Selling for Resale, Selling Services, Sales Promotion, Exhibitions, Public Relations

2. SALES RESPONSIBILITIES & PERSONAL SELLING SKILLS:

Prospecting, Database & Knowledge Management, Self Management, Handling Complaints, Providing Service, Sales Preparation.

The Opening, Needs & Problem Identification, Presentation & Demonstration, Dealing Objection, Negotiation, Closing Sales, Follow-up

3. SALES FORCE MANAGEMENT:

Organisation for Recruitment & Selection, Sources of Sales Force Recruits, Pre Interview Screening, Formal Application Form, The Interview, Supplementary Selection Aids.

Motivation, Leadership, Training, Conclusions, Designing Sales Compensation Plan, Types of Compensation Plans, Fringe Benefits.

4. SALES QUOTAS:

Objectives in using Quotas, Types of Sales Quota & Procedure for Quota Setting, Administering the Quota Systems.

5. SALES FORCE EVALUATION:

Sales Force Evaluation Process, Purpose of Evaluation, Setting Performance Standards, Gathering Information, Measures of Performance, Appraisal Interviewing.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Apply the selling skills

CO2: Apply effective sales and distribution strategy

CO3: Manage marketing channels, and sales force

CO4: Manage delivery and intermediaries and planning territory

CO5: Analyze the sales budget, Sales quota and forecasting of sales

SUGGESTED BOOKS:

1. Selling & Sales Management	David Jobber, Geoffrey Lancaster	Pearson Education
2. Sales & Distribution Management - An Indian Perspective	Pingali Venugopal	Response Sage Publications Ltd
3. Sales Management Decisions, Strategies & Cases	Richard R. Still, Adward W. Cundiff, Norman A. P. Govoni	Prentice Hall

1. INTERNATIONAL MARKETING:

Definitions, Natures, Scope, Significance Transition from Domestic Marketing to International Marketing, International Marketing Environment (Internal and External).

2. IDENTIFICATION AND SELECTION OF ORIGIN MARKETS:

Global Market Segmentation, Decisions Relating Foreign Market Entry Mode, Barriers to Entry, International Positioning.

3. PRODUCT PLANNING FOR INTERNATIONAL MARKETS:

Product Design, Standardization vs. Adaptation, New Product Development, Branding, Packaging.

4. INTERNATIONAL PRICING:

Factors determining International Pricing Process, Pricing Methods, Pricing Policies and Strategies International Quotation and Terms of Payments.

5. PROMOTION OF PRODUCTS/ SERVICES ABROAD:

Direct Mail and Sales Literature, Advertising and Sales Promotion, Trade Fairs and Exhibitions, Personal Selling.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Analyze the issues involved in making international marketing decisions, including product, price, promotion, and place decisions to create a marketing mix.

CO2: Analyze the differences in global economic, cultural, social, political, and legal environments influence marketing decisions

CO3: Apply strategic thinking in the context of complex problems and challenges faced by executives and managers taking decisions in global and international marketing context

CO4: Identify and analyze various sources of information for research and evaluation of international markets.

CO5: Effectively communicate marketing issues in group discussions, oral presentations and written reports in a cross and multi-cultural environment

Suggested Readings:

1. International Marketing Management Bhattacharya and Varshney Sultan Chand
2. International Marketing Kripalini Prentice Hall
3. Ten Essence of International Marketing Paliwode Prentice Hall
4. Principle of Marketing Kotler & Armstrong Prentice Hall

A. FORMAT OF PROJECT REPORT**With general guidelines on how to write a Project Report**

- Consult your Guide from time to time, as well as whenever necessary, carry out suggested changes by your guide and then proceed for next step.
- Do take signature of your project guide as required on your progress report sheet.
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CO5: Write the overall report of an enquired problem

**Schedule for Project Completion
Department of Business
Management Summer Training
Project Report**

S. No.	Activities to be Completed.	Signature with Date
1.	Initial discussions & finalization of title.	
2.	Finalization of chapter scheme.	
3.	Finalization of chapter 1& 2	
4.	Finalization of chapter 3	
5.	Finalization of chapter 4 & 5	
6.	Final Draft	
7.	Approved draft shall go for binding	
8.	Final submission of report	

B. INSTRUCTIONS FOR TYPING/ PRINTING

The project report should be strictly prepared according to the following guidelines.

- **Finalization of the Project Report**
Student should obtain clearance from their respective guide before final printing of the final project report.
- **Paper**
The size of the paper sheet: A4
Typing should be done on one side of the paper.
- **Font**
Type: Times New Roman
Size: 12
- **Line Spacing**
Body of the text: 1.5 lines
List of tables/ graphs/ charts/ bibliography: Single Line
- **Alignment**
Title page: Centre
Chapter heading: Centre
Subheading: Left
Body of Text: Justify
- **Margins**
At the binding edge (Left): not less than 3 cm
Other margins (Right, Top, Bottom): not less than 2 cm.
- **Titles**
All titles and subtitles should be printed in BOLD.
All the Tables/ Graphs/ Charts/ should have appropriate titles.
- **Numbering of the Tables/Graphs/Charts**
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Pages separating Chapters should not be numbered but be counted.

- **Binding of the report**

The project should be hard bound with golden embossing as per the standard format

- **Number of copies to be prepared**

2 Hard copies and 1 soft copy (C.D.)

- **Before submission**

Students must sign Declaration and Acknowledgement before putting for the signature of the Guide.

C. TITLE OF THE PROJECT REPORT

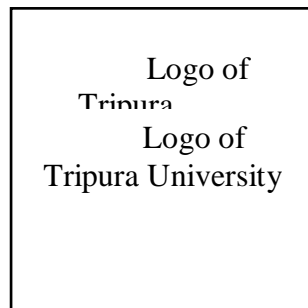
Title of the Project Report (14, Title Case, Bold)

Submitted in Partial Fulfilment for the Award of the

Degree of Bachelor in Business Administration YYYY-YYYY (14, Bold)

Under the Guidance of: (14, Bold)
Name of the Guide from Institute (14 size)
Designation (14 size)

Submitted By: (14, Bold)
Name of the Student (14 size)
University Enrolment No. (14 size)



Department of Business Management (14, Bold)
Tripura University (A Central University) (14 size)
Suryamaninagar, Agartala, Tripura (W), Pin-799022 (14 size)

D. WRITING THE SUMMER PROJECT REPORT

- Student's Declaration
- Certificate from the Company
(Mandatory if the Project is External. Otherwise required only for the students who are doing their Internal Projects in any outside organization/ Company)
- Certificate from the Guide
- Acknowledgements
- Executive Summary
- List of Tables
- List of Charts
- List of Graphs

Table of Contents

Chapter 1 - Introduction to the topic

About the company/ topic (include details like product mix, marketing mix, HR policies, etc) according to the need of the project

Chapter 2 - Methodology

Research Design (Exploratory, Analytical etc.)

Data Collection

Primary and Secondary data

Instruments for Data Collection (Questionnaire, Inventories, Interview etc.)

Method for Data Collection (Shopping Mall Intercept, Telephone, E-mail etc.)

Chapter 3

Findings & Analysis Chapter 4

Conclusions

Chapter 5 Recommendations / Suggestions

Chapter 6 Limitations of the Study

- Bibliography
- Annexure
 - 1. Questionnaire (If Applicable)

○ 2. Miscellaneous :

➤ Schedule for Project completion.

E. STUDENT DECLARATION

STUDENT DECLARATION

(On plain paper)

This is to certify that I have completed the Summer Project titled “(title of the project)” under the guidance of “(name of the guide)” in partial fulfilment of the requirement for the award of Degree of Bachelor of Business Administration at Department of Business Management, Tripura University (A Central University), Suryamaninagar, Agartala, Tripura (W). This is an original piece of work & I have not submitted it earlier elsewhere.

Date:

Signature:

Place:

Name:

University Enrolment No.:

F. CERTIFICATE FROM THE INSTITUTE GUIDE

CERTIFICATE FROM THE INSTITUTE GUIDE

This is to certify that the summer project titled “_____” is an academic work done by “_____” submitted in the partial fulfilment of the requirement for the award of the degree of Bachelor of Business Administration at Department of Business Management, Tripura University (A Central University), Suryamaninagar, Agartala, Tripura (W), under my guidance & direction.

To the best of my knowledge and belief the data & information presented by him/ her in the project has not been submitted earlier.

Signature:

Name of the Faculty:

Designation:

G. BIBLIOGRAPHY

Word or list of the words referred in a text or consulted by you for writing report. It should be arranged in alphabetical order by name of the authors.

For books

Name of the author (last name first) Title of the book, Edition, year of publication, No of Vol. (if any) Name and place of publisher.

Example:

Kothari, C.R. Research methodology, 3rd edition, 1997, Vikas Publishing House Pvt. Ltd, New Delhi.

For Research Papers, Published articles, Magazines, Periodicals, Journals, Newspaper etc. Name of the author (last name first), Title of the article, (in quotation mark) Name of the Journals/ Periodicals/ Magazines etc in italics, Volume number, year, Page numbers.

Example: Wortman, Maxs (Jr.) “Entrepreneurship: An Integrating Typology and Evaluation of the Empirical Research in the field”, *Journal of Management*, Vol.13(2), 1967,pp 259-279.

Online published material on World Wide Web (Alphabetically arranged Webliography)

Name of the Website, Date and time of referring the Website, Name of the Author, Title/ Topic

H. ATTENDANCE SHEET

DEPARTMENT OF BUSINESS MANAGEMENT TRIPURA UNIVERSITY (A CENTRAL UNIVERSITY)

Attendance Sheet

Name of the Student : _____

University Enrolment No. : _____

Name of the Supervisor from the Industry : _____

S. No	Date	Time	Progress Report	Signature of the student	Signature of Supervisor (Institute)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

***Minimum (8 out of 10) 80% attendance compulsory.**

BBA (6th Semester) Financial Management

BMGT 606C

MANAGEMENT ACCOUNTING

1. USE OF MARGINAL COSTING IN DECISION MAKING:

Decision Making Process in various situations (areas), viz. make or buy provisions, accept or reject business proposals (local market+ foreign markets), Export Order, Shut-Down or Continue, Stop or further Process, Selection of Optimum Product Mix, Key factors influencing decisions, Optimum level Production

2. STANDARD COSTING:

Meaning advantages and disadvantages of standard costing, Techniques of standard costing, Variance analysis and reporting.

3. BUDGETARY CONTROL SYSTEM:

Meaning advantages and disadvantages of Budgetary control system, the Concept of Budget factor (Key or limiting factor) and the Budget Period, Types of Budgets, functional (or operational) Budgets, Sales, Production, Purchase, Cash Budget, Flexible Budgets, Zero-Based Budgets, Performance Budgets, Master Budget.

4. ACCOUNTING FOR OVERHEADS

Meaning of overhead costs, importance of overhead costing.

Methods of overhead costing – primary distribution and secondary distribution, Problems.

5. ACTIVITY-BASED COSTING(ABC)

Meaning, feature and importance of ABC, Various term used in ABC system, Advantages and disadvantages of ABC. Difference with traditional costing system, Technique of ABC, Problems on Absorption Costing and Variable Costing.

Course outcome and Objectives:

At the end of the course student will be able to

CO1: Apply the basic concepts of cost accounting

CO2: Apply various tools of accounting for analyzing business situation and take decision

CO3: Analyze the budgetary control system of a business organization

CO4: Apply various cost accounting techniques to all types of organizations for planning, decision making and control purposes in practical situations

CO5: Identify and analyze contemporary Issues in Cost Accounting

SUGGESTED BOOKS:

1. Management Accounting	Paresh Shah	Oxford University Press
2. Advanced Cost Accounting	S. P. Jain, K. L. Narang, S. Aggarwal	Kalyani Publishers

1. NATURE, SCOPE AND TYPE:

Meaning, origin and development, essential elements, nature, functions and importance, Classification- scope of life, fire, marine, motor and other insurances.

2. Indian insurance market:

Insurance organizations in public and private sectors, organization structure of LIC, GIC, Insurance ombudsman.

3. Insurance Intermediaries:

Insurance agent – procedure for becoming insurance agent- rights, termination of an insurance agent- essentials for successful insurance salesman- surveyor and loss assessor- brokers- third party administrators, Privatization of Indian insurance sector.

4. Risk and fund management:

Meaning, difference between risk and uncertainty, characteristics- classification of risk and risk management- corporate risk management, personal risk management; Principles of insurance contract : under insurance- over insurance, insurance fund management: significance, characteristics, process and strategies.

5. Insurance Regulatory and Development authority:

Meaning, important terms, organizing body, functions of IRDA- eligibility, registration and capital requirements, recent regulations.

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Manage the personal finance of individuals

CO2: Evaluate their own worth

CO3: Protect their wealth from risks and hazards

CO4: Convince others on protecting them through insurance

CO5: Enhance return of investment

SUGGESTED BOOKS:

1. . Insurance Management	Inderjit Singh, Rakesh Katiyal, Surjit Kaur	Kalyani Publishers
2. Insurance : Theory and Practice	Pal Prabir, Tripathy, Nalini Prava	PHI
3. Fundamentals of Insurance	P.K Gupta	Himalaya Publishing House

1. INTERNATIONAL FINANCIAL ENVIRONMENT:

Evolution of the International Financial System, The Gold Standard, The Bretton Wood System and the IMF, The World Bank, WTO, Euro Bonds, Recent Pattern of International Banking Activities, Balance of Payment

2. FOREIGN EXCHANGE RISK MANAGEMENT:

Exchange Rate, Interest Rate, Inflation Rate and Exposure, Nature & Exposure of Risk, Exchange Rate and Interest Rate Volatility, Problems.

3. THEORIES ON EXCHANGE RATE MOVEMENTS:

Purchasing Power Parity, Fischer effect, International Fischer Effect.

4. GLOBAL FINANCIAL MARKETS AND INTEREST RATES:

The Global Financial Markets, Domestic & Offshore Markets, Euro Markets, Interest Rate in the Global Money Markets and an Overview of Money Market Instrument

5. FOREIGN EXCHANGE MARKET:

Structure, Types of Transaction and Settlements Rates, Exchange Rate Quotation, Forward Quotation, Exchange Rate Regimes and Foreign Exchange Market in India

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: Interpret the relationship between general management and finance in international setting

CO2: Identify and analyze various issues of international finance like exchange rates, inflation comparison, idea about investing in international debt securities

CO3: Analyze the capital markets across tech world

CO4: Identify various sources of international finance like commercial banks, international agencies and development banks, international capital markets etc.

CO5: Analyze various legal and ethical issues in assessing international markets for financial arrangement

SUGGESTED BOOKS:

1. International Financial Management	Madhu Viz	Excel Books
2. International Financial Management	V.K. Bhalla	Anmol Publications
3. International Financial Management	H.R.Machiraju	Himalaya Publications
4. International Financial Management	V.A. Avdhani	Himalaya Publications
5. International Financial Management	Shashi K. Gupta & Praneet Rangi	Kalyani Publishers

1. DIFFERENT FORMS OF COMPANY BALANCE SHEET-

Vertical, Horizontal, As per Revised Schedule VI of Companies Act 1956

2. CONTENTS AND ANALYSIS OF CORPORATE INCOME STATEMENT**3. ECONOMIC VALUE ADDED (EVA) AND MARKET VALUE ADDED (MVA) REPORTING****4. ACCOUNTING STANDARDS:-**

Meaning, Objectives, Merits and Limitations, Different Accounting Standards- Disclosure of Accounting Policies (AS-1), Segment Reporting (AS-17), Related Party Disclosure (AS-18), Earnings Per Share (AS-20), Accounting for Taxes on Income (AS-22), Interim Financial Reporting (AS-25), Intangible Assets (AS26), Impairment of Assets (AS-28).

5. DISTRESS ANALYSIS:

Indicators of Financial Distress, Distress Prediction

Course outcome and learning objectives:

At the end of the course student will be able to

CO1: analyze a company's financial statements and accounts to make better economic decision

CO2: Interpret income statement, statement of cash flows and fund flows for appropriate company decision towards profitability and sustainability

CO3: Evaluate organizational risks, performance and financial health.

CO4: Demonstrate financial situation of a firm in front of various stakeholders like investors, the government, the public and other decision makers.

CO5: Prepare and maintain standards of various financial health analysis tools like balance sheet, cash and funds flow etc.

Suggested Readings:

1. Financial Statement Analysis & Reporting Shashi K. Gupta and R. K. Sharma Kalyani Publishers
2. Student's Guide to Accounting Standards R. S. Rawat Taxmann

A. FORMAT OF PROJECT REPORT**With general guide lines on how to write a Project Report**

- Consult your Guide from time to time, as well as whenever necessary, carry out suggested changes by your guide and then proceed for next step.
- Do take signature of your project guide as required on your progress report sheet.
- Work regularly with commitment and ensure you are following Project Report Activity Completion Schedule and avoid last minute's hustle.

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Course outcome and learning objectives:

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CO1: Solve any issue existing in an industry/sector by applying various scientific rigor

CO2: Analyze and interpret various problem specific data with a meaningful recommendation

CO3: Apply various statistical tools and techniques for data analysis

CO4: Apply various scientific methods (e.g., qualitative, empirical, experimental) through which a problem can be solved

CO5: Write the overall report of an enquired problem

**Schedule for Project Completion
Department of Business
Management Summer Training
Project Report**

S. No.	Activities to be Completed.	Signature with Date
1.	Initial discussions & finalization of title.	
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B. INSTRUCTIONS FOR TYPING/ PRINTING

The project report should be strictly prepared according to the following guidelines.

- **Finalization of the Project Report**

Student should obtain clearance from their respective guide before final printing of the final project report.

- **Paper**

The size of the paper sheet: A4

Typing should be done on one side of the paper.

- **Font**

Type: Times New Roman

Size: 12

- **Line Spacing**

Body of the text: 1.5 lines

List of tables/ graphs/ charts/ bibliography: Single Line

- **Alignment**

Title page: Centre

Chapter heading: Centre

Subheading: Left

Body of Text: Justify

- **Margins**

At the binding edge (Left): not less than 3 cm

Other margins (Right, Top, Bottom): not less than 2 cm.

- **Titles**

All titles and subtitles should be printed in BOLD.

All the Tables/ Graphs/ Charts/ should have appropriate titles.

- **Numbering of the Tables/Graphs/Charts**

Tables/ Graphs/ Charts should be numbered in the following fashion. Second table/ Graph/ Chart in Second Chapter should be numbered as Table/ Graph/ Chart No 2.02 where first digit stands for Chapter No. and digits after (.) period stand for serial number of Table/ Graph/ Chart in that chapter. Same numbering system should be followed for other chapters. Tables/ Graphs/ Charts must be followed by proper explanation and analysis.

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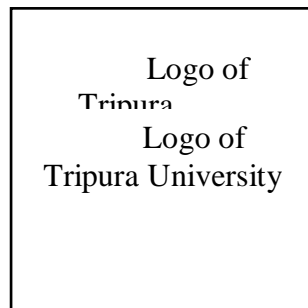
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Findings & Analysis Chapter 4

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Chapter 6 Limitations of the Study

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Date:

Signature:

Place:

Name:

University Enrolment No.:

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To the best of my knowledge and belief the data & information presented by him/ her in the project has not been submitted earlier.

Signature:

Name of the Faculty:

Designation:

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Word or list of the words referred in a text or consulted by you for writing report. It should be arranged in alphabetical order by name of the authors.

For books

Name of the author (last name first) Title of the book, Edition, year of publication, No of Vol. (if any) Name and place of publisher.

Example:

Kothari, C.R. Research methodology, 3rd edition, 1997, Vikas Publishing House Pvt. Ltd, New Delhi.

For Research Papers, Published articles, Magazines, Periodicals, Journals, Newspaper etc. Name of the author (last name first), Title of the article, (in quotation mark) Name of the Journals/ Periodicals/ Magazines etc in italics, Volume number, year, Page numbers.

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Online published material on World Wide Web (Alphabetically arranged Webliography)

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DEPARTMENT OF BUSINESS MANAGEMENT TRIPURA UNIVERSITY (A CENTRAL UNIVERSITY)

Attendance Sheet

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University Enrolment No. : _____

Name of the Supervisor from the Industry : _____

S. No	Date	Time	Progress Report	Signature of the student	Signature of Supervisor (Institute)
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2					
3					
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5					
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8					
9					
10					

***Minimum (8 out of 10) 80% attendance compulsory.**

BBA (6th Semester) Human Resource Management

BMGT 611C – Industrial Relations

1. GROWTH OF INDUSTRIAL RELATIONS IN INDIA:

Meaning, Nature, Significance, Cause and effect for poor Industrial Relations in India, Suggestions to improve I.R.

2. INDUSTRIAL DISPUTES IN INDIA:

Meaning, forms of disputes, History of Labor disputes in India, Causes of Disputes, Results of Disputes, Trade Union and relevant Acts.

3. NATIONAL COMMISSION ON LABOUR AND I.R.:

Collective Bargaining, Discipline and Disciplinary Procedure.

4. METHODS FOR PREVENTION AND SETTLEMENT OF I.D.:

Voluntary Level, Statutory Level, Authorities for the Settlement of I.D. Voluntary Level, Statutory Level, Authorities for the Settlement of I.D. Users Committees, Conciliation Officer, Board of Conciliation, Court of Equity, Labour Court, Industrial Tribunal and National Tribunal. Central Industrial Relations Machinery in India, Central Implementation and Evaluation Machinery, Industrial Disputes (Amendment) Bill Ramaswamy Committee on I.R.

5. ACTS:

Trade Union Act 1926. Standing Order Act 1946, Industrial Disputes Act, 1947. Dynamics of I.R.C. B. Memoria, Himalayan Publication.

Course Background and Learning Objectives:

At the end of the course student will be able to:

CO1: Make systematic study of both regulated as well as institutionalized industrial relations.

CO2: Analyze the issues of Industrial Relations so that they do not give rise to industrial disputes and grievances.

CO3: Apply the skills of negotiations and collective bargaining as a successful tactic to achieve successful and responsible industrial relations.

CO4: Analyze the issues that relate to industrial relations that have an impact on successful industrial relations and sensitize towards handling the issues.

CO5: Apply the theoretical as well as practical knowledge of industrial relations.

Suggested Books:

1.	Industrial Relations	A.M. Sharma	Himalaya Publishing House
2.	Dynamics of Industrial Relations	C.B. Memoria	Himalaya Publishing House
3.	Personnel Management & Industrial Relations	R.S. Davar	Vikas Publishing House

BMGT 612C Organizational Development

- 1. Introduction to Organization Development:** Concept, nature & scope of organizational development, history of organizational development underlying assumptions & values, Operational components diagnostic, action & process- maintenance component.
- 2. Action Research As A Process:** An approach- history. Use & varieties of action research- when & how to use action research in organizational development.
- 3. Organization Development Interventions:** Team interventions- inter- group interventions- personal, interpersonal & group process interventions- comprehensive interventions- structural interventions.
- 4. Implementation & Assessment of Organisational Development:** Conditions for success & failure- ethical standards in organizational development- organizational development & organizational performance- its implications.
- 5. Key Considerations & Issues in Organizational Development:** The future of organizational development – Indian experiences in organizational development.

Course Background and Learning Objectives:

At the end of the course student will be able to:

CO1: Apply and impart the knowledge and techniques of behavioral sciences, including resistance to change (individual & organization).

CO2: Manage organizational change, organizational effectiveness, power and politics, create and sustain a positive culture.

CO3: Apply the techniques of organizational diagnosis.

CO4: Apply the various concepts of resistance to organizational change which may help them become change agents.

CO5: Apply the concepts of organization development

Suggested Books:

1. Organizational Development	French & Bell
2. Organizational Development: Theory Practice & Research	French Bell & Zawach
3. Organizational Development: Strategies & models	Richard Beckhard
4. Organizational Development for Excellence	Kesho Prasad
5. Organizational Development	J. Jayasankar

BMGT 613C - Labour Law II

1. **Payment of Bonus Act, 1965**
2. **Payment of Gratuity Act, 1972**
3. **Payment of wages Act, 1936**
4. **Industrial Employment (Standing Order) Act, 1946**
5. **The Maternity Benefit Act, 1961**

Course Background and Learning Objectives:

At the end of the course student will be able to:

CO1: Demonstrate the relationship between workers, employing entities, government and trade unions.

CO2: Apply the labor laws that have an impact on successful industrial relations and sensitize towards handling the issues.

CO3: Apply theoretical as well as practical knowledge of labor legislations.

CO4: Implement the Labor Laws in the industry.

CO5: Apply the labor laws in the organization and manage the grievances of the labor.

Suggested Books:

1.	Industrial & Labour Laws	S.N.Mishra	
2.	Handbook of Industrial Law	N.D.Kapoor	
3.	Industrial Laws(Bare Acts)		Taxman Publication
4.	Case Laws on Industrial Relations	L.Mishra	

BMGT 614C – Human Resource Development II

- 1. Training & Executive Development:** Concept, Meaning, Definition, Features, Principles, Need & Importance, Methods, Evolution, Steps to Training & Development, Drawbacks, Suggestive System
- 2. Job Design and Career Planning:** Job Design: Job Description, Job Specification, Approaches, Job Enrichment, Succession Planning, Individual & Organisational Career Development Steps, HRD & Career Planning.
- 3. Performance & Potential Appraisal:** Concept, Purpose, Factors, Process, Methods, Limitations, Essentials of good Appraisal System, Assumptions of Performance Appraisal System, Main Components, Potential Appraisal; Steps to Develop Potential Appraisal.
- 4. Competency Mapping and Counselling:** Introduction, Definition, Needs, Types, Applications & Uses, Benefits, Methods, Competence versus Competency; **Counselling:** Concept, Characteristics, Need, Functions, Types, Objectives, Conditions for Effective Counselling, Process.
- 5. Participation & Empowerment:** Meaning, Forms, Objectives, Advantages, Evaluation, Effective WPM, Empowerment – Meaning, Process, Merits, Demerits, Requisites for the success of Empowerment.

Course Background and Learning Objectives:

At the end of the course student will be able to:

CO1: Manage people in the organizations from the stage of acquisition to development and retention.

CO2: Prepare the manpower Plan of a business enterprise and subsequent plans of actions.

CO3: Apply the principles and techniques as professionals for developing human resources in an organization.

CO4: Apply the concepts and techniques for developing employees' better productivity.

CO5: Develop the skills for designing strategy for employees so that they can adapt to organization's culture and to do their jobs effectively.

Suggested Books:

1.	Human Resource Development	D.K Bhattacharya	Himalaya Publishing
2.	Successful Application to HRD	IswarDayal	New Concept
3.	Management of change through HRD	Maheshwari, B.L. &Sinha, Dharni P.	Tata Mcgraw Hill

A. FORMAT OF PROJECT REPORT**With general guide lines on how to write a Project Report**

- Consult your Guide from time to time, as well as whenever necessary, carry out suggested changes by your guide and then proceed for next step.
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Project Report**

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The project report should be strictly prepared according to the following guidelines.

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The size of the paper sheet: A4
Typing should be done on one side of the paper.
- **Font**
Type: Times New Roman
Size: 12
- **Line Spacing**
Body of the text: 1.5 lines
List of tables/ graphs/ charts/ bibliography: Single Line
- **Alignment**
Title page: Centre
Chapter heading: Centre
Subheading: Left
Body of Text: Justify
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All titles and subtitles should be printed in BOLD.
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Students must sign Declaration and Acknowledgement before putting for the signature of the Guide.

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Title of the Project Report (14, Title Case, Bold)

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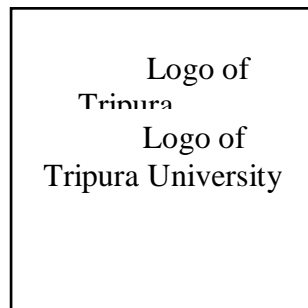
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Name of the Student (14 size)

University Enrolment No. (14 size)



Department of Business Management (14, Bold)

Tripura University (A Central University) (14 size)

Suryamaninagar, Agartala, Tripura (W), Pin-799022 (14 size)

D. WRITING THE SUMMER PROJECT REPORT

- Student's Declaration
- Certificate from the Company
(Mandatory if the Project is External. Otherwise required only for the students who are doing their Internal Projects in any outside organization/ Company)
- Certificate from the Guide
- Acknowledgements
- Executive Summary
- List of Tables
- List of Charts
- List of Graphs

Table of Contents

Chapter 1 - Introduction to the topic

About the company/ topic (include details like product mix, marketing mix, HR policies, etc) according to the need of the project

Chapter 2 - Methodology

Research Design (Exploratory, Analytical etc.)

Data Collection

Primary and Secondary data

Instruments for Data Collection (Questionnaire, Inventories, Interview etc.)

Method for Data Collection (Shopping Mall Intercept, Telephone, E-mail etc.)

Chapter 3

Findings & Analysis Chapter 4

Conclusions

Chapter 5 Recommendations / Suggestions

Chapter 6 Limitations of the Study

- Bibliography
- Annexure
 - 1. Questionnaire (If Applicable)

○ 2. Miscellaneous :

➤ Schedule for Project completion.

E. STUDENT DECLARATION

STUDENT DECLARATION

(On plain paper)

This is to certify that I have completed the Summer Project titled “(title of the project)” under the guidance of “(name of the guide)” in partial fulfilment of the requirement for the award of Degree of Bachelor of Business Administration at Department of Business Management, Tripura University (A Central University), Suryamaninagar, Agartala, Tripura (W). This is an original piece of work & I have not submitted it earlier elsewhere.

Date:

Signature:

Place:

Name:

University Enrolment No.:

F. CERTIFICATE FROM THE INSTITUTE GUIDE

CERTIFICATE FROM THE INSTITUTE GUIDE

This is to certify that the summer project titled “_____” is an academic work done by “_____” submitted in the partial fulfilment of the requirement for the award of the degree of Bachelor of Business Administration at Department of Business Management, Tripura University (A Central University), Suryamaninagar, Agartala, Tripura (W), under my guidance & direction.

To the best of my knowledge and belief the data & information presented by him/ her in the project has not been submitted earlier.

Signature:

Name of the Faculty:

Designation:

G. BIBLIOGRAPHY

Word or list of the words referred in a text or consulted by you for writing report. It should be arranged in alphabetical order by name of the authors.

For books

Name of the author (last name first) Title of the book, Edition, year of publication, No of Vol. (if any) Name and place of publisher.

Example:

Kothari, C.R. Research methodology, 3rd edition, 1997, Vikas Publishing House Pvt. Ltd, New Delhi.

For Research Papers, Published articles, Magazines, Periodicals, Journals, Newspaper etc. Name of the author (last name first), Title of the article, (in quotation mark) Name of the Journals/ Periodicals/ Magazines etc in italics, Volume number, year, Page numbers.

Example: Wortman, Maxs (Jr.) “Entrepreneurship: An Integrating Typology and Evaluation of the Empirical Research in the field”, *Journal of Management*, Vol.13(2), 1967,pp 259-279.

Online published material on World Wide Web (Alphabetically arranged Webliography)

Name of the Website, Date and time of referring the Website, Name of the Author, Title/ Topic

H. ATTENDANCE SHEET

DEPARTMENT OF BUSINESS MANAGEMENT TRIPURA UNIVERSITY (A CENTRAL UNIVERSITY)

Attendance Sheet

Name of the Student : _____

University Enrolment No. : _____

Name of the Supervisor from the Industry: _____

S. No	Date	Time	Progress Report	Signature of the student	Signature of Supervisor (Institute)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

***Minimum (8 out of 10) 80% attendance compulsory**

**Ph.D.
Forestry
and
Biodiversity**

Syllabus for course work

Department of Forestry and Biodiversity



**Tripura
University**

Programme Outcome: The programme will enable the student to

PO1: Identify the problems and formulate problems specific Research studies in Forestry and Biodiversity

PO2: Advance scientific understanding of the forests and its Biodiversity and the values associated with its existing resources.

PO3: Understand and practise the concepts of conservation and management for meeting the ambits of sustainability.

PO4: Meet the needs of recent global issues by adopting methodologies at par with modern scientific methods and develop models.

PO5: Fulfil the requirements of the communities through research and extension activities.

Syllabus for Ph.D Course Work in Forestry and biodiversity:

Course name	Credit	Course Code	Title	Content
Paper-1: Research methodology-1	4	FRBD101C	Research methodology-I At the end of the course student will be able to.... CO1: gain adequate knowledge and understanding on Formulation of Research CO2: Understand the soft skills required in Research CO3: Know the different aspects of Research ethics CO4: Understand the ways and methods of writing research reports	<ul style="list-style-type: none"> Annexure-I
Paper-2: Research methodology-2	4	FRBD102C	Research methodology-II CO1: understand the critics of the research in different fields of Forestry and Biodiversity. CO2: develop skills in formulation of experimental design	<ul style="list-style-type: none"> Review and critics of published research in the field of forestry and biodiversity, training, fieldwork,

			<p>CO3: update advanced knowledge in field of Forestry and Biodiversity.</p>	<p>communication skill etc.- will be finalized by respective RAC.</p>
<p>Paper-3: Advance area of research in the subject</p>	4	FRBD101E	<p>Biodiversity and biotechnology</p> <p>CO1:The course gives an idea about biodiversity resource utilization and benefits regeneration from organisms/various ecosystems to fulfill daily human life requirements.</p> <p>CO2:The course helps to build the mind setup of the student on how high species diversity is vital for the processes and functions of all ecosystems.</p> <p>CO3: Our dependency on biodiversity for clean air, food, Pollination of crops, improvement of genetic diversity in agro-ecosystem, and management of crop plant diseases, all of which are imperative for human standards of living and well-being.</p> <p>CO4:Generates knowledge on producing sufficient food for the world, developing renewable fuels, and sustainably managing ecosystems.</p> <p>CO5:Forest Biotechnology gives our students a specialized competence and skills to recognize, understand and find solutions to the present challenges of green energy production, natural resource utilization, and sustainable development.</p>	<p>• Annexure-II</p>

		<p>FRBD102E</p>	<p>Forest Biology & Tree Physiology</p> <p>CO1:The course generates a brief concept about how the physiological process of plants are collectively affected or individuals interact with the environment and regulate the distribution of species on earth.</p> <p>CO2:Generate an idea about the growth efficiency of different tree species in a particular environment and factors affecting the length of the growing season of trees.</p> <p>CO3: This course creates a concept of how plants' physiological processes and environmental factors regulate plants' sexual/reproductive growth.</p> <p>CO4:Seed physiology extends knowledge on managing forest tree species of any landscape.</p>	
		<p>FRBD103E</p>	<p>Silviculture</p> <p>CO1: Understand the silvicultural practices and techniques in stand management.</p> <p>CO2: Identify the problems in silviculture and Develop solutions</p> <p>CO3:Acquire knowledge on patterns and dynamics of forest stands.</p> <p>CO4: Develop understanding on the ecological processes affecting forest stands.</p> <p>CO5: Acquire knowledge and</p>	

			skills in regeneration of Forest species under different systems of management.	
		FRBD104E	<p>Tree improvement</p> <p>CO1: Understand the advanced concepts and methods in Tree Improvement.</p> <p>CO2: Acquire knowledge hybridization techniques.</p> <p>CO3: Understand the reproductive biology of forest trees.</p> <p>CO4: Acquire skills in selection and hybrid development.</p> <p>CO5: Understand the problems in breeding Forest trees and ways to improve them.</p>	
		FRBD105E	<p>Forest ecology</p> <p>CO1: Understand the ecological aspects in forest management.</p> <p>CO2: Understand the advanced topics in forest ecology.</p> <p>CO3: Impart in-depth knowledge about recent global environmental issues</p> <p>CO4: To understand the potentiality of forest genetic resources.</p> <p>CO5: To know the strategies for forest conservation.</p>	
		FRBD106E	<p>Advances in agroforestry</p> <p>CO1: Develop the knowledge of</p>	

			<p>recent research and development in agroforestry.</p> <p>CO2:Explore the potentiality of agroforestry in land use development.</p> <p>CO3: Skill for diagnose the problem and develop the agroforestry design for a specific area.</p> <p>CO4:Ability to understand different future aspects of agroforestry systems.</p> <p>CO5:To know the strategies for agroforestry management.</p>	
		FRBD107E	<p>Environmental impact assessment</p> <p>CO1:Understand the concepts and significance of EIA.</p> <p>CO2:Calculate the costs and benefits of EIA.</p> <p>CO3: Understand the steps and process involved in EIA</p> <p>CO4:Apply Remote Sensing and GIS in EIA formulation and assessment.</p> <p>CO5:Understand the new approaches and advancements in EIA</p>	
		FRBD108E	<p>Ecosystem goods services and valuation</p> <p>CO1:Understand the ecosystem good and service value concept.</p> <p>CO2:Know the processes involved in ecosystem and their maintenance.</p>	

			<p>CO3: Prescribe measures maintaining and regulating the ecosystem.</p> <p>CO4: Value the ecosystem services by applying the economic valuation concepts and methods.</p> <p>CO5: Apply the different methods in valuing ecosystem goods and services.</p>	
		FRBD109E	<p>Conservation ecology and sustainable development</p> <p>CO1: Understand the ecological principles in conservation and development.</p> <p>CO2: Know the ecological consequences of development activities.</p> <p>CO3: Understand the species and landscape approaches to conservation.</p> <p>CO4: Visualize the future challenges in sustainable management of ecosystems.</p> <p>CO5: Apply the concepts of conservation science in resource management and outreach.</p>	
Paper-4: Seminar/Practical/Project & Assignment etc.	4	FRBD103C	<p>Seminar/Practical/Project & Assignment etc.</p> <p>CO1: develop skills in research reporting.</p> <p>CO2: understand the problem-specific research.</p> <p>CO3: develop communication</p>	<ul style="list-style-type: none"> • To be decided according to need of RAC

**Learning Outcomes
of
Integrated Masters Degree in Commerce
(IMDC)
(With exit option after completion of 6th Semester successfully)**

Under

***Tripura University Rules & Regulations for the Integrated Masters' Degree
Programme in the Choice Base Credit System (CBCS)***



**Department of Commerce
Tripura University
(A Central University)
2020**

<https://www.tripurauniv.ac.in/Page/departmentsDetailsHome/21-DepartmentsHome>

Programme Specific Outcomes (PSOs)

- **PSO1:** Programme facilitates the theoretical as well as practical knowledge about the different aspects of the business perspectives which prepare them to work in various entities
- **PSO2:** Attain the expert knowledge in various domain areas like management, economics, accounting, costing and taxation
- **PSO3:** Provide ability to work in various industries like manufacturing, service, retail, banking and finance etc.
- **PSO4:** Programme intends to make the students able to set up own business ventures and promote entrepreneurship

Course Specific Outcomes

Course Code	Course Title	Course Specific Objectives (COs)
COMM101C	Business Communication	<ul style="list-style-type: none"> • CO1: have an in-depth knowledge regarding the various types of communication, elements in the communication process, the significance of feedback and the barriers associated with the communication process. • CO2: draft invitation of tenders, order letter, enquiry letter, offices memos, circulars, draft reports. • CO3: make quality power point presentations. • CO4: write cover letter and prepare CV.
COMM102C	Financial Accounting	<ul style="list-style-type: none"> • CO1: know the various accounting principles and concepts. • CO2: Prepare final accounts of profit seeking and nonprofit seeking firms. • CO3: perform accounting procedures for Hire-Purchase transactions, Consignment and Joint Venture. • CO4: perform accounting for the reconstitution of partnership firms.
COMM103C	Principles of Management	<ul style="list-style-type: none"> • CO1: learn theories and practice of management. • CO2: learn business case studies and managerial solutions. • CO3: learn the theoretical aspects of Management and strategic management. • CO4: learn the contemporary issues in Management.
COMM104C	Business Mathematics	<ul style="list-style-type: none"> • CO1: learn theory of sets metrics and determinants and its applications in business. • CO2: learn functions, limit and continuity function and its applications in business.

		<ul style="list-style-type: none"> • CO3: learn rules of differentiation, partial differentiation and higher order differentiation; and its applications in business. • CO4: finding the area of curve using the concept of integration and its applications in business feasibility, viability and sustainability.
COMM105C	Fundamentals of Computer (Practical)	<ul style="list-style-type: none"> • CO1: understand the practical applications of business data • CO2: learn the effective use of spreadsheet for presentation and visualization of numerical data • CO3: analyze the numerical data and interpret it • CO4: use of open source software like Libra Calc, R programming
COMM201C	Environmental Studies	<ul style="list-style-type: none"> • CO1: learn and create awareness among stakeholders and make them aware of the issues related to the environment in this era of development. • CO2: learn interaction between the various living beings and non-living beings. • CO3: development of knowledge base related to the environment. • CO4: learn maintaining ecological balance.
COMM202C	Advanced Accountancy	<ul style="list-style-type: none"> • CO1: learn the concept of accounting standards and Practical implication of Accounting Standards. • CO2: learn to prepare final accounts of Service industries. • CO3: learn and attain perfection in preparing the consolidated financial statements of holding company and its subsidiaries. • CO4: learn preparation of financial Statements of insurance companies with schedules.
COMM203C	Principles of Marketing	<ul style="list-style-type: none"> • CO1: understanding the concept, scope and importance of marketing

		<ul style="list-style-type: none"> • CO2: learn about the consumer behaviour in marketing and know the buyer process of decision making • CO3: identify the factors affecting price determination and diverse promotion of marketing process • CO4: understanding the various process of distribution and emerging issue of marketing
COMM204C	Micro Economics	<ul style="list-style-type: none"> • CO1: learn the basics of demand and Supply, determinants and elasticity of demand • CO2: learn the preference theory of consumers, budget line, indifference curve, equilibrium etc • CO3: learn the concepts of Production function; law of variable proportions; Isoquants; Return to scale Economics and Diseconomies of scale. • CO4: learn the Market Structure Perfect Competition; allocative efficiency of perfect competition
COMM205C	Business Law	<ul style="list-style-type: none"> • CO1: understand different business organizations and comprehend importance of company form of business organisation with its incorporation and administration. • CO2: know about rising of capital by companies in compliance with SEBI regulations. • CO3: Learning legal aspects of accounts and audit of companies with role of auditors. • CO4: have knowledge about different restructuring methods for companies and Understand business rescue proceedings and compromises
Semester-III		
COMM301C	Human Resource Management	<ul style="list-style-type: none"> • CO1: learn various methods of HR Planning, Recruitment, training and development. • CO2: learn strategies related to retention of employees in an organisation • CO3: learn working environment in an organisation • CO4: learn conflict management and

		collective bargaining in an organisation.
COMM302C	Business Statistics	<ul style="list-style-type: none"> • CO1: bridge the gap between theory and practical applications. • CO2: enable the students to be confident in handling numerical data. • CO3: provide the students the role of Statistics as a business decision making tool • CO4: provide students with the knowledge to use open-source software like R to solve a range of statistical problems
COMM303C	Corporate Accounting	<ul style="list-style-type: none"> • CO1: learn the conceptual knowledge about the corporate accounting and reporting framework • CO2: experience practical skills to have the foothold in accounting arena • CO3: prepare and understand consolidated financial statement and Accounting for Business Combination. • CO4: learn the emerging areas of Corporate Accounting like HR Accounting and Inflation Accounting.
COMM304C	Business Environment	<ul style="list-style-type: none"> • CO1: learn different types of business environment for business decision making. • CO2: learn nature and impact of economic environment in business decision making. • CO3: learn nature and impact of culture in business. • CO4: learn the role of the government and legal environment, technological environment in business decision.
COMM305C	E-Commerce	<ul style="list-style-type: none"> • CO1: learn role of e-commerce in business. • CO2: learn to plan online business. • CO3: learn threats and challenges of e-commerce in business. • CO4: learn operations of e-commerce.
Semester-IV		
COMM401C	Financial Management	<ul style="list-style-type: none"> • CO1: get an overview of the process in financial management of the firm. • CO2: know the concepts of time value of money and the role of a finance manager. • CO3: know the concepts of capital budgeting decisions and leverage analysis • CO4: understand the theories of capital

		structure and cost of capital of a firm.
COMM402C	Cost Accounting	<ul style="list-style-type: none"> • CO1: Understand the basic concepts of cost accounting • CO2: Classify the costs and apply the same for cost determination. • CO3: Apply the cost accounting principles in cost accounting of materials. • CO4: Know the application of cost accounting in calculation of labour cost and overheads
COMM403C	Computer Applications in Business	<ul style="list-style-type: none"> • CO1: learn the various features of word processing; formatting a letter or draft tender • CO2: learn the spreadsheet functions and its application in business data processing • CO3: learn the effective way of presentation of report, dissertations etc • CO4: learn creating business spreadsheet in the field of accounting, finance and statistics; and its business applications
COMM404C	Macro Economics	<ul style="list-style-type: none"> • CO1: learn the concepts and measurement of GNP, NNP, GDP, NDP, NI, DI, GNP deflator, GDP deflator and price indices • CO2: learn the Relationship between MPC & MPS, APC & APS; four consumption hypothesis; Investment (Autonomous & Induced) and its Determinants. • CO3: learn the determination of equilibrium level of income, Comparative Static analysis and the multiplier analysis • CO4: learn the Fisherian Quantity Theory of Money, Meaning and Functions of Commercial Banks and indicators and instruments of Monetary Control.
COMM405C	Entrepreneurship	<ul style="list-style-type: none"> • CO1: gain knowledge on the characteristics of entrepreneurs and new venture creation in order to acquire the knowledge and spirit for venturing. • CO2: Identify the difference between a business idea and a potential innovative business opportunity. • CO3: understand the importance of the planning process and learn how to develop, write and present an effective business plan for a new venture.

		<ul style="list-style-type: none"> • C04: Build an assessment process for a new venture to determine its desirability, feasibility, viability and sustainability.
Semester-V		
COMM501C	Direct Tax Law & Practice	<ul style="list-style-type: none"> • CO1: Understand the basic concepts related to income tax. • CO2: Acquaint with knowledge and skills of computing taxable income of different entities. • CO3: Demonstrate e-filing of income tax return and online payment. • CO4: Gain knowledge about GST.
COMM502C	Indian Financial System	<ul style="list-style-type: none"> • CO1: learn components of financial systems. • CO2: learn credit creation process of commercial banks. • CO3: learn functions and scope of Reserve Bank of India. • CO4: learn concepts of development bank and their needs in Indian financial system.
COMM503C	Management Accounting-I	<ul style="list-style-type: none"> • CO1: Understand the fundamentals of Management Accounting. • CO2: Explain the analysis and interpretation of financial statements. • CO3: Demonstrate the estimation of working capital requirements. • CO4: Practice to analyze the changes in financial position.
COMM504C	Principles of Banking & Insurance	<ul style="list-style-type: none"> • CO1: understand the various services offered and various risks faced by banks and insurance companies. • CO2: know about the various banking innovations after nationalization. • CO3: understand various principles, provisions that govern the Life and General Insurance Contracts. • CO4: to carry out financial analysis of banks and insurance companies
COMM505C	Self Project/ Industrial Training & Viva	<ul style="list-style-type: none"> • CO1: gain industrial knowledge. • CO2: learn manufacturing process and possible problems. • CO3: exposure to the real life experience about the industry.

		<ul style="list-style-type: none"> • CO4: career development.
Semester-VI		
COMM601C	Auditing	<ul style="list-style-type: none"> • CO1: Understand the basic concepts and objectives of audit • CO2: Gain working knowledge of generally accepted auditing procedures • CO3: Identify the skills and techniques of conducting audit of various entities • CO4: Know the recent trends in practice of audit
COMM602C	Indirect Tax Law & Practice	<ul style="list-style-type: none"> • CO1: learn history of Indirect Tax Systems in India. • CO2: learn about different GST Acts. • CO3: learn registration process under GST. • CO4: learn about custom laws
COMM603C	Management Accounting-II	<ul style="list-style-type: none"> • CO1: Understand the fundamentals of Management Control System and Reporting. • CO2: Explain the marginal costing and cost-volume profit analysis and demonstrate decision making based thereon. • CO3: Simulate the budgetary control system and demonstrate the budgeting • CO4: Practice to analyze the cost variances.
COMM604C	Fundamentals of Investment	<ul style="list-style-type: none"> • CO1: learn about investment environment. • CO2: learn about fixed income securities and approaches to equity analysis. • CO3: learn about portfolio analysis and financial derivatives. • CO4: learn about SEBI and investor protection acts.
COMM605C	Dissertation & Viva	<ul style="list-style-type: none"> • CO1: Enabling students to gather the knowledge of Research work. • CO2: Give student a glimpse of research work. • CO3: learn about methodological issues in research. • CO4: Understand the role of research in business decision making.

Syllabus of Semesters VII-X will be as per the Syllabus of M.Com.

DEPARTMENT OF HISTORY
TRIPURA UNIVERSITY
FIVE YEARS' INTEGRATED MASTERS
DEGREE PROGRAMME
SYLLABUS FOR
HISTORY (MAJOR)
FOR
1ST TO 6TH SEMESTERS

PROGRAMME SPECIFIC OUTCOME

A student enrolled in Five Years' Integrated masters Degree programme with History as Major subject will study in the first six semesters (three years) History as major subject along with other subjects. Thereafter he/she will join the Masters' Programme in the respective department. During the first six semesters:

1. The programme is intended to impart students' basic knowledge and understanding of history as a discipline of study.
2. It is intended to provide students with knowledge of Indian and world history so that they become eligible for sitting in competitive examinations.
3. It is intended to create among students a consciousness of the past so that they can relate it with the present.

**IMD FIRST SEMESTER
HISTORY (MAJOR)
PAPER: I (IHS 101)
HISTORY OF INDIA UP TO C. A.D. 650**

Course Specific Outcome:

At end of the course student will

1. Be acquainted with pre-history and proto-history
2. Learn about the emergence of Early Historic India
3. Learn about the Mauryan Empire and decline of the Mauryan State
4. Understand the post Maurya and development up to the age of Harshavardhana

Course Content:

Unit- I: Pre History and Proto History

- a. General background: Physiography, environment, unity in diversity, people and language
- b. Sources: Literary and archaeological
- c. Pre-history: Palaeolithic, Mesolithic, Chalcolithic cultures- features and geographical distribution.
- d. Proto-history: Harappan Civilization-origin, distribution, features , decline

Unit- II: Emergence of early Historic India

- a. Aryan Problem: Society, economy, polity and religion as reflected in early and late Vedic Literature.
- b. Jainism, Buddhism and Ajvikas- background and features
- c. Rise of Janapadas and Mahajanapadas- expansion of urbanization
- d. Iranian and Macedonian invasions- causes and impact

Unit -III: Mauryan India

- a. Rise of Magadha and Mauryan Empire- material background
- b. Mauryan expansion and administration from Chandrapta Maurya to Asoka
- c. Asoka's Dhamma. Mauryan Art and Architecture
- d. Decline of the Mauryan state

Unit – IV: Post Mauryan development up to Harshavardhana

- a. The Kushanas- Kanishka, their economy and culture: Satavahanas- Gautamiputra Satkarni
- b. Sangam Age: society, language and literature.
- c. Administrative, economic and cultural life in the Gupta age.
- d. Harshavardhana: emergence and estimate; beginning of feudalism

Suggested Readings:

1. R.C. Majumdar (ed); History and Culture of the Indian People, Relevant volumes (Bharatiya Vidyabhavan)
2. R.C. Majumdar: An Advanced History of India (Macmillan)
3. R.C. Majumdar: Ancient India (Motilal Banarasidass)
4. R.C. Majumdar: History of Bengal, Vol-I (Tulshi Prakashani)
5. Romila Thapar (ed.): Recent Perspectives of Early Indian History (Popular Prakashan)
6. D.N. Jha: Early India: A Concise History (Manohar)
7. Herman Kulke and Dietmar Rothmund: A History of India (Routledge and Manohar)
8. A.L. Basham: The Wonder that was India, Vol –I (Rupa)
9. S.A.A. Rizvi: The Wonder that was India, Vol-II (Rupa)
10. Upinder Singh: A History of Ancient and Early Medieval India (Pearson)
11. R.S. Sharma: India's Ancient Past (OUP)
12. R.S. Sharma: Indian Feudalism (Macmillan)

IMD SECOND SEMESTER
HISTORY (MAJOR)
PAPER : II (IHS 201)
HISTORY OF INDIA C 650- C 1550 AD

Course Outcome:

At end of the course student will:

1. Learn about the sources of early medieval and sultanate period, Arab invasion and tripartite struggle
2. Learn about the economy and socio-cultural developments from c 650-1200 A.D.
3. Learn about the establishment and consolidation of Delhi Sultanate and its downfall
4. Learn about the Vijayanagar and Bahamani kingdoms, Bhakti and Sufi Movements, art and architecture and economy of the Delhi Sultanate

Course Content :

Unit I c 650- 1200 AD (I)

- a. Sources- early medieval & sultanate period: epigraphy, numismatics & literature
- b. Arab Invasion: Causes & Impact
- c. Regional Polities: Palas & Cholas
- d. Tripartite Struggle

Unit II c 650- c 1200 AD (II)

- a. Economy: land grants and agrarian expansion; feudal relations
- b. Economy: urban centres, trade & commerce
- c. Rise & growth of regional Languages with special reference to Bengali, Tamil & Marathi
- d. Socio-Cultural developments: Shankara & Bhakti philosophy; transformation of Buddhism- influence of tantric practices, art & architecture of the Pallavas & the Cholas

Unit III c 1200- c 1550 AD (I)

- a. Establishment & consolidation of Delhi Sultanate: Iltutmish, Razia, Balban- Role & assessment
- b. Alauddin Khalji, Muhammad bin Tughlaq, Firoz Tughlaq- Reforms, Foreign policies, assessment
- c. Central, Provincial & Military organization under the Delhi Sultanate; ideas of kingship- Balban & Alauddin Khalji
- d. Timur's invasion & decline of Delhi Sultanate

Unit IV c 1200- c 1550 AD (II)

- a. Rise of provincial kingdoms- Vijayanagar & Bahmani
- b. Bhakti & Sufi Movements- Origin, Features & Impact

- c. Art & Architecture of the Sultanate period
- d. Economy of the Delhi Sultanate: Agriculture & Revenue System; Urbanization; trade & commerce

Suggested readings:

1. R.C. Majumdar (ed); History and Culture of the Indian People, Relevant volumes (Bharatiya Vidyabhavan)
2. R.C. Majumdar: An Advanced History of India (Macmillan)
3. R.C. Majumdar: Ancient India (Motilal Banarasidass)
4. R.C. Majumdar: History of Bengal, Vol-I (Tulshi Prakashani)
5. Romila Thapar (ed.): Recent Perspectives of Early Indian History (Popular Prakashan)
6. D.N. Jha: Early India: A Concise History (Manohar)
7. Herman Kulke and Dietmar Rothmund: A History of India (Routledge and Manohar)
8. A.L. Basham: The Wonder that was India, Vol –I (Rupa)
9. S.A.A. Rizvi: The Wonder that was India, Vol-II (Rupa)
10. Upinder Singh: A History of Ancient and Early Medieval India (Pearson)
11. B.D. Chattopadhyay: The Making of Early Medieval India (OUP)
12. Satish Chandra: Medieval India, From Sultanate to Mughals, Part-I (Har Anand)
13. Satish Chandra: History of Medieval India (Orient Blackswan)
14. K.A. Nilkanatha Shastri: A History of South India (OUP)
15. K. Veluthat: The Early Medieval in South India (OUP)
16. Ranabir Chakravarti: Exploring Early India upto A.D. 1300 (Macmillan)
17. R.S. Sharma: Indian Feudalism (Macmillan)
18. R.S. Sharma: Early Medieval Indian Society (Orient Blackswan)
19. B. Jackson: The Delhi Sultanate (Cambridge, Foundation Books)
20. K.A. Nizami: Religion and Politics in the Thirteenth Century (Aligarh)
21. Vipul Singh: Interpreting Medieval India, Vol: I (Macmillan)
22. Provatanshu Maiti: Studies in Ancient India (Sreedhar)

IMD THIRD SEMESTER
HISTORY (MAJOR)
PAPER: III (IHS-301)
HISTORY OF INDIA (1550-1818)

Course specific outcome:

After studying this course:

1. The students will learn about the sources and historiography of Mughal India.
2. They will learn about the Mughal and Afghan fight for supremacy in India.
3. They learn about the analysis of the administration of Sher Shah Suri.
4. This analysis shall also extend to the various policies under the various kings of Mughal India like Babur, Humayun, Akbar, Jahangir, Shah Jahan and Aurangzeb.
5. They would also reflect upon the developments in art, architecture and the cultural side of Mughal India.
6. They would be able to analyse the decline of the Mughals and the coming of the English East India Company.

Course content:

UNIT 1

1. Sources and Historiography of Mughal History
2. Mughal-Afghan contest for supremacy
3. Sher Shah's administrative reforms
4. Establishment of Mughal Rule: Babar and Humayun

UNIT 2

1. Religious and Rajput Policies of the Mughals: from Akbar to Aurangzeb
2. Administration under the Mughals: from Akbar to Aurangzeb
3. Revenue Reforms under the Mughals: from Akbar to Aurangzeb
4. Central Asian and Deccan Policy of the Mughals: from Akbar to Aurangzeb

UNIT 3

1. Art and Architecture under the Mughals
2. Music, literature and society under the Mughals
3. Religious Developments: Sufi and Bhakti traditions, Sikhism
4. Decline of Mughal power: major debates

UNIT 4

1. Colonialist and Nationalist perceptions of 18th c India.
2. Expansion and Consolidation of British power (1740s-1818): military expansions and commercial interests
3. British administration in India: Clive, Warren Hastings, Cornwallis, Wellesley
4. Impact of colonial policies: Bengal famine of 1770, Sanyasi and Fakir Uprisings.

Suggested Readings:

1. Herman Kulke and Dietmar Rothmund: A History of India (Routledge and Manohar)
2. A.L. Basham: The Wonder that was India, Vol –I (Rupa)
3. S.A.A. Rizvi: The Wonder that was India, Vol-II (Rupa)
4. Upinder Singh: A History of Ancient and Early Medieval India (Pearson)
5. B.D. Chattopadhyay: The Making of Early Medieval India (OUP)
6. Satish Chandra: Medieval India, From Sultanate to Mughals, Part-I (Har Anand)
7. Satish Chandra: History of Medieval India (Orient Blackswan)
8. R.S. Sharma: Early Medieval Indian Society (Orient Blackswan)
9. B. Jackson: The Delhi Sultanate (Cambridge, Foundation Books)
10. K.A. Nizami: Religion and Politics in the Thirteenth Century (Aligarh)
11. Vipul Singh: Interpreting Medieval India, Vol: I (Macmillan)

**IMD FOURTH SEMESTER
HISTORY (MAJOR)
PAPER-IV (IHS-401)
HISTORY OF INDIA: 1818-1947**

Course Specific outcome:

1. Students will learn about colonial Polity and Popular Resistance Movement.
2. They will understand the major Constitutional Reforms since 1909 up to 1935.
3. They will learn about the Colonial Society and Economy prevailing under Colonial India.
4. They will be provided with information about the formation of Indian National Congress and the genesis of the National Movement against the British rule in India.
5. The students will also be taught about the rise of Left wing in India, the depressed caste movement, the growth of Communalism and the circumstances leading to the Partition of India.

Course Content:

UNIT 1: Colonial Polity and Popular Resistance

1. Expansion and Consolidation of British Power in India (1818-1856); Charter Acts of 1813 and 1833.
2. Ideology to Expansion-Mercantilism, Orientalism
3. Popular resistance to colonial rule: a. Santhal – causes, nature and impact. b. Revolts of 1857 – causes, nature and impact and historiography.
4. Major constitutional reforms since 1909 to 1935.

UNIT 2: Colonial Society and Economy

1. Spread of western education, growth of press; Debate on nineteenth century Bengal Renaissance
2. Socio-religious reform movements: Young Bengal, Rammohun Roy, Arya Samaj, Vidyasagar, Vivekananda and Sir Syed Ahmad Khan
3. Agriculture and Land Revenue Settlements: Ryotwari, Mahalwari and commercialization of Agriculture
4. Drain of Wealth and Deindustrialization of traditional industries; emergence of modern industries and transportation facilities-cotton, steel and railways.

UNIT 3: National Movement (I)

1. Formation of Indian National Congress-background; Moderates and Extremists- their activities.
2. Partition of Bengal and Swadeshi Movement; Revolutionaries and their activities: Bengal, Punjab and Maharashtra
3. Gandhian Movements: Non-cooperation, Civil Disobedience, Quit India Movements, women's participation
4. Subhash Chandra Bose and his role; INA, RIN Mutiny

UNIT 4: National Movement (II)

1. Rise of left wing and their role; Telangana uprising
2. Depressed caste movements: Phule and Ambedkar
3. Growth of communalism: Muslim League and demand for Pakistan
4. Circumstances leading to the partition of India: Cripps Mission to Mountbatten Plan.

Suggested Readings:

1. Sumit Sarkar, *Modern Times: India 1880s to 1950s*, Permanent Black: Ranikhet, 2014.
2. Ishita Bannerjee-Dube, *A History of Modern India*, Cambridge University Press, 2014.
3. Bipan Chandra, *India's Struggle for Independence 1857-1947*, Penguin, 2016
4. Bipan Chandra, *India Since Independence*, Penguin, 2008.
5. Shekhar Bandopadhyaya, *From Plassey to Partition*, Orient Blackswan Private Limited, New Delhi, 2014.

IMD FIFTH SEMESTER
HISTORY (MAJOR)
PAPER-V (IHS-501)
RISE OF THE MODERN WEST, MID 15TH TO LATE 18TH CENTURIES

Course specific outcome:

After studying this course:

1. Students will learn about the decline of feudalism and onset of modernity in Europe
2. Students will learn about the important markers of modern world such as renaissance, religious reformation, nation states etc.
3. Students will have detailed knowledge about two major causes of transformation of Europe and they are the Industrial Revolution and the French Revolution.
4. Students will also learn about growth of both parliamentary democracy in England and royal absolutism in France.

Course Content:

UNIT-A:

1. Crisis and decline of Feudalism in western Europe and forms of survival in eastern Europe.
2. Rise of absolute monarchies in England, France and Spain: reasons
3. Thirty Years' War and Treaty of Westphalia- causes and significance.
4. Economic origins of modern western society: Mercantilism, Commercial Revolution

UNIT-B:

1. Renaissance: Meaning, causes, nature, spread, limitations; growth of Humanism.
2. Reformation: origin, course, varieties ,significance; Counter Reformation
3. Modern Science and Technology: From origins to 18th century; Printing Revolution –impact
4. Geographical Explorations: motives and early voyages and beginnings of colonialism with special reference to Spain, Portugal and England.

UNIT-C:

1. Price Revolution and Agrarian Changes-causes, nature and impact
2. Industrial Revolution in England: background and features.
3. Challenge to colonialism: American War of Independence- causes and significance.
4. Debate on transition from feudalism to capitalism

UNIT-D:

1. Political patterns- I : conflict between parliament and Crown in England in the 17th century; Glorious Revolution of 1688, growth of liberalism
2. Political patterns-II: Royal Absolutism in France, Louis XIV and his policies.
3. Eighteenth century as Age of Enlightenment: Features and impact on society and polity

4. French Revolution: background, nature, course (1789-1799) and impact.

Recommended Readings:

1. Rodney Hilton: Transition from Feudalism to Capitalism (Aakar Books,2006)
2. J.D. Bernal: Science in History
3. Euan Cameron (ed.): Early Modern Europe: An Oxford History (OUP, Indian edition)
4. Eugene F. Rice and Anthony Grafton: The Foundations of Early Modern Europe,1460-1559 (WW Norton & Company, Indian Edition)
5. Richard Dunn: The Age of Religious Wars, 1559-1715 (WW Norton & Company, Indian Edition)
6. Arvind Sinha : Europe in Transition: From Feudalism to Industrialism (Manohar)
7. Rila Mukherjee: Europe Transformed (Progressive)
8. Meenakshi Phukan : Rise of Modern West (Macmillan)
9. P. Deane: The First Industrial Revolution (Cambridge, Indian edition)
10. B.V. Rao : History of Europe, 1453-1815 (Sterling)
11. L. Mukherjee: A Study of European History 1453-1815 (J.N. Ghosh and Sons, Kolkata)
12. C.J. H. Hayes: Modern Europe to 1870 (Surjeet Publications)
13. Perry Anderson : Lineages of the Absolutist States(Verso)
14. K.C. Choudhury: British History (New Central Book Agency)
15. J.R. Tanner: English Constitutional Conflicts of the Seventeenth century (Cambridge)
16. Henry Bamford Parkes : A History of United States of America (Khosla Publishing House)

IMD FIFTH SEMESTER
HISTORY (MAJOR)
PAPER: VI (IHS-502)
MODERN EUROPE AND THE WORLD: C. 1800 A.D.-1939A.D.

Course specific outcome:

After studying this course:

1. Students will learn about Napoleon Bonaparte, Politics of Conservatism, the Revolution of 1830 & 1848 and France under the Third Republic.
2. Students will learn about Nationalism in Europe, the Eastern Question, Russia in 1917 and about the American Civil War.
3. Students will have detailed knowledge about two major causes of the World War and the Post-War Crisis.
4. Students will also learn about growth of Industrialisation in Europe, Utopian and Marxian Socialism, Rise of Working Class and working Class Movement and about the Rise of new Imperialism.

Course content:

UNIT-A:

1. Napoleon Bonaparte : Rise, Reforms, Downfall and Assessment.
2. Politics of Conservatism : Congress of Vienna, Concert of Europe , Holy Alliance, Metternich
3. The July Revolution of 1830: Causes and Results; The February Revolution of 1848: Causes and Results
4. France under Third Republic: Work of Reconstruction and Challenges; The Commune of 1871.

UNIT-B:

1. Nationalism in Europe: Unification of Italy- Mazzini, Garibaldi and Cavour; Unification of Germany-Role of Bismarck and his Diplomacy till 1890.
2. The Eastern Question: Background and Nature; the Crimean War; the Berlin Congress; Balkan Wars.
3. Russia: Modernisation under Alexander II and his Criticism; the Russian Revolution of 1917: Background and Impact.
4. American Civil War: Causes, Impact; Role of Abraham Lincoln

UNIT-C:

1. First World War: Background, Impact; Versailles Settlement- Assessment
2. Post War Crisis I- Economic Depression of 1929: Causes and Impact; Rise of Totalitarian Regimes in Germany, Italy and Japan
3. Post War Crisis II- French Quest for Security; League of Nations: Formation and Performance.
4. Origins of Second World War

UNIT-D:

1. Industrialisation in Europe: Differences between England and the Continent.
2. Utopian and Marxian Socialism.
3. Rise of Working Class and Working Class movement.
4. Rise of new Imperialism: Causes; Scramble for Africa

Recommended Readings:

1. David Thomson : Europe Since Napoleon (Penguin),
2. E. Lipson: Europe in the 19th and 20th Centuries (Allied Publishers)
3. A.J.P. Taylor : The Struggle for Mastery in Europe (OUP)
4. A.J. P. Taylor : Origins of the Second World War
5. Georges Lefebvre : The Coming of the French Revolution (Routledge India)
6. E.H. Carr: International Relations between the Two World wars,1919-1939 (Palgrave)
7. David S. Mason: A Concise History of Modern Europe (Orient Blackswan)
8. L. Mukherjee: A Study of modern Europe and the World (J.N. Ghosh and Sons)
9. Ranjan Chakraborty: A History of the Modern World, An Outline (Primus Books)
10. B.V. Rao : History of Modern Europe,1789-2010 (Sterling)
11. James Joll: Europe Since 1870 (Penguin)
12. C.J. Hayes: Modern Europe to 1870 (Surjeet Publications)
13. C.J. Hayes: Modern Europe since 1870 (Surjeet Publications)
14. Henry Bamford Parkes : A History of United States of America (Khosla Publishing House)

**IMD SIXTH SEMESTER
HISTORY (MAJOR)
PAPER-VII (IHS-601)
HISTORY OF NORTH –EAST INDIA, 1826 A.D.-1949 A.D.**

Course specific outcome:

After studying this course:

1. Students will know about the First Anglo- Burmese War, the British annexation policy in Northeast India, British relation with Manipur and the Economic Changes under British rule in Northeast India.
2. Students will know about the growth of National Movement in Assam.
3. The student will learn about the Princely Tripura, British relation with Chakla Roshanabad and Hill Tripura, Resistance Movements in the 19th century and about Revolt of 1857 and Tripura.
4. Students will learn about the Social and political movements in Tripura, Rabindranath Tagore, World War I & II and its impact in Tripura and about integration of Tripura to Indian Union

Course Content:

UNIT-A: NORTH-EAST INDIA-I

1. First Anglo- Burmese War and the Treaty of Yandaboo; Annexation of Upper and Lower Assam; Decline of Ahom Kingdom-Causes.
2. British annexation of Cachar, Jaintia, Khasi, Naga and Mizo Hills.
3. British relation with Manipur till 1891
4. Economic Changes under British rule: Tea Plantation, Coal and Petroleum mining and Railways.

UNIT-B: NORTH-EAST INDIA-II

1. Spread of western education and cultural awakening in Assam-press, literature and organisations.
2. Revolt of 1857 and Assam; National Movement and Assam: Role of Assam Association.
3. Non-Cooperation, Civil Disobedience and Quit India Movements in Assam.
4. Cabinet Mission and Independence; Integration of Manipur and Khasi States into the Indian Union.

UNIT-C: TRIPURA-I

1. Princely Tripura: social, political and economic institutions and condition in the middle of the 19th century before the accession of Birchandra Manikya.
2. British relation with Chakla Roshanabad and Hill Tripura; appointment of Political Agent.
3. Resistance Movements in the 19th century- Tipra (1850), Kuki (1860-61), Jamatia (1863).
4. Revolt of 1857 and Tripura.

UNIT-D: TRIPURA-II

5. Era of modernisation and reformative measures – Birchandra Manikya to Bir Bikram Kishore Manikya.
6. Social and political movements in Tripura (1905-1949)
7. Rabindranath Tagore and Tripura; Contribution of Princely Court towards development of Bengali language and literature.
8. World War I & II and Tripura; integration of Tripura to Indian Union

Recommended Readings:

1. Edward Gait: A History of Assam (Eastern Book House)
2. Priyam Goswami : A History of Assam(Orient Blackswan)
3. H.K. Barpujari: Assam in the Days of the Comapany (NEHU)
4. H.K. Barpujari : Political History of Assam Vol-I (Assam Publication Board)
5. A.C. Bhuyan : Political History of Assam , Vols II and III (Assam Publication Board)
6. R. M. Lahiri: Annexation of Assam (Firma KLM)
7. Amalendu Guha : Planter Raj to Swaraj (Tulika)
8. Jyotirmoy Roy: A History of Manipur (Firma KLM)
9. David Syiemlieh : British Adminisaration in Meghalaya (Heritage)
10. Piketo Sema : British Policy and Administaration in Naagaland (Scholar)
11. C. Nunthra : Mizoram: Society and Polity (Indus)
12. N.R. Roychudhury : Tripura Through the Ages (Sterling)
13. H.K. Sur: British Relations with the State of Tripura (Naba Chandana)
14. Banikantha Bhattacharjee: Tripura Administration (Mittal)
15. Dipak Kumar Choudhury : Political Agents and native Raj (Mittal)
16. Ranjit Kumar De : Scio-political Movement in India: A Historical Study of Tripura (Mittal)

**IMD SIXTH SEMESTER
HISTORY (MAJOR)
PAPER-VIII (IHS-602)
HISTORY OF CHINA AND JAPAN, C.1840 A.D.- 1949 A.D.**

Course specific outcome:

After studying this course:

1. Students will know about the rise and transformation of Japan and China in the 19th and 20 centuries.
2. Students will know about the growth of nationalism and communism in China.
3. The student will learn about the process of modernisation experienced by Japan and how Japan became a modern industrialised country.
4. Students will learn about the role of China and Japan during the Second World War.

Course Content:

UNIT-A: CHINA-I

1. Chinese society and economy in the pre modern world; influence of Confucius
2. European expansion and opening of China: tribute system, Canton trade, Opium trade and Wars, unequal treaties.
3. Response of the Chinese: Taiping Rebellion, Self-Strengthening Movement, Hundred Days' Reform, Boxer Rebellion
4. Revolution of 1911: causes and results, role of Sun Yat Sen; birth of Republic and Yuan Shi Kai.

UNIT-B: CHINA-II

1. New intellectual ideas and May Fourth Movement
2. Kuomintang and the 1st United Front; politics of warlordism.
3. Chinese Communist party: origin & growth; Role of Mao Tse Tung; 2nd United Front and Civil War.
4. Chinese Revolution of 1949- ideology, causes and significance

UNIT-C: JAPAN-I

1. Society, economy and polity under Tokugawa Shogunate; decline of Shogunate-causes
2. The Perry Mission and Opening of Japan
3. Meiji Restoration; popular and democratic movements-Satsuma rebellion and popular rights movements; Meiji constitution of 1889.
4. Modernisation of Japan under Meijis- features and impact

UNIT-C: JAPAN-II

1. Sino-Japanese War (1894), Anglo-Japanese Alliance (1902), Russo-Japanese War (1904-05)
2. Rise of Japanese militarism-causes; crisis of democratic system- growth of Fascist ideas.
3. Manchurian crisis-causes, international repercussion.
4. Japan and Second World War.

Recommended Readings:

1. H. M. Vinacke: History of far East in Modern Times (kalyani)
2. Archana Tewari : The History of China and Japan (Pearson India)
3. James McClain : Japan : A Modern History (WW Norton & Co.)
4. Amit Bhattacharyya: Transformation of Japan (Setu)
5. Amit Bhattacharyya: Transformation of China (Setu)
6. J.K. Fairbank and M. Goldman: China : A New History (Prentice Hall India)
7. Immanuel Hsu: The Rise of Modern China (OUP)

TRIPURA UNIVERSITY



Department of English
Tripura University (A Central University),
Suryamaninagar, Agartala, ,
Tripura West-799022

Programme Outcome (PO)
& Course Outcome (CO)

for
Integrated Master's Degree
MA
PHD

INTEGRATED MASTER’S DEGREE IN ENGLISH (IMD)
(6 SEMESTERS)

PROGRAM SPECIFIC OUTCOME: The Integrated Master’s Degree Program in English aims at facilitating students to:

PO-1: Pursue English studies uninterruptedly through an organic Bachelor’s-cum-Master’s Program.

PO-2: Bridge the gap between post-matriculation or intermediate levels of study and post graduate programs in English Literature, Language and Cultural Studies.

PO-3: Prepare students not only for higher academics, but also gear them towards careers in Content Writing, Soft-skills and the media.

PO-4: Nurture a group of inhouse students right from the undergraduate level for taking up the subject concerned at postgraduate level. This is in addition to the students that the department gets every year in its MA programme from affiliated colleges offering English Honours.

SEM	PAPERS	UNIT	COURSE CONTENT		COURSE OUTCOME
I	EN101	I		History of Eng. lit. from Old English to 18 th century	This Course is an induction meant for beginners in the subject who are familiarized with fundamental notions of genre in literature studies
		II		Literary Types	
		III			
		IV	16 th and 17 th cent. Poetry	Sidney, Spenser, Donne, Marvel	
II	EN 201	I		Hist. of Eng.Lit. 19 th to 20 th cent.	This Course intends to introduce students to canonical authors and works of the Renaissance and post-Renaissance British literature.
		II	Plays other than Shakespeare	Ben Jonson/ Marlowe; J.M.Synge/ Shaw	
		III	Shakespeare	Tragedy, Comedy, Sonnets	
		IV			
III	EN 301	I	16 th to 17 th cent. Poetry and prose	Paradise Lost Book 1, Dryden Bacon’s essays	This Course intends to familiarize students with authors associated with the great European Enlightenment.
		II			
		III	18 th cent. Poetry drama and prose	Pope Sheridan and Goldsmith, Addison	
		IV			
IV	EN 401	I	Late 18 th and 19 th cent. Poetry and prose	Romantic and Victorian Poetry Lamb and Hazlitt	This course introduces students to notions of Romanticism and Victorianism in British literature.
		II			
		III	19 th cent. fiction	Fiction: Hardy, Jane Austen	
		IV			

V	EN 501	I		Hist. of Eng.Lang. Rhetoric and Prosody	This Course introduces students to language studies, English philology and phonetics.
		II			
		III		Phonetics	
		IV		Linguistics	
	EN-502	I	Late 19 th and 20 th cent. Poetry	Hopkins, Yeats, Eliot, Auden, Owen	This course introduces students to the world of modern literatures, with special emphasis on the notions of 'modernity' and 'modernism'
		II			
III IV		20 th cent. fiction	Joyce, Lawrence, Mansfield, Roald Dahl.		
VI	EN-601	I	Indian English Lit.	Hist. of Indian Eng. Lit Drama, Novel, short stories, poetry.	This Course introduces students to Indian English writings since pre-independence, with a special component on the literatures of India's Northeast.
		II			
		III IV	Unit on NE lit. in English		
	EN-602	I	Literary Criticism and theory	Classical to modern (including ancient Indian aesthetics)	The final course of the IMD English program prepares the students for postgraduate studies, by introducing classical and modern theories of literature, and also familiarizes them with non-British literatures in English across the globe.
		II			
		III IV	Other Literatures in English	African, Canadian, Australian, Caribbean	
				Critical appreciation of unseen prose/verse	

M.A English (4 Semesters)

PROGRAMME OUTCOME:

The Department of English, Tripura University confers Master's Degree and Doctor of Philosophy after successful completion of the respective programmes of MA English and PhD offered by it. In addition to these, in its constant endeavour to keep up to the recent trends in the discipline of modern English studies, The English Department has taken care to:

PO-1 Propose a course structure that responds to changing times and changing needs of students. English studies in India and the employment opportunities that may be opened up through a pursuit of a postgraduate degree in the subject have been kept in mind while designing the program.

- PO-2** Develop research acumen and skills have also been focussed upon so that students at the postgraduate level are introduced to the idea of research to be taken up in the course of their academic career.
- PO-3** Highlight the literatures of the Northeast part of India both in English and in translation to enable the students to relate to the literary and cultural concerns of their immediate topography.
- PO-4** Keep it in sync with structure and content of the UGC NET/SET examinations while framing the present programme so as to prepare prospective researchers and aspiring teachers for a fruitful career in college and university teaching right from the postgraduate classroom
- PO-5** Inspire research activities and identify prospective research areas, the present programme has opened up a number of Optional Special papers that have been designed to initiate research curiosity and skills in a variety of study areas.
- PO-6** Introduce Courses in this program to cater to the needs of the industry, with the aim of maintaining an academia-industry interface.
- PO-8** **Inculcate lifelong learning among students and enhance their hermeneutic and analytic faculties for appreciating literature in close association with life, culture, art and aesthetics.**

COURSES AND COURSE-OUTCOMES (CO)

Course Code	Name of the Course	Credits (classes per week)	Marks	Course Outcome CO
CORE				
EN 701C	English Literature from Chaucer to Milton	04	100	To sensitize students on the foundations of literary practices of Europe
EN 702C	The Elizabethan and Jacobean Age	04	100	To focus on the background of Renaissance Humanism and its impact on European and world literatures, with special reference to core British literature
EN 703C	Seventeenth and Eighteenth Century English Literature	04	100	To focus on events that prompted the emergence of neoclassicism in European and British art and literature

EN704C	The Rise of Fiction	04	100	To foreground the history of the novel as one of the most enduring literary genres of the modern times
EN 705C	Introduction to the Study of Literature and Culture-I	04	100	To provide an overview of the growth and development of literature in Europe in general and Britain in particular, in the first semester
EN801C	Romantic and Victorian Poetry	04	100	To develop analytical skills in appreciating poetry and aesthetic theories of the late 18 th and 19 th century Europe and Britain in particular.
EN802C	The Novel in the Eighteenth and Nineteenth Century	04	100	To develop analytic skills in appreciating fiction right from its inception in 18 th century Europe to the era of the novel in the 19 th century.
EN803C	Indian Literature in English - I	04	100	To provide a thorough overview of the Indian literary heritage through a selection of literary voices since India's independence with spl. emphasis on issues of colonialism, nationalism, cultural revivavlistm etal.
EN804C	Literature of the Modern Age	04	100	To facilitate an in-depth exploration of the idea of 'modernity' and 'modernism' in art and literary practices of the 20 th century through textual readings of <i>avante garde</i> literatures of Europe.
EN 805C	Introduction to the Study of Literature and Culture II	04	100	To provide an overview of the entire course content of the semester, to promote original and innovative strategies of learning.
EN901C	Literatures in English (Special Author – Dissertation Project)	04	100	The dissertation to be prepared at the end of the semester is aimed at developing and promoting critical and original thinking on the area, with emphasis on any single author of one's choice.
EN902C	Literacy Criticism and Theory-I	04	100	To familiarize students with important watersheds in aesthetics and critical thought across literary histories, both of India and the West
EN 914C	Introduction to Research in English Studies	04	100	This course introduces PG students to the fundamentals of research and research writing in the discipline

				including research problem, research design, formulating a statement of purpose, conducting a review of literature, writing a research paper, dissertation etal.
EN1001C	The Postmodern Era to the New Millennium (Select Author - Project)	04	100	To aid and motivate students to conceive of a definitive plan of research in the penultimate stages of postgraduate studies, choosing a contemporary author in the context of postmodern studies and post-postmodern culture.
EN1002C	Literary Criticism and Theory-II	04	100	To familiarize students with modern 20 th and 21 st century theoretical approaches to art, culture and literature
EN 1013C	Introduction to the Study of Literature and Culture-III	04	100	To familiarize students with the history of modern literary theory and cultural studies
OPEN ELECTIVES				
EN903E	Linguistics-I	04	100	To provide basic understanding of different levels of analysis of phonology, syntax and semantics
EN 904E	Modern English Grammar and Usage	04	100	To promote awareness of the structure of English language and hone the students' ability to teach English grammar with reasonable accuracy and skill.
EN 905E	Translation Studies I	04	100	To sensitize students on the importance of translation as a cultural necessity to negotiate varied languages, literatures and cultures.
EN 906E	Popular Culture and Literature I	04	100	To introduce students to the interdisciplinary domain of Cultural Studies and identify discursive strategies of the canon and academia which have branded literature in terms of 'serious', 'classics' and 'popular'
EN 907E	Gender in Literature I	04	100	To sensitize learners on basic concepts of sex, gender, and popular gender stereotypes in the light of a few significant theories and literary texts
EN 908E	American Literature I	04	100	To contextualize American literature as a parallel literary tradition to the

				British mainstream, with its unique cultural and literary history and scrutinize its canonisation and inclusion in Indian university depts.
EN 910E	New Literatures in English I	04	100	To extend the frontiers of English studies across the non-British and English-speaking Commonwealth nations, beginning with African and Caribbean nations.
EN 911E	Creative Writing	04	100	To foster creative writing skills in students pursuing literature studies with required academic and professional assistance
EN 912E	Book Review	04	100	This Course, with its professional edge, is meant not only to equip students with techniques of reading and critiquing/reviewing, but also to train them as reviewers in publishing industry and press.
EN 913E	Writings from the Northeast I	04	100	To sensitize students and promote in them awareness of the Northeast of Indian cultures and their literary traditions and hence to situate themselves in their roots.
EN 1003E	Linguistics-II	04	100	To introduce learners to advanced areas of linguistics and enable a general understanding of sociolinguistics and psycholinguistics
EN 1004E	ELT	04	100	To foster awareness on the different methods of teaching English as a second language in Indian institutions within a curricular framework; to explore new techniques and materials in the field.
EN 1005E	Translation Studies II	04	100	To enable students to practice the act of translation from other languages into English in the light of evolving theories of translation.
EN 1006E	Popular Culture and Literature II	04	100	To aid students in conceptualizing the popular-elite dichotomy in the light of contemporary theories of popular culture, with special emphasis on the emergence of visual and digital culture
EN	American Literature II	04	100	To help students in analysing modern

1007E				and contemporary texts in the domain of American literature and engage with theories of multiculturalism, race and ethnicity
EN 1008E	Literature and Industry	04	100	To promote an industry-academia interface and exchange by instilling necessary skills in students pursuing literature studies, enabling them to be competent in the domain of copy-editing and publishing.
EN 1009E	Folk and Oral Literatures	04	100	This Course is exclusively devoted to the study of Oral literatures and the folk heritage of India's Northeast, and Tripura in particular.
EN 1010E	Writings from the Northeast II	04	100	This Course is intended to be an extension of an earlier course primarily aimed at exploring the literary culture of the Northeast in the light of texts and authors from across the seven sister states.
EN 1011E	New Literatures in English II	04	100	This Course is an extension of an earlier Course, and its primary focus is an exploration of commonwealth nations like Australia and Canada, not dealt with in the earlier part.
EN 1012E	Gender in Literature II	04	100	To promote contemporary critical debates on the frameworks of psychoanalytic gender studies in the light of modern and contemporary literary texts.
COMPULSORY FOUNDATION				
	Basics of Computer Applications Skill I	04	100	To promote and develop basic computer skills to aid students in documentation and effectively use digital resources
EN909C	Seminar Presentation (No End-semester examination.	02	100	To foster soft-skills and communicative competence in students through Seminar presentations and PPTs on their chosen areas of study and research.

Ph.D. Programme in English

(3 years)

The Ph.D program offered by the Department of English orients prospective researchers to different types of research in literature, language and cultural studies, viz. theoretical research, textual research, historical research, interpretative research and interdisciplinary research.

Programme Objectives (PO):

- PO-1.** To train Research Scholars to become independent researchers in the field of literature, language and cultural studies.
- PO-2.** To educate Research Scholars for careers in academia and in the field of higher education.
- PO-3.** To update Research Scholars on current and latest trends in research and documentation in the chosen area of research.
- PO-4.** To train Research Scholars on latest theoretical developments in the field of literature and literary evaluation, aesthetics and cultural studies.
- PO-5.** To contribute to the existing epistemic corpus of research in the discipline.
- PO-6.** **To highlight the specific issues of the region (North East in general and Tripura in particular) that pertain to literature, language, culture, orature and folklore for ensuring their proper documentation and preservation.**

Ph.D. Coursework

Department of English, Tripura University

Paper Code	Paper Name	Total Credits	Marks	COURSE OUTCOME
PHD-9001 (Paper-I)	Research Methodology-I	4	100	1. To train scholars in formulating a research proposal maintaining all the formalities of academia that include latest MLA stylesheet-based documentation, pursuing a review of literature, and exploring the subject through appropriate methodological aids. 2. Special emphasis is laid on the ethics of research by sensitizing scholars on the malice of plagiarism.
PHD-9002 (Paper-II)	Research Methodology-II	4	100	1. Aims at preparing scholars for field visits, archival studies and various data collection techniques as and when applicable. 2. Special emphasis is laid on augmenting communication skills in researchers by sensitizing them on the various ways in which their studies can be widely circulated and peer-reviewed.

PHD-9003 (Paper-III)	Advanced Areas of Research in the domain of study	4	100	The contents of this paper (either single or in combination) and the outcome is generally decided by the concerned faculty member/s offering the course, keeping in mind the proposed areas of research of the scholars and according to the requirements of the Research Advisory committees concerned.
PHD-9004 (Paper-IV)	Seminar/practical/project and assignments	4	100	This course is primarily aimed at preparing beginners in their respective domains to appropriately communicate to an audience their statement of purpose or objective of study, and prepare a formal road map of their intended study.
TOTAL		16	400	

**COURSE OF STUDIES IN
MASTER OF ARTS (M.A.) IN
SANSKRIT**



(Choice based credit system)

REVISED SYLLABUS

DEPARTMENT OF SANSKRIT

TRIPURA UNIVERSITY

(A Central University)

W. e. f. November, 2020

COURSE STRUCTURE

No. of Semester- 04

No. of Course- 20

Full Marks- 2000

DISTRIBUTION OF MARKS:
(FOR EACH COURSE)

Full Marks: 100

End Semester- 70 Pass Mark- 28

Internal Test- 30 Pass mark- 12

SEMESTER – I

Course – SANS 701C Vedic and Ancillary Texts
SANS 702C Elements of Sanskrit Grammar
SANS 703C History of Vedic and Classical Sanskrit Literature
SANS 704C Indian Philosophy
SANS 705F Foundation Course: Computer (Skill-1)

SEMESTER – II

Course- SANS 801C Sanskrit Linguistics and History of Sanskrit Grammar
SANS 802C Upanisadic Texts
SANS 803C Sanskrit Plays & Poetics
SANS 804C Dharmasastra and Scientific Literature
SANS 805E Inscription & Functional Sanskrit

SEMESTER –III

Course – SANS 901C Indian Philosophical Texts
SANS 902C History of Indian Culture and Civilization
SANS 903C Poetry & Prose
SANS 904C Sanskrit Drama
SANS 905E Sahityasastra

SEMESTER – IV

Course – SANS 1001C Sanskrit Poetics and Vakroktijivitam
SANS 1002C Modern Sanskrit Literature
SANS 1003C Sanskrit Epics and Prakrit Grammar
SANS 1004E Mimamsa, Vedanta and Bhagavadgita
SANS 1005C (Project)

Semester wise Core, Foundation &
Elective Papers with name of Paper

SEMESTER: I

PAPER: SANS-701C

Vedic and Ancillary Texts (4 credits): 100 Marks

Unit - I 25 Marks

Ṛgveda: Agni II.6; Puruṣa X. 90; *Nāsadīya* X. 129; *Vāk* X.125; Varuṇa I.25; *Parjanya* V.83.
Indra 132; Jñāna X.71: Samjñāna X.191

Unit – II 25 Marks

i) *Atharvaveda*: *Prthivī* XII.1, 1-35; *Sammanasya* III.30; *Vṛṣṭi* IV.15, Rāṣṭrābhivardhan I.29
ii) *Rkprātisākhya* (paṭala – I { *samjñā-paribhāṣāpaṭala* }, *Sūtras* 1 - 52) – (Definition of the *Samānākṣaraṃ*, *Sandhyakṣaraṃ*, *Aghoṣaḥ*, *Sosmānaṃ*, *Svarabhaktiḥ*, *Yamaḥ*, *RaktaRiphita*, *Samyogaḥ*, *Pragṛhyaḥ*).

Unit – III 25 Marks

Vedāṅga: -*Nirukta* of Yāska – Ch. I

Unit – IV 25 Marks

Brāhmaṇas –

i) *Aitareya-Brāhmaṇa*– (a) I.3 (*Dīkṣaṇīyeṣṭi*); (b) Legend of *Śunaḥśepakathā* - XXXIII. 1-4;
ii) *Śatapatha-Brāhmaṇa*- (a) *Pañcamahāyajña* XI. 5.6, 1-9; (b) *Vājapeya* – *Kāṇḍa*–V

Sambādasūkta : Purūrava- ūrvaśī: Yama-yamī, Sarama-pani:, Viśvāmitra-nadi

Books recommended

- *Rk-sūktasamgraha* – (Ed.) Haridatta Shastri, Sahitya Bhandar, Meerut

- *Ṛgveda (sayanabhāsyasahita)*, Vol. 1-5 NarayanasharmaSontakke, Vaidiksamsodhan Mandala, Poona
- *Nirukta–Yāska* (Ed.) Prof. UmashankarSharma“Rishi”, CowkhambaVidyabhavan, Varanasi, 2001
- *Nirukta –pañcādhyāyī* – (Vyakhyakara) MahamahopadyayaChhajuramShastri, MeherchandLaxmanadas Publications, Delhi, 1985
- *Ṛk-prātiśākhya* with Uvata’s commentary (Ed.) RamprasadTripathy, The Director, Sampurnananda Sanskrit Research Institute, Varanasi
- *Ṛk- prātiśākhya* Patalas I-IV, (Ed.), Chaubey, BrajBihari, BharatiyaVidyaprakashan, New Delhi
- New Vedic Selection - Chaubey, BrajBihari&ShastriKantanath, BharatiyaVidyaprakashan, Varanasi, 1981
- Vedic Selections Part I & II, K. C. Chattarjee, University of Colcutta
- *Atharveda* with Sayana’s commentary (4 vol.) – VVRI, Hoshiarpur, Punjab
- Hymns of the *Atharvaveda* (Ed. And trans.), M. Bloomfield, MLBD, New Delhi, 1954
- VaidikSahityaaurSamskriti (in Hindi), BaladevUpadyaya, SaradaSamsthan, 37B, Rabindrapuri, Durgakunda, Varanasi
- Vedic Reader for students, A. A. MacDonnell, Oxford University Press, Delhi, 1960
- Religion of the Veda (translation in to English by Sridhar &Shrotri), Herman Oldenberg, MLBD, Delhi, 1988
- The *Hariścandropākhyāna* (the story of Śunaḥśepa, 4th edition), Ed. Umashankar Sharma, CowkhambaVidyabhavan, Varanasi, 1989
- The *HariścandropākhyānaathavāŚunaḥśepopākhyānaṃ* (in Hindi), Dr. SushamaPandey
- *Śatapatha-Brāhmaṇaṃ(srī-bājasaneyī-mādhyandīnaśākhā)*, Vol. IV, Jnana Publishing House, 29/6, Shaktinagaram, Delhi, 1987
- *Śatapatha-Brāhmaṇaṃ(mādhyandīna-śākhā)*, Bhaga -3, satyaprakashSaraswati, Govind - ram Hasanda, New Delhi, 2010
- India of the age of the *Brāhmaṇas*, YogirajBasu, Sanskrit Pustakabhandar, 1st publication, Nov. 1969

PAPER: SANS -702C

Elements of Sanskrit Grammar (4 credits):

100 Marks

Vaiyākaraṇa – Siddhāntakaumudī

Unit – I

25 Marks

Kāraka-prakaraṇaṃ

Unit – II

Samāsa prakaraṇam

25Marks

Unit – III

Mahābhāṣyaṃ:

Paśpaśāhnika:

25 Marks

Unit –IV

25 Marks

History of Sanskrit Grammar

Samjñā, Paribhāṣā

Books recommended

- *Sidhhānta-kaumudī* – with Balamanorama and Tatvabodhini, MLBD, New Delhi
- *Sidhhānta-kaumudī* (Eng.) – S.C. Basu, MLBD, New Delhi
- *Sidhhānta-kaumudī* (Ed.) – S. R. Ray, Sanskrit PustakBhandar, Kolkata
- *Sidhhānta-kaumudī* (Ed.) – M. V. Mahashabde, Pune
- *Mahābhāṣyapaśpaśāhnika*, Hindi Commentary by ChaturvedaShastri, ChowkhambaPrakashan, Varanasi
- *Mahābhāṣya* Vol. I, Critical Edition, F. Kielhorn (Ed), Bhandarkar Oriental Institute, Poona.
- The *Mahābhāṣya* of Patanjali with annotation (Anhikas I-IV), Translated by SurendranathaDasgupta, Published by – Indian Council of Philosophical Research, New Delhi
- *Mahābhāṣyaṃ* (in Bengali), SanghamitraSengupta, Sanskrit PustakBhandar, Kolkata
- *Mahābhāṣya* (part-I, Vol. I), YdhistirMimamsaka, RamlalKapur Trust, Bhalgarh, Sonipath, Haryana (2nd Edition), 1992
- *Siddhanta Kaumudi, (Ed)samasa-Madhubala sharma 7 J Shastri*
- SamskritVyakaranaShastrkaitihasa; YudhistiraMimamsaka, Sonipat, Ajmer, 1974
- SanskrtaVyakaranaShastrakaUdbhavaaurVikasa; SatyakamaVarma, Delhi
- *Vaiyākaraṇa-sidhhāntakaumudī* (vol. III, in Sanskrit), Pandit Sri GopalShastri, Chawkhamba Sanskrit Sansthan, Varanasi
- *Vaiyākaraṇa-sidhhāntakaumudī (matvarthīya and tiṅanta)* in Hindi, RamavilasChaudhury, MLBD, New Delhi, 2002
- *Vaiyākaraṇa-sidhhāntakaumudī (Samjñā,paribhāṣā)* in Bengali, M.K. Gangopadhyaya, Sanskrit Book Depot. Kolkata

- *Karakprakarana-A. Sanyal*

PAPER: SANS-703C

History of Vedic and Classical Sanskrit Literature (4 Credits): 100 Marks

Unit – I 25 Marks

History of Vedic Literature:

i). General structure of Vedic Literature, Different theories on the age of the Vedas, Dialogue hymns of the *R̥gveda*, Philosophical hymns of the *R̥gveda*, Educational system in the Vedic times, Social condition.

Unit – II 25 Marks

ii). A general acquaintance of the subject-matter of *Sāmaveda -Samhitā*, *Yajurveda-Samhitā*, *Atharvaveda-Samhitā*, *Brāhmaṇa* and *Āraṇyaka* literature, fundamental doctrines of the *Upaniṣads*, *Vedāṅga* literature.

Unit – III 25 Marks

Vedic Interpretation:

Survey of Vedic Interpretation: (Traditional and Modern) Sayana, Aurovindo, Dayananda Saraswati, Mahidhara, Max Muller, Rudolf Roth, Wilson, Hillebrandt, Venkatamadhav and Skandaswami

Unit – IV 25 Marks

History of Classical Sanskrit Literature:

Mahākavya, Kāvya, Historical Kāvya, Lyric poetry, Drama, Prose, Campū literature and Popular Tales and fables

Books recommended

- *Vaidik Sahitya aur Samskriti* (in Hindi), Baladev Upadyaya, Sarada Samsthan, 37B, Rabindrapuri, Durgakunda, Varanasi
- *Vaidika-vāṇmayasyetiḥāsaḥ* (in Sanskrit), Acharya Jagadish Mishra, Chaukhamba Surabharati Prakashan, Varanasi

- Vedic Reader for Students, A. A. MacDonnell, Oxford University Press, Delhi, 1960
- A History of Sanskrit Literature, A. A. MacDonnell, MLBD, New Delhi, 1997
- A History of Sanskrit Literature, A. B. Keith, Oxford University Press, London, 1920
- History of Sanskrit Literature, Umashankar Rishi, Chaukhamba Publication, Varanasi
- *SamskrutasahityakaItihasa*, BaladevUpadhyaya, Chaukhamba Publication, Varanasi
- *Vederparichaya* (in Bengali), YogirajBasu, Farma KLM Private Limited, Kolkata, 1993
- History of Indian Vedic Literature, J. Gonda, 463. Wiesbaden, Otto Harrassowitz, 1975.
- Vedic Religion & Mythology: A Survey of the works of some western scholars, University of Poona, Poona, 1965
- Schools of Vedic Interpretation: Eastern and Western – B. P Bhattacharya, School of Vedic Studies, RavindraBharati University, Kolkata, 2006
-
- *Vaidik Sahityaevam Samskriti*, Kapil Dev Divedi, University Publication, Varanasi,(5th Edition), 2010
- *Saṃskṛita Vāṅmayaka Vrihaditihāsa* (vol. I Veda), Baladev Upadhyaya, Uttar Pradesh Sanskrit samsthan, Lucknow.
- *History of Classical Sanskrit Literature*, M. Krishnamachariar, MLBD, Delhi
- A History of Sanskrit Literature, Baradachari
- History of Sanskrit Literature, S.N Dasgupta.

PAPER: SANS-704C

Indian Philosophy (4 credits):	Marks:100
Unit - I	Marks 25
Introductions to Indian Philosophy- Six schools of Indian Philosophy	
Unit - II	Marks 25
Sarvadarśanaśāgraha: (Cārvaka, Bauddha, Ārḥata)	
Unit - III	Marks 25
Bhaṣāpariccheda(<i>Pratyakṣakāṇḍa</i>)	
Unit - IV	Marks 25
Tarkabhāṣa of Keśava Miśra	

Books recommended

- Bhasaparincheda, (Ed.) Sri Niranjanwarupabrahmachari, Bodhi press, Shankar Ghosh Lane, Kolkata – 6
- Bhasaparincheda with Muktaivali, (Ed.) Panchanan Shastri.
- Classical Vaiśeṣika in Indian Philosophy : On Knowing and What is to be Known By Prof. Shashi Prabha Kumar, Taylor & Francis Group, Routledge Publishers, Oxford, U.K. 2013.
- Sarvadarshan-samgraha; Madhavacharya, (Tr.) Umashankar Sharma Rishi, Chowkhamba Vidyabhawan, Varanasi, 1964
- Nyaya Darshana: Goutama's Nyaya Sutra and Vatsyayana's Bhasya, (Ed.) Phanibhushan Tarkavagisha, Panchimvama Madhya Siksha Parshad.
- Sarvadarshan-samgraha; Madhavacharya, (Ed.) Madan Mohan Agrawal, Chowkhamba Surabharati Prakashan, Delhi
- Sarvadarshan-samgraha; Madhavacharya, (Tr.), E. B. Cowell and A. E. Gough, MLBD, Delhi
- Tarkabhasa of Keshav Mishra, Acharya Badarinatha Shukla, Motilal Banarssidas, Varanasi, 1968
- Tarkabhasa of Keshav Mishra, Srinibas Shastri, Sahityabhandar, Meerut, 1972
- Tarkabhasa of Keshav Mishra, Acharya Visveswar Siddhantasiromani, Chowkhamba Sanskrit Office, Varanasi, 1963
- Indian Philosophy, S. Radhakrishnan, Oxford University Press, delhi

PAPER: SANS -705F

Foundation Course: Computer (Skill - I)

SEMESTER: II

PAPER: SANS-801C

Sanskrit Linguistics and History of Sanskrit Grammar

Marks:100

Unit - I

25 Marks

(I) General outline of comparative Philology (II) Origin Definition of Language (III) Branches and Aspects of Science of Language, (IV) Classification of Language, (V) difference between Language and dialect, (VI) *Veda* and *Avesta*, (VII) Vedic and Classical Sanskrit

Unit – II

25 Marks

(I) Indo-European family of Language, (II) Indo-Iranian, (III) Sanskrit as a member of Indo-European family of Languages, (IV) Role of Sanskrit in Comparative Philology, (V) A short description of Indo-European Languages [Greek, Germanic Italic (Latin)]

Unit – III

25 Marks

(I) Sanskrit Phonology and Phonetic Laws, Grimm's Law, Varner's Law, Grossmann's law, Cowlitz' Law, (II) Sanskrit morphology with special reference to Declension of nouns & pronouns, conjugational system, (III) Semantics, (IV) *Pali*, *Prakrit* and *Apabhramsa*

Unit – IV

25 Marks

Old Indo Aryan (OIA) it's origin & Development, The IE sound system and its development of OIA, Sanskrit and Computational Linguistics.

Books recommended

- Elements of the Science of Language-I; J. S. Taraporewala, Calcutta University Press, Calcutta, 1962
- An Introduction to Comparative Philology; P. D. Gune, , Chowkhamba Sanskrit Pratisthan, Delhi, 2005
- Linguistic Introduction to Sanskrit-I,II,III; B. K. Ghosh, Sanskrit PustakBhandar, Calcutta, 1977
- Indo-Aryan and Hindi; S. K. Chatarjee
- An Introduction to Sanskrit Linguistics; M. S. Murthi, D. K. Publication, Delhi, 1984
- Modern Linguistics; S. K. Verma & Krishnaswamy, Oxford University Press, Delhi, 2000
- Introduction to Prakrit; A.C Woolner, Bharatiya Vidya Prakashan, Varanasi
- Tulanatmaka Bhasa Vijnana; Mangaladev Shastri
- Bhasavijnana O Bhasashastra; Kapildev Dwivedi
- Tulanatmaka Bhasavijnana; Bholanath Tiwari, Motilal Banarssidas, Delhi, 1974
- Bhasavijnana; Bholanath Tiwari, Kitab Mahala, Allahabad, 1992
- Sanskritka Bhasasdhastriyaadhyayana; Bholasankar Vyasa, Chowkhamba Vidyabhawan, 1957
- Bhasavijnana; Karan Singh, Meerut, UP
- Sanskrita-vyakaranasya-itihasa; Lokamani Dahala, Delhi

- Systems of Sanskrit Grammar; S. K. Belvelkar, Delhi
- A Handbook of Sanskrit Philology, S. R. Banerjee, Sanskrit Pustak Bhandar, Calcutta

PAPER: SANS-802C

Upanisadic Texts (4 credits):	100 Marks
Unit – I	25 Marks
<i>Aitareyopaniṣad (R̥gveda)</i>	
Unit – II	25 Marks
<i>Śvetāśvetaropaniṣad(Kṛsnayajurveda)</i>	
Unit – III	25 Marks
<i>Muṇḍakopaniṣad (Atharvaveda)</i>	
Unit – IV	
<i>Taittirīyopaniṣad(Kṛṣṇayajurveda)</i>	25 Marks

Books recommended

- Upanisad-samgraha;(Ed.) JagadishShastri, MLBD, Delhi 1984
- Sixty Upanisads; (Trans.) P. Deussan, MLBD, New Delhi
- Thirteen Principal Upanisads; R. E. Hume, Shivalik Publication, New Delhi
- Principal Upanisads; S. Radhakrishnan, Centenary edition, DUP, Delhi, 1989
- Philosophy of Upanisads; Paul Deussen, Education enterprise, Calcutta, 1972
- Aitareyopaniṣad; Gitapress, Gorakhpur, UP
- Mundakopaniṣad; Gitapress, Gorakhpur, UP
- *Taittiriyopaniṣad,Dev Sahitya Kutir Private limited Kolkatta*
Svetasvetaropaniṣad, Ed. Sri Hanuman Prasad Poddar, Gita Press, Gorakhpur

PAPER: SANS-803C

Sanskrit Plays &Poetics (4 credits):	100 Marks
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Unit – I	25 Marks
Vikramorvaṣīyaṃ	
Unit – II	25 Marks
Dhvanyāloka (Udyota - I)	
Unit – III	25 Marks
Mṛcchakatikam of <i>Sūdraka</i>	
Unit – IV	25 Marks
<i>Kāvya prakāśa (Chapter I, II)</i>	

Books recommended

- Vikramorvasiyam; M. R. Kale, MLBD, Delhi
- Vikramorvasiyam; ParameswardinPandeya and Aswini Kumar Pandeya, Chowkhamba Publication, Varanasi
- Mrcchakatikam; (Ed) M.R. Kale, Booksellers and Publishers Co., Bombay, 1952
- Mrcchakatikam; (Ed) Pritvidhara, Nirnayasagara Press, Bombay
- Dhvanyaloka of Anandavardhana: K. Krishnamurthy, MLBD, Delhi, 1982
- Dhvanyaloka; JagannathaPathak, Chowkhamba Publication, Varanasi
- Dhvanyaloka; AcharyaVisveswar, Jnanamandal Limited, Varanasi
- Kavyaparakasha; (Ed) V. Jhalkikar, BORI, Pune, 1965
- Kavyaparakasha; Chowkhamba Publication, Varanasi
- Kavyaparakasha; AcharyaVisveswar, Jnanamandal Limited, Varanasi

PAPER: SANS-804C

Dharmasastra and Scientific Literature (4 credits): 100 Marks

Unit – I

Manusamhitā Ch. II 25 Marks

Unit – II 25 Marks

Yajnavalkyasanhita(Acara adhyay)

Unit – III 25 Marks

History of Dharmaśāstra

Unit – IV 25 Marks

Ancient Indian Scientific Literature (Vastusastra, Astronomy,

Medical Science, Chemistry,

Mathematics, Geography)

Books recommended

- Manusmriti, (Ed.) Shivaraj Acharya, Chowkhamba Vidyabhawan, Varanasi
- Manusmriti, (Ed.) Haragovinda Shastri, Chowkhamba Sanskrit Pratisthana, Delhi
- Manusamhitā, (Ed.) Manabendu Bandyopadhyay, Sanskrit Pustak Bhandar, Kolkata.
- Yajnavalkyasmriti, (Ed.) Gangasagar Ray, Chowkhamba Sanskrit Pratisthana, Delhi
- History of Dharma Shastra, P.V. Kane, BORI, Poona
- Science in Ancient India, K.P. Sina
- Indian Tradition of Chemistry and Chemical Technology, A.R. Vasudeva Murty, Sanskrit Bharati, New Delhi
- Indian Mathematics and Astronomy, Dr. S. Balachandra Rao, Mana Deep Publication, Bangalore

PAPER: SANS – 805E

Inscription & Functional Sanskrit: 100 Marks

UNIT - I 25 Marks

General Introduction of Inscription
Allahabad Pillar Inscription of Samudragupta

UNIT- II 25 Marks

Campurāmāyana (Bālakānda)

UNIT – III 25 marks

Unseen Translation from English to Sanskrit & Sanskrit to English

UNIT – IV 25 marks

Sanskrit Composition

Sanskrit to English / English to Sanskrit Equivalent

Books recommended

- A Study of Important Gupta Inscriptions, M.Banerji, Calcutta, 1974
- Aśoka and His inscriptions (Two Parts), B.M. Barua, Calcutta, 1968.
- Corpus Inscriptional Indicum, J.F. Fleet, 1974
- Gupta Abhilekha, Vasudev Upādhyay, Bihar Hindi Grantha Academy , Patna, 2000
- Sanskrit Nibandha Manjuṣa, Acarya.C
- Select Inscriptions, Sircar, D.C, University of Calcutta, 1965.
- Higher Sanskrit Grammar, M.R. Kale, MLBD Delhi
- Sanskrit Sikshan-Sarani, Acharya Ram Sastri, Parimal Publications, Delhi
- Campurāmāyana, Sri Ramachandra Mishra, Chowkhamba Vidyabhavan, Varanasi.

SEMESTER: III

PAPER: SANS-901C

Indian Philosophical Texts (4 credits): 100 Marks

Unit – I 25 Marks

Sāṃkhya-Kārikā with Sāṅkhyatattvakaumudī

Unit – II 25 Marks

Yogasūtra with Vyāsabhāṣya (Samādhipāda)

Unit – III 25 Marks

Arthasaṃgraha of Laugakṣībhāskara

Unit – IV 25 Marks

Vedāntasāra

Books recommended

- Upanisad-samgraha;(Ed.) JagadishShastri, MLBD, Delhi 1984
- Sixty Upanisads; (Trans.) P. Deussan, MLBD, New Delhi
- Thirteen Principal Upanisads; r. E. Hume, Shivalik Publication, New Delhi

- Samkhyakarika (Hindi Translation), JagannathaShastri, MLBD, Delhi,1998
- Samkhyakarika (English Translation), Wilson,Delhi,1978
- Samkhyakarika, BrajamohanChaturvedi, National Publishing House, Delhi, 1988
- Samkhyakarika, Vimala Karnataka, ChowkhambaOrientalia, Varanasi, 1984
- Samkhyakarika, RakeshShastri, Sanskrit Granthagar, Delhi, 2004
- Arthasaṃgraha of LaougakshiBhaskar, Kameswarnath, Mishra, ChoukhambaSurabharatiPrakashan, Varanasi,1983
- Arthasaṃgraha of LaougakshiBhaskar, DayashankarShastri, ChowkhambaVidyabhawan, Varanasi
- Arthasaṃgraha of LaougakshiBhaskar, VachaspatiUpadhyaya, ChowkhambaOrientalia, Varanasi, 1977
- Arthasaṃgraha of Lauugakshi Bhaskar, A. B. Gajendragadkar, & R. D. Karmakar, Bhandarkar Oriental Research Institute, Poona, 1973
- History of Indian Philosophy, S. N. Dasgupta, MLBD, Delhi, 1975
- Outline of Indian Philosophy, M. Hiriyanna, London,1956
- Yogasūtram- Patañjali (ed.) J.R. Ballantyne, Pious Book Corp., Delhi
- Patañjali-Yogasūtram- Patañjali, vyākhyātā, Swamī Hariharānanda Āranyak, MLBP, Delhi.
- Vedantasara of Sadananda, Acharya Ramamurti Sharma, Eastern Book linkers, Delhi, 2001
- Vedantasara of Sadananda (English Translation), Swaminikhilananda, Advaita Ashrama,R.K.Mission, Calcutta, 1974
- Vedantasara of Sadananda (Hindi Translation), Mahesh Chandra Bharatiya, Ghaziabad, 1978

- Samkhyatattvakaumudi, Shri. Narayan Chandra Goswami, Sanskrit Pustak Bhandar, Kolkatta

PAPER: SANS-902C

History of Indian Culture and Civilization (4 credits): 100 Marks

Unit - I Marks 25

Culture and Civilization in the Saṃhitā Period,
Brāhmaṇa and Vedāṅga Period

Unit - II Marks 25

Culture and Civilization during the time of the Rāmāyaṇa,
Mahābhārata and Purāṇas

Unit - III Marks 25

Study of Indian Culture & Civilization in the light of
Varnāśrama system, *Puruṣārthas*, *Samskāras*, ancient
Indian Education system, Position of Women & downtrodden
in ancient India.

Unit - IV Marks 25

Growth & development of Buddhism, Jainism, Baishnavism & Shaivism

Books recommended

- Adbhuta Bharat, A. L. Basam, Shivrul agrawal & Company, Agra
- Ancient India; R. C. Majumder, Delhi
- Ancient Indian education; R. K. Mukharjee, MLBD, Delhi
- Baishnava, Shaiva aur Anya Dharmika Mata (Tra), Maheswari Prasad, Bharatiya Vidya Prakashan, Delhi

- Bharatasya Sanskritika-nidhih (RP), Ramji Upadhyaya, Chowkhamba Sanskrita Pratistan, Delhi
- Bharatiya sanskriti ka Uthana, Ramjee Upadhyaya, Chowkhamba Vidyabhawan, Varanasi
- Bharatiya Sanskriti, Kiran Tandon, Eastern Book Linkers, Delhi
- Bharatiya Sanskriti, Priti Prabha Goyel, Rajasthani Granthagar, Jayapur
- Bharatiya Sanskriti, Sivadatta Giani, Rajkamal Prakasani, Delhi
- Dharma, Samaj aur Sanskriti; Krishna Mohan Sriamli, Granthasilpi Pvt. Ltd., Delhi
- Dharmashastra Ka Itihas; P. V. Kane, Uttarpradesha Hindia sansthan, Lacknow
- Education in Ancient India; A.S. Altekar, Delhi
- Epic India; C. V. Vaidya, Delhi
- Glories of India; P. K .Achray
- Hindu Sanskar, Rajabali Pandeya, Chowkhamba Surabharati Prakashan, Varanasi
- History of Dharmashastra; Vol. II, P.V. Kane, BORI, Poona
- Indian Tradition of Chemistry and Chemical Technology, A.R. Murty, Sanskrit Bharati, New Delhi.
- Life, thought and Culture in India (300-1000 AD); Vol. II, Part-I, K. Sacchidanadamurty, MLBD, Delhi
- Prachina Bharat ki sanskriti maur sabhyata, D. D. Kousambi, Raja Kamal Prakasan, New Delhi
- Prachina Bharat Men Siksha, A.S. Altekar
- Pride of India- A Glimpse into India's Scientific Heritage, Ed. by Sanskrit Bharati, New Delhi.
- Source of Indian Tradition (2nd edition); De Bary, Theodore & others, MLBD, Delhi, 1963
- The Discovery of India; Jawaharlal Nehru, Penguin Books, New Delhi
- The wonder that was India; A.L. Basam, London
- Vaidik Sahitya aur Sanskriti, Saradmandir, Varanasi
- Vaisnavism, Saivism and minor Religious Systems; R. G. Bhandarkar, Delhi
- Vedic Religion & Mythology; R. N. Dandekar, University of Poona, 1965
- The Cultural Heritage of India, Vols I to VI, The Ramakrishna Mission Institute of Culture, Kolkata, 2002-03

PAPER: SANS-903C

Poetry & Prose (4 credits):

100 Marks

Unit – I

25 Marks

Naiṣadhacarita of Śrīharṣa (1st Canto)

Unit – II

25 Marks

Harṣacaritaṃ of Bāṇa (Chapter - V)

Unit – III

25 Marks

Kādamabarī of Bāṇa (Mahāśvetā-vṛttāntam)

Unit – IV

25 Marks

Meghadūta of Kālidasa

Books recommended

- Meghadūtam, Ramashankar Tripathy, MLBD, Delhi
- Meghadūta, (Ed.) M.R. Kale, MLBD, Delhi
- Meghadūta, (Ed.) C. R. Devdhar, MLBD, Delhi
- The Harsacarita of Bana (English Translation), E. B. Cowell and F. W. Thomas, London: Royal Asiatic Society, 1897
- Harshacharita by Banabhatta (in Hindi), Ashok Kaushik, Diamond Pocket Books, Delhi
- Harshacharitam (in Bengali), (Ed.) Alaka Chakraborty, Sanskrit Pustak Bhandar, Kolkata – 6, 2002
- Kadambari, by S. P. Pandeya, Krsnadas Academy, Varanasi
- Kadambari, by Samir Sharma, Choukhamba Vidya Bhavan, Varanasi
- The Kadambari of Banabhatta: Purvabhaga (ed.), P. V. Kane, Motilal Banasidass Publishers, New Delhi 1921
- Naisadhiyacaritam, Ramanarayan Lal Veniprasad, Allahabad
- Naisadhiyacaritam, Mohandev Panth, Motila Banasi Dass, Delhi
- Naisadhiyacaritam, Surendradev Shastri, Gokuldas Sanskrit Granthamala, Varanasi
- Naisadhiyacaritam, Suryadev Shastri, Chowkhamba Orientalia, Varanasi, 1975

PAPER: SANS-904C

Sanskrit Drama (4 credits):

100 Marks

Unit – I 25 Marks

Uttararāmacaritan of Bhavabhūti

Unit – II 25 Marks

Ratnāvalī of Haṣa

Unit – III 25 Marks

Natyaśāstra of Bharatamuni I, II, VI

Unit – IV 25 Marks

Daśarūpaka of Dhanañjaya (Chapter I)

Books recommended

- Dasarupaka, (Ed.) SrinivashShastri, SahityaBhandar, Meerut
- Dasarupaka, Kesavarao Musalgaonkara,(ed) Chowkhamba Prakashan, Varanasi, 2007
- Dasarupaka, (Ed.) LokamaniDahal, ChowkhambaAmarbharati, Varanasi,
- Natyasastra, R. S. Nagar (ed), Parimal Publication, Delhi, 1988
- Natyashastra of Bharata Muni, (Ed.) N. P. Unni, 1998
- Natyashastra of Bharata Muni, Babulalshukla, Chowkhamba Sanskrit Sansthan, Varanasi
- Natyashastra of Bharata Muni, BatukNath Sharma & Pt. BaladevUpadyaya, Kasi Sanskrit series, Varanasi
- Ratnavali, M.R. Kale. MLBD, New Delhi.
- Uttararamacaritam – M. R. Kale, M. L. B. D., Delhi,1962
- Uttararamacaritam _ P. V. Kane, M. L. B. D., Delhi, 1962
- Uttararamacaritam _Ed. C. R. Devadhar, MLBD, Delhi
- Uttararamacaritam, Sitanath Acarya and Debkumar Das, Calcutta
-

PAPER: SANS-905E

Sāhityaśāstra (4 credits)

100 Marks

Unit – I 25 Marks

Kavyaparakāśah(9th & 10th Ullas)

Unit – II 25 Marks

Sāhityadarpaṇa (chapter I & II)

Unit – III 25 Marks

Sāhityadarpaṇa (chapter III & IV)

Unit – IV 25 Marks

Kāvyaṁīmāmsā (Chapter –I)

Books recommended

- Sāhityadarpaṇa of KavirajaVisvanatha, (Ed.) P.V. Kane
- Sāhityadarpaṇa of KavirajaVisvanatha, Laksmatika,
- Sāhityadarpaṇa of KavirajaVisvanatha, NirupanaVidyalamkara, SahityaBhandar, Meerut, 2004
- Sāhityadarpaṇa of KavirajaVisvanatha, ShaligramShastri, MLBD, Delhi, 2004
- Sāhityadarpaṇa of KavirajaVisvanatha, Satyabrata Singh, ChowkhambaVidyabhawan, Varanasi 1988
- Kavyaparakasha; (Ed) V. Jhalkikar, BORI, Pune, 1965
- Kavyaparakasha of Mammata; R. C. Dwivedi
- Kavyamīmāmsā of Rājaśekhara, S.Parasara.
- Kavyamīmāmsā of Rājaśekhara, A.K. Bhattacharjee.

SEMESTER: IV

PAPER: SANS-1001C

Sanskrit Poetics and *Vakroktijīvitam* (4 credits):

100 Marks

Unit – I

25 Marks

Alaṃkāra School, Guṇa School, Dhavi School, Rīti School, Rasa School, Vakrokti School

Aucitya School

Unit – II

25 Marks

Bharatamuni, Bhāmaha, Daṇḍī, Agni Purāṇa, Viṣṇudharmottara purāṇa, Rudraṭa, Dhanañjaya, Viśvanatha Kaviraja, Appaya Dīkṣita, Panditaraaj Jagannatha

Unit – III

25 Marks

Ānandavardhaṇa, Mukulabhaṭṭa, Bhaṭṭanāyaka, Rājaśekhara, Abhinavagupta, Kuntaka, Mahimabhaṭṭa, Bhojaraja, Kṣemendra, Mammaṭa, Ruyyaka,

Unit – IV

25 Marks

Vakroktijīvitam of Kuntaka - I

Books recommended

- History of Sanskrit Poetics, S.K. De, Calcutta.
- History of Sanskrit Poetics, P.V . Kane, MLBD, Delhi
- Studies on some concepts on Alaṃkāraśāstra, V.Raghvan.
- Vakroktijīvitam, Rabishankar Bandyopadhyay, Kolkata.

PAPER: SANS-1002C

Modern Sanskrit Literature (4 credits):

100 Marks

Unit-I

25 marks

History of Modern Sanskrit poetry & prose

Unit-II

25 marks

History of Modern Sanskrit Dramas

Unit-III

25 marks

Śrīsvāmīvivekānandacaritam

Unit-IV

25 marks

Kāvyaḷaṅkāraśāstra

Books recommended

- *Ādhunika-Sanskṛta-Sāhityasye-tihāsaḥ*, KalanathaShastri, Jayapur
- Sanskrit writings in Independent India, V.N. Jha, Poona
- A Bibliography of modern Sanskrit writings, Radhavallav Tripathi, Rastriya Sanskrit Samsthanam, New Delhi,
- *Vimśati-śatābdi-saṃskṛta-kāvyaṃṛtaṃ*, Rajendra Mishra, Delhi Sanskrit Academy, Delhi
- *Sanskrit Sahitya Ka Abhinav Itihāsa*, RadhavallabhaTripathy, Varanasi
- *Śrīsvāmīvivekānandarita Mahākavya*, Pandit Tryambaka Sharma Bhandarkar, Chowkhamba Sanskrit Series Office, Varanasi.
- *Kāvyaṅkārikā* of Revāprasād Dvivedi, Varanasi

PAPER: SANS-1003C

Sanskrit Epic & Prakrit Grammar (4 credits):	100 Marks
Unit – I	25 Marks
Rāmāyaṇa ādikāṇḍa (Chapter – I)	
Unit – II	25 Marks
Mahābhārata (śāntiparvan)	
Unit – III	25 Marks
Rajatarāṅginī (<i>Taraṅga – I</i>)	
Unit – IV	25 Marks
Prākṛita Grammar (Chapter I & II)	

Books recommended

- *Rāmāyaṇa* of *Vālmīki* (Vol. – I) the *Bālakāṇḍa*, Critically Edited by G.H Bhatt, Oriental Institute, Baroda, Gujrat
- *ŚrīmadvālmīkīyaRāmāyaṇaṃ*, Sri VasudevLaxmanaShastri, Indological Book House, Varanasi
- *ŚrīmadvālmīkīyaRāmāyaṇaṃ*, Gita Press, Gorakhpur, UP

- *Rāmāyana* (with four Commentaries) , Govindara & Others, LaxmiVenkateswara Press, Bombay, 1935
- *Rāmāyana*, (Ed.) Chinnaswami Shastrigal, and V. H. SubrahmanyamShastri, N. Ramaratham, Madras, 1958
- *Mahābhārata*, Critical Edition, BORI, Poona
- *Mahābhārata* Text, Gita Press, Gorakhpur, UP
- *Mahābhārata* with Nilakantha's Commentary, Chitrasala Press, Poona
- *Mahābhārataṃ*, Sripada Damodara Satavalekar, Paradi, Valsad, Gujrat
- Prākṛita Prakāśa of Vararuci, S.R. Banerjee, Sanskrit Pustak Bhandar, Kolkata
- A Grammar of Prakrit Language, D.C. Sircar.

PAPER: SANS-1004E

Mīmāmsā , Vedānta, & Bhagavadgītā(4credits):	100 Marks
Unit – I	25 Marks
Mīmāmsāsūtras of Jaimini (<i>Sutra I – V with) Śavarabhāṣya</i>	
Unit – II	25 Marks
Mīmāmsāparibhāṣā	
Unit – III	25 Marks
Vedāntaparibhāṣā	
 Unit – IV	25 Marks
Bhagavadgītā (jñānaṣaṭka)	

Books recommended

- Mīmāmsāparibhāṣa, Ramkrishna Mission Publication
- Mīmāmsāparibhāṣa, Narayan Ram Acarya
- Pūrvamīmāmsā in its Sources, Ganganath Jha
- The Philosophical Tradition of India, P.T.Raju, New Delhi.
- Mīmāmsāsābarabhāṣyam, U. Sharma, Chowkhamba, New Delhi.
- *Śrīmadbhagavadgītā with Śaṅkarabhāṣyam*, Geeta Press, Gorakhpur
- *Śrīmadbhagavadgītā with Śaṅkarabhāṣyam*, Ramkrishna Mission, Golpark, Kolkata

- *Vedāntaparibhāṣā, S.Radhakrishna Dharmaraja dhvarindra, Suryanarayan Shastri, Adyar Library Research Centre*
- *Vedāntaparibhāṣā, Pancanana Tarkatirtha(ed) Sanskrit Pustak Bhandar, Calcutta*

PAPER: SANS-1005C

Project

Written 70

Viva 30

TRIPURA UNIVERSITY
MASTER OF ARTS (M.A.) IN SANSKRIT



CURRICULUM STRUCTURE

FIRST & THIRD SEMESTER: JULY-DEC

SECOND & FOURTH SEMESTER: JAN-JUNE

Tripura University (A Central University)

Suryamaninagar, Agartala, Tripura West-799022

Educational Objectives of Programme

The Department of Sanskrit is one of the oldest Departments of the University which was known as the Centre for Post Graduate Studies in Tripura under the University of Calcutta (C.U.P.G. Centre) and started functioning in 1977. Cultivation of traditional Sanskrit learning in the princely state of Tripura was in full swing from early times under the royal patronage. Taking this rich heritage forward Department of Sanskrit started its journey in Post Graduate level since 1977 with an aim to connect the history and tradition with modernity. Since then the Department has come a long way. In between curriculum has been designed and redesigned several times keeping the shifts and trends of Sanskrit learning in the country in mind. Recently, many new and innovative subjects and themes have been introduced in the curriculum along with language teaching and literature studies which still remain the prime focus of the Department. The Department aims to meet the growing need for well-qualified Sanskrit scholars who will help in Nation Building. A number of distinguished scholars also have served the department for a long time. The department with an intake of 80 + 8 (EWS) students offers P.G. Course in Sanskrit in CBCS pattern of syllabus. Research work is also given prime importance in the Department. A full paper on dissertation writing has been dedicated so to build research aptitudes in the PG level itself.

Keeping the wholesome development of the student in view utmost care has been taken to design curriculum so to cover almost all fields and areas of Sanskrit learning in the M. A. in Sanskrit Programme. The present programme aims to provide not only high level theoretical knowledge but also to build cognitive skill among the students so that they can think deeply, research and produce new knowledge and contribute to Sanskrit learning progressively. However, the main objectives of the programmes are as follows:

- To preserve and promote the rich and continuous Indian intellectual tradition that flows in the language of Sanskrit.
- To prepare the students in critical thinking so that they can successfully comprehend various concepts, analyze and build their understanding effectively.
- To prepare the students with excellent communication skills especially in Sanskrit, capable of communicating effectively in various context, thus sharing new knowledge with other researchers from other Institutions and Universities.
- To prepare the students for national and international level academic endeavors in Sanskrit and allied fields such as linguistics, translations, various social sciences and interdisciplinary studies.
- To provide students with an academic environment nurturing excellence, leadership, ethical and moral values in them and igniting zeal for life-long learning that is needed for a successful professional career.

- To develop gender–neutral attitude and practices; respect for all races, nations, religions, cultures, languages and traditions which is core to Sanskrit tradition and philosophy.

Programme Outcomes

PO1: This programme will train the students with basic knowledge of Vedic and Sanskrit language features. After the completion of the Programme students will be able to demonstrate knowledge about Vedic Sanskrit as well as Classical Sanskrit language.

PO2: Learners will be able to show knowledge about Vedic, Classical and Modern Sanskrit literature, literary history, literary criticism etc. They will be able to analyze debate and discuss various concepts coming in Sanskrit literature.

PO3. Learners will demonstrate adequate knowledge about Sanskrit grammar and linguistics, grammatical methods existing in Sanskrit especially Paniniyan school of grammar, trends in modern linguistics.

PO4.Learners will develop clear, first hand understanding about the general characteristics of Indian Culture and Civilization as reflected in the vast literature of Sanskrit. They will learn and evaluate Indian culture, way of life as found in Indian Epics and *Puranas*.

PO5: This programme will enable the students to demonstrate knowledge about Indian Philosophy. They will be able to understand various concepts and ideas of philosophy and critically analyze them. They will show thorough knowledge about general and special features of both orthodox and non-orthodox branches of Indian Philosophy.

PO6. After the completion of the course students will have practical experience of thorough reading of some of the most important Sanskrit texts such as selections from *Rgveda*, *Brahmanas* and *Upanishads*, selections from *Ramayana* and *Mahabharata* and *Dharmashastras* and various Prose and Poetry authored by celebrated writers like *Kalidasa*, *Sri Harsha*, *Banabhatta* etc.

PO7. This Programme will also enable the students to provide an insight on many of the recent Sanskrit texts authored by modern Sanskrit literatures and will develop skill of creating original Sanskrit writings themselves.

PO8.This programme will develop research aptitude among students and train them with basic knowledge, standard method, critical thinking and skill required for Indological research.

PO9.Students after completing this programme will applying one’s disciplinary knowledge about studying, analyzing inscriptions and know about various scripts.

PO10.This programme will develop soft skills for translation in Sanskrit and enable the students to translate from Sanskrit to other Indian languages and vice-versa.

Curriculum Structure

MASTER OF ARTS (M. A.) IN SANSKRIT

Total Core(C) Credits: 64, Total Elective (E) Credits:12,

Foundational Course: 04 Total Credits: 80

M.A. in Sanskrit First(1 st)Sem.-500Marks (C credits: 16; Foundational Course: 04)							
Theory Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
		L	T	P			
SANS 701C	Vedic and Ancillary Texts	4	0	0	4	100	C: Core Course
SANS 702C	Elements of Sanskrit Grammar	4	0	0	4	100	
SANS 703C	History of Vedic and Classical Sanskrit Literature	4	0	0	4	100	
SANS 704C	Indian Philosophy	4	0	0	4	100	
SANS 705F	Foundation Course: Computer (Skill-1)	4	0	0	4	100	Offered by University Centrally
SUBTOTAL		20	0	0	20	500	
M. A. in Sanskrit Second(2 nd)Sem.- 500 Marks (C credits: 16; Ecredits:04)							
Theory Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
		L	T	P			
SANS 801C	Sanskrit Linguistics and History of Sanskrit Grammar	4	0	0	4	100	C: Core Course
SANS 802C	<i>Upanisadic</i> Texts	4	0	0	4	100	
SANS 803C	Sanskrit Plays & Poetics	4	0	0	4	100	
SANS 804C	<i>Dharmasastra</i> and Scientific Literature	4	0	0	4	100	
SANS 805E	Inscription & Functional Sanskrit	4	0	0	4	100	E: Elective Course Offered for all Departments
SUBTOTAL		20	0	0	20	500	
M. A. in Sanskrit Third(3 rd) Sem.-500Marks(Ccredits:16; Ecredits:04)							
Theory Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
		L	T	P			
SANS 901C	Indian Philosophical Texts	4	0	0	4	100	C: Core Course

SANS 902C	History of Indian Culture and Civilization	4	0	0	4	100	
SANS 903C	Poetry & Prose	4	0	0	4	100	
SANS 904C	Sanskrit Drama	4	0	0	4	100	
SANS 905E	<i>Sahityasastra</i>	4	0	0	4	100	
SUBTOTAL		20	0	0	20	500	
M. A. in Sanskrit Fourth(4th) Sem. -500 Marks(Ccredits:16; E credits: 04)							
Theory Papers (Code)	Paper Name	Credit Distribution			Total Credit	Marks	Remarks
		L	T	P			
SANS 1001C	Sanskrit Poetics and <i>Vakroktijivitam</i>	4	0	0	4	100	C: Core Course
SANS 1002C	Modern Sanskrit Literature	4	0	0	4	100	
SANS 1003C	Sanskrit Epics and <i>Prakrit</i> Grammar	4	0	0	4	100	
SANS 1004E	<i>Mimamsa, Vedanta and Bhagavadgita</i>	4	0	0	4	100	E: Elective Course Offered for all Departments
SANS 1005C	Project	4	0	0	4	100	C: Core Course
SUBTOTAL		20	0	0	20	500	
AGGREGATE (Entire Duration of M. A. in Sanskrit)		80	0	0	80	2000	

*L-Lecture hrs./week T-Tutorial hrs./week P-Project/Practical/Lab/All other non-classroom academic activities, etc. hrs./week C- Credit Points of the Course E- Elective Points of the Course

Evaluation Scheme for Theory Courses:

Internal Exam	End Semester Exam	Total
30 marks	70 Marks	100 Marks

LEARNING OUTCOMES

M. A. in Sanskrit 1st Semester

M.A. in Sanskrit First (1st) Sem.–500Marks (Credits: 16; Foundational Course: 04)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
SANS 701C	Vedic and Ancillary Texts	4	0	0	4	100

At the end of the course student will be able to:

- Demonstrate knowledge; critically analyze various passages from the *Samhita* and *Brahmana* texts.
- Provide an insight about Vedic language and grammar, phonological features, Vedic meter.
- Show competence in understanding the language and subject of the Vedic ancillary texts.
- Analyze Vedic symbolism, cultural references and philosophical topics as found in the Vedas.

Course Contents:

Selections from the *R̥gveda*: *Varuṇa* I.25; *Indra* I.32; *Agni* II.6; *Parjanya* V.83; *Jñāna* X.71; *Puruṣa* X. 90; *Vāc* X.125; *Nāsadīya* X. 129; *Samjñāna* X.191

Selections from the *Atharvaveda*: *Rāṣṭrābhivardhan* I.29; *Sammanasya* III.30; *Vṛṣṭi* IV.15; *Prthivī* XII.1, 1-35

Selected portion of *R̥kprātiśākhya* (*paṭala* – I{*samjñā-paribhāṣāpaṭala*}, *Sūtras* 1 - 52) – (Definition of the *Samānākṣaram*, *Sandhyakṣaram*, *Aghoṣaḥ*, *Sosmāṇam*, *Svarabhaktiḥ*, *Yamaḥ*, *Rakta Riphita*, *Samyogaḥ*, *Pragṛhyaḥ*).

***Vedāṅga* Literature:** Selected portion from *Nirukta* of *Yāska* – Ch. I

Selections from the *Brāhmaṇas* –

i). *Aitareya-Brāhmaṇa*– (a) I.3 (*Dīkṣaṇīyeṣṭi*); (b) Legend of *Śunaḥśepakathā* - XXXIII. 1-4;

ii) *Śatapatha-Brāhmaṇa*- (a) *Pañcamahāyajña* XI. 5.6, 1-9; (b) *Vājapeya* – *Kāṇḍa*–V

Study of the *Sambādasūktas*: *Purūrava-ūrvaśī*: *Yama-yamī*, *Sarama-pani*.; *Viśvāmitra-nadi*

Recommended Books:

1. *R̥k-sūktasamgraha* – (Ed.) Haridatta Shastri, Sahitya Bhandar, Meerut
2. *R̥gveda (sayanabhasyasahita)*, Vol. 1-5 Narayanasharma Sontakke, Vaidiksamsodhan

Mandala, Poona

3. *Nirukta–Yāska* (Ed.) Prof. Umashankar Sharma “Rishi”, Cowkhamba Vidyabhavan, Varanasi, 2001
4. *Nirukta –pañcādhyāyī – (Vyakhyakara)* Mahamahopadyaya Chhajuram Shastri, Meherchand Laxmanadas Publications, Delhi, 1985
5. *Ṛk-prātiśākhya* with Uvata’s commentary (Ed.) Ramprasad Tripathy, The Director, Sampurnananda Sanskrit Research Institute, Varanasi
6. *Ṛk- prātiśākhya* Patalas I-IV, (Ed.), Chaubey, Braj Bihari, Bharatiya Vidyaprakashan, New Delhi
7. *New Vedic Selection* - Chaubey, Braj Bihari & Shastri Kantanath, Bharatiya Vidyaprakashan, Varanasi, 1981
8. *Atharveda* with Sayana’s commentary (4 vol.) – VVRI, Hoshiarpur, Punjab
9. *Hymns of the Atharvaveda* (Ed. And trans.), M. Bloomfield, MLBD, New Delhi, 1954
10. *Vedic Reader for students*, A. A. MacDonnell, Oxford University Press, Delhi, 1960
11. *The Hariścandropākhyāna* (the story of Śunahśepa, 4th edition), Ed. Umashankar Sharma, Cowkhamba Vidyabhavan, Varanasi, 1989
12. *Śatapatha-Brāhmaṇam (srī-bājasaneyī-mādhyandinaśākhā)*, Vol. IV, Jnana Publishing House, 29/6, Shaktinagaram, Delhi, 1987
13. *Śatapatha-Brāhmaṇam (mādhyandina-śākhā)*, Bhaga -3, satyaprakash Saraswati, Govind -ram Hasanda, New Delhi, 2010

SANS 702C	Elements of Sanskrit Grammar	4	0	0	4	100
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At the end of the course student will be able to:

- Demonstrate skill in Paniniyan system of grammar in technical terms and *sandhi* rules.
- Able to show skill in analyzing *karaka* rules and *samasa* rules
- Provide information about history of Sanskrit grammatical tradition.
- Analyze and explain word etymology, sentence structure, phonetic and phonological features of Sanskrit language
- Apply one’s disciplinary knowledge in textual reading of selected portion of *Siddhantakaumudī*

Course Contents:

- *Vaiyākaraṇa – Siddhāntakaumudī:*
 - a) *Samjñā, Paribhāṣā*
 - b) *Kāraka-prakaraṇam*
 - c) *Samāsaprakaraṇam*
- Study of *Mahābhāṣyam: Paśpāsāhnika:*
- History of Sanskrit Grammar

Recommended Books:

1. *Sidhānta-kaumudī* – with Balamanorama and Tatvabodhini, MLBD, New Delhi
2. *Sidhānta-kaumudī* (Eng.) – S.C. Basu, MLBD, New Delhi
3. *Mahābhāṣyaśpaśāhnīka*, Hindi Commentary by Chaturveda Shastri, ChowkhambaPrakashan, Varanasi
4. *Mahābhāṣya* Vol. I, Critical Edition, F. Kielhorn (Ed), Bhandarkar Oriental Institute, Poona.
5. *SiddhantaKaumudī*, (Ed)samasa-Madhubalasharma 7 J Shastri
6. SamskritVyakaranaShastrakaitihasa; YudhistiraMimamsaka, Sonipat, Ajmer, 1974
7. SanskritVyakaranaShastrakaUdbhavaaurVikasa; SatyakamaVarma, Delhi
8. *Vaiyākaraṇa-sidhāntakaumudī* (vol. III, in Sanskrit), Pandit Sri GopalShastri, Chawkhamba Sanskrit Sansthan, Varanasi
9. *Vaiyākaraṇa-sidhāntakaumudī (Samjñā,paribhāṣā)* in Bengali, M.K. Gangopadhyaya, Sanskrit Book Depot. Kolkata
10. *Karakprakarana-A. Sanyal*

SANS703C	History of Vedic and Classical Sanskrit Literature	4	0	0	4	100
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At the end of the course student will be able to:

- Evaluate history, principles , framework and features of Vedic Literature
- Provide coherent knowledge about the comprehensive knowledge about the *Samhita* literature
- Describe the subject matter, philosophy and importance of the Upanishads
- Demonstrate basic understanding about the subject and treatment of the *Vedāngas*
- Showcase basic general understanding about the outline of Classical Sanskrit Literature
- Provide information and critical assessment about prominent Sanskrit authors and their works

Course Contents:

- History of Vedic Literature:
 - i). General structure of Vedic Literature, Different theories on the age of the Vedas, Dialogue hymns of the *R̥gveda*, Philosophical hymns of the *R̥gveda*, Educational system in the Vedic times, Social condition.
 - ii). A general acquaintance of the subject-matter of *Sāmaveda -Samhitā*, *Yajurveda-Samhitā*, *Atharvaveda-Samhitā*, *Brāhmaṇa* and *Āraṇyaka* literature, fundamental doctrines of the *Upaniṣads*, *Vedāṅga* literature.
- Vedic Interpretation: Survey of Vedic Interpretation: (Traditional and Modern) Sayana, Aurovindo, Dayananda Saraswati, Mahidhara, Max Muller, Rudolf Roth,

Wilson, Hillebrandt, Venkatamadhav and Skandaswami

- History of Classical Sanskrit Literature: *Mahākavya*, *Kāvya*, Historical *Kāvya*, Lyric poetry, Drama, Prose, *Campū* literature and Popular Tales and fables

Recommended Books:

1. *Vaidik Sahitya aur Samskriti* (in Hindi), Baladev Upadhyaya, Sarada Samsthan, 37B, Rabindrapuri, Durgakunda, Varanasi
2. *Vaidika-vāṅmayas yetihāsaḥ* (in Sanskrit), Acharya Jagadish Mishra, Chaukhamba Surabharati Prakashan, Varanasi
3. Vedic Reader for Students, A. A. MacDonnell, Oxford University Press, Delhi, 1960
4. A History of Sanskrit Literature, A. A. MacDonnell, MLBD, New Delhi, 1997
5. A History of Sanskrit Literature, A. B. Keith, Oxford University Press, London, 1920
6. History of Sanskrit Literature, Umashankar Rishi, Chaukhamba Publication, Varanasi

7. *Samskruta sahitya ka Itihasa*, Baladev Upadhyaya, Chaukhamba Publication, Varanasi
8. *Veder parichaya* (in Bengali), Yogiraj Basu, Farma KLM Private Limited, Kolkata, 1993
9. History of Indian Vedic Literature, J. Gonda, 463. Wiesbaden, Otto Harrassowitz, 1975.
10. Vedic Religion & Mythology: A Survey of the works of some western scholars, University of Poona, Poona, 1965
11. Schools of Vedic Interpretation: Eastern and Western – B. P. Bhattacharya, School of Vedic Studies, Ravindra Bharati University, Kolkata, 2006
12. *Vaidik Sahitya evam Samskriti*, Kapil Dev Dvivedi, University Publication, Varanasi, (5th Edition), 2010
13. *History of Classical Sanskrit Literature*, M. Krishnamachariar, MLBD, Delhi
14. History of Sanskrit Literature, S.N Dasgupta.

SANS 704C	Indian Philosophy	4	0	0	4	100
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At the end of the course student will be able to:

- Apply one's disciplinary knowledge in describing general characteristics of Indian Philosophy.
- Demonstrate introductory knowledge about six schools of Indian philosophy
- Critically evaluate the philosophy of both orthodox and non-orthodox schools
- Develop thorough reading and evaluating skill in selected portions *Sarvadarshana samgraha*
- Critically evaluate the topics treated in the text of *Bhashapariccheda*

- Show critical understanding about debates and discussions on epistemology, metaphysics etc.
- Compare between Western and Indian Philosophy

Course Contents:

- Introductions to Indian Philosophy- Six schools of Indian Philosophy
- *Selections from Sarvadarśanasamgraha: (Cārvāka, Bauddha, Ārhata)*
- 1st Chapter of *Bhaṣāpariccheda (Pratyakṣakāṇḍa)*
- Study of *Tarkabhāṣa of Keśava Miśra*

Recommended Books:

1. Bhasapariccheda, (Ed.) Sri Niranjan swarupabrahmachari, Bodhi press, Shankar Ghosh Lane, Kolkata – 6
2. Bhasapariccheda with Muktāvalī, (Ed.) Panchanan Shastri.
3. Classical Vaiśeṣika in Indian Philosophy: On Knowing and What is to be Known By Prof. Shashi Prabha Kumar, Taylor & Francis Group, Routledge Publishers, Oxford, U.K. 2013.
4. Sarvadarshan-samgraha; Madhavacharya, (Tr.) Umashankar Sharma Rishi, Chowkhamba Vidyabawan, Varanasi, 1964
5. Nyaya Darshana: Goutama's Nyaya Stutra and Vatsyayana's Bhasya, (Ed.) Phanibhushan Tarkavagisha, Panschimvama Madhya Siksha Parshad.
6. Sarvadarshan-samgraha; Madhavacharya, (Ed.) Madan Mohan Agrawal, Chowkhamba Surabharati Prakashan, Delhi

1. Sarvadarshan-samgraha; Madhavacharya, (Tr.), E. B. Cowell and A. E. Gough, MLBD, Delhi
2. Tarkabhasa of Keshav Mishra, Acharya Badarinatha Shukla, Motilal Banarssidas, Varanasi, 1968
3. Tarkabhasa of Keshav Mishra, Srinibas Shastri, Sahityabhandar, Meerut, 1972
4. Tarkabhasa of Keshav Mishra, Acharya Visveswar Siddhanta siromani, Chowkhamba Sanskrit Office, Varanasi, 1963
5. Indian Philosophy, S. Radhakrishnan, Oxford University Press, Delhi

SANS 705F	Foundation Course Computer (Skill-1)	4	0	0	4	100	Offered by University Centrally
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Foundation Course: Computer (Skill- I)

M. A. in Sanskrit 2nd Semester

M. A. in Sanskrit Second (2nd) Sem.- 500 Marks (C credits: 16;Ecredits:04)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
SANS 801C	Sanskrit Linguistics and History of Sanskrit Grammar	4	0	0	4	100

At the end of the course student will be able to:

- Provide an insight in basic knowledge about the fundamental concepts of modern linguistics
- Showcase understanding about the history and development of modern linguistics
- Demonstrate adequate knowledge about historical and comparative linguistics
- Explain Proto Indo Aryan language, Old Indo Aryan language, their origin and development
- Present thoughtful understanding about Indo-Aryan sound system, morphological system, semantic changes
- Analyze and apply phonetic laws
- Compare between Indian and Western linguistics

Course Contents:

- Introduction to Linguistics

(I) General outline of comparative Philology (II) Origin Definition of Language (III) Branches and Aspects of Science of Language

(IV) Classification of Language, (V) difference between Language and dialect, (VI) *Veda* and *Avesta*, (VII) Vedic and Classical Sanskrit

- Indo-European Language Family

(I) Indo-European family of Language, (II) Indo-Iranian, (III) Sanskrit as a member of Indo-European family of Languages, (IV) Role of Sanskrit in Comparative Philology, (V) A short description of Indo-European Languages [Greek, Germanic Italic (Latin)]

- Sanskrit Phonology, Morphology, Syntex, Semantui of Phonetic Laws:-

(I) Sanskrit Phonology and Phonetic Laws, Grimm's Law, Varner's Law, Grossmann's law, Cowlitz' Law,(II) Sanskrit morphology with special reference to Declension of nouns & pronouns, conjugational system,(III)Semantics, (IV) *Pali*, *Prakrit*and *Apabhramsa*

- Old Indo Aryan (OIA) it's origin & Development, The IE sound system and its

development of OIA, Sanskrit and Computational Linguistics.

Recommended Books:

1. Elements of the Science of Language-I; J. S. Taraporewala, Calcutta University Press, Calcutta, 1962
2. An Introduction to Comparative Philology; P. D. Gune, , Chowkhamba Sanskrit Pratisthan, Delhi, 2005
3. Linguistic Introduction to Sanskrit-I,II,III; B. K. Ghosh, Sanskrit PustakBhandar, Calcutta, 1977
4. An Introduction to Sanskrit Linguistics; M. S. Murthi, D. K. Publication, Delhi, 1984
5. Modern Linguistics; S. K. Verma&Krishnaswamy, Oxford University Press, Delhi, 200Introduction to Prakrit; A.C Woolner,BharatiyaVidyaPrakashan, Varanasi
6. Bhasavijnana O Bhasashastra; Kapildev Dwivedi
7. Tulanatmaka Bhasavijnana; BholanathTiwari, MotilalBanarssidas, Delhi, 1974
8. Bhasavijnana; BholanathTiwari, KitabMahala, Allahabad, 1992
9. Sanskritka Bhasasha striyaadhyayana; BholasankarVyasa, ChowkhambaVidyabhawan, 1957
10. Bhasavijnana; Karan Singh, Meerut, UP
11. Sanskrita-vyakaranasy-itihasa; LokamaniDahala, Delhi
12. Systems of Sanskrit Grammar; S. K. Belvelkar, Delhi
13. A Handbook of Sanskrit Philology, S. R. Banerjee, Sanskrit Pustak Bhandar, Calcutta

SANS 802 C	Upanisadic Texts	4	0	0	4	100
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At the end of the course student will be able to:

- Provide an insight about the tradition, philosophy and framework of *Upanishadic* texts
- Deal with reading and critically evaluating selected *Upanishadic* texts
- Successfully discuss principal philosophy, various symbolism, concepts as found in selected *Upanishadic* texts
- Analyze and explain the relevance and applicability of the Upanishads in present time

Course Contents:

- Study of *Aitareyopaniṣad (Ṛgveda)*
- Study of *Śvetāśvetaropaniṣad (Kṛsnayajurveda)*
- Study of *Muṇḍakopaniṣad (Atharvaveda)*
- Study of *Taittirīyopaniṣad (Kṛṣṇayajurveda)*

Recommended Books:

1. Upanisad-samgraha;(Ed.) JagadishShastri, MLBD, Delhi 1984

2. Sixty Upanisads; (Trans.) P. Deussen, MLBD, New Delhi
3. Thirteen Principal Upanisads; R. E. Hume, Shivalik Publication, New Delhi
4. Principal Upanisads; S. Radhakrishnan, Centenary edition, DUP, Delhi, 1989
5. Philosophy of Upanisads; Paul Deussen, Education enterprise, Calcutta, 1972
6. Aitareyopanisad; Gitapress, Gorakhpur, UP
7. Mundakopanisad; Gitapress, Gorakhpur, UP
8. *Taittiriopaniṣad*, DevSahityaKutir Private limited Kolkatta
9. *Svetasvetaropanisad*, Ed. Sri Hanuman Prasad Poddar, Gita Press, Gorakhpur

SANS 803C	Sanskrit Plays & Poetics	4	0	0	4	100
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At the end of the course student will be able to:

- Provide basic knowledge about the illustrious history of Sanskrit drama and dramaturgy
- Deal with reading and critically analyzing selected Sanskrit plays
- Explain and analyze selected texts on Indian poetics
- Develop critical understanding about Indian stagecraft, architecture, style as described in Sanskrit drama and dramaturgy
- Demonstrate thorough understanding about subjects like *rasa* (aesthetic pleasure), *bhava* (emotion) etc.
- Compare between Indian and western poetics

Course Contents:

- Textual reading of this play Vikramorvaṣīyaṃ *Natakam*
- *Dhvanyāloka (Udyota - I)* (A text on Literary Criticism)
- Study of *Mrcchakatikam* of *Sūdraka*
- Selection from *Kāvya prakāśa* (Chapter I, II)

Recommended Books:

1. Vikramorvasiyam; M. R. Kale, MLBD, Delhi
2. Vikramorvasiyam; Parameswardin Pandeya and Aswini Kumar Pandeya, Chowkhamba Publication, Varanasi
3. Mrcchakatikam; (Ed) M.R. Kale, Booksellers and Publishers Co., Bombay, 1952
4. Mrcchakatikam; (Ed) Pritvidhara, Nirnayasagara Press, Bombay
5. Dhvanyaloka of Anandavardhana: K. Krishnamurthy, MLBD, Delhi, 1982
6. Dhvanyaloka; Jagannatha Pathak, Chowkhamba Publication, Varanasi
7. Kavyaprakasha; (Ed) V. Jhalkikar, BORI, Pune, 1965
8. Kavyaprakasha; Chowkhamba Publication, Varanasi

SANS 804C	Dharmasastra and Scientific Literature	4	0	0	4	100
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At the end of the course student will be able to:

- Provide an insight about the history and tradition of the *Dharmaśāstras*
- Showcase a fair idea about basic principles of Indian code of conduct, ancient Law and Governance
- Deal with important *Dharmaśāstra* texts like *Manusmṛhitā* etc.
- Appreciate in the light of reason various customs, rituals and traditions as found in the *Dharmaśāstras*.
- Apply one's disciplinary knowledge about various Indian positive sciences such as astronomy, architecture, medicine etc.
- Compare the development of Law and Governance in Indian and western worlds
- Compare the development of positive sciences in Indian and western worlds

Course Contents:

- Selected portion of *Manusmṛhitā*(Ch. II)
- *Yajnavalkyasahita*(*Acaraadhyay*)
- History of *Dharmaśāstra*
- Introductions to Ancient Indian Scientific Literature (*Vastusastra*, Astronomy, Medical Science, Chemistry, Mathematics, Geography)

Recommended Books:

1. Manusmriti, (Ed.) ShivarajAcharya, ChowkhambaVidyabhawan, Varanasi
2. Manusmriti, (Ed.) HaragovindaShastri, Chowkhamba Sanskrit Pratisthana, Delhi
3. Manusmṛhitā, (Ed.) ManabenduBandyopadhyay, Sanskrit PustakBhandar, Kolkata.
4. Yajnavalkyasmriti, (Ed.) Gangasagar Ray, Chowkhamba Sanskrit Pratisthana, Delhi
5. History of Dharma Shastra, P.V. Kane, BORI, Poona
6. Science in Ancient India, K.P. Sina
7. Indian Tradition of Chemistry and Chemical Technology, A.R. VasudevaMurty, Sanskrit Bharati, New Delhi
8. Indian Mathematics and Astronomy, Dr. S. BalachandraRao, Mana Deep Publication, Bangalore

SANS 805E	Inscription & Functional Sanskrit	4	0	0	4	100
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At the end of the course student will be able to:

- Disseminate information about history of inscriptions written and available in Sanskrit
- Describe and decipher in some details some of the selected inscriptions
- Provide information about manuscripts and Manuscriptology
- Describe and evaluate the history and development of Sanskrit scripts
- Decipher selected ancient Indian scripts
- Apply skill in Sanskrit translations and translational methods

Course Contents:

- General Introduction of Inscription
- Study of Allahabad Pillar Inscription of Samudragupta
- Selection portion *Campurāmāyana(Bālakānda)*
- Unseen Translation from English to Sanskrit & Sanskrit to English
- Sanskrit Composition
- Sanskrit to English / English to Sanskrit Equivalent

Recommended Books:

1. A Study of Important Gupta Inscriptions, M.Banerji, Calcutta, 1974
2. Aśoka and His inscriptions (Two Parts), B.M. Barua, Calcutta, 1968.
3. Corpus Inscriptional Indicum, J.F. Fleet,1974
4. Gupta Abhilekha, VasudevUpādhyay, Bihar Hindi Grantha Academy, Patna, 2000
5. Sanskrit NibandhaManjuṣa, Acarya.C
6. Select Inscriptions, Sircar, D.C, University of Calcutta, 1965.
7. Higher Sanskrit Grammar, M.R. Kale, MLBD Delhi
8. Sanskrit Sikshan-Sarani, Acharya Ram Sastri, Parimal Publications, Delhi
9. Campurāmāyana, Sri Ramachandra Mishra, ChowkhambaVidyabhavan, Varanasi.

M. A. in Sanskrit 3rd Semester

M. A. in Sanskrit Third (3rd) Sem.-500 Marks (Ccredits:16; Ecredits:04)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
SANS 901C	Indian Philosophical Texts	4	0	0	4	100

At the end of the course student will be able to:

- Explain Indian epistemology, metaphysics and ethics in some details

- Acquire and apply one's disciplinary knowledge about the basic principles of *Samkhya*, *Yoga*, *Mimamsa* and *Vedanta*
- Explain and analyze basic Sanskrit texts of the four schools of Indian philosophy
- Compare between Indian and western philosophical system

Course Contents:

- Study of *Sāṃkhya-Kārikā with Sāṅkhyatattvakaumudī (SāṅkhyaPhilosophy)*
- Study of *Yogasūtra with Vyāsabhāṣya(Samādhipāda, Yoga Philosophy)*
- Study of *Arthasaṃgraha of Laugakṣī Bhāskara (Mimamsa Philosophy)*
- Study of *Vedāntasāra of Sadananda (Vedānta Philosophy)*

Books recommended

1. Samkhyakarika (Hindi Translation), JagannathaShastri, MLBD, Delhi,1998
2. Samkhyakarika (English Translation), Wilson,Delhi,1978
3. Samkhyakarika, BrajamohanChaturvedi, National Publishing House, Delhi, 1988
4. Arthasaṃgraha of Laougakshi Bhaskar, Kameswarnath, Mishra, Choukhamba SurabharatiPrakashan, Varanasi,1983
5. Arthasaṃgraha of Laougakshi Bhaskar, DayashankarShastri, ChowkhambaVidyabhawan, Varanasi
6. Arthasaṃgraha of Laougakshi Bhaskar, VachaspatiUpadhyaya, ChowkhambaOrientalia, Varanasi, 1977
7. Arthasaṃgraha of LauugakshiBhaskar, A. B. Gajendragadkar, & R. D. Karmakar, Bhandarkar Oriental Research Institute, Poona, 1973
8. History of Indian Philosophy, S. N. Dasgupta, MLBD, Delhi, 1975
9. Outline of Indian Philosophy, M. Hiriyanna, London,1956
10. Yogasūtram- Patañjali (ed.) J.R. Ballantyne, Pious Book Corp., Delhi
11. Patañjali-Yogasūtram- Patañjali, vyākhyātā, SwamīHariharānandaĀranyak, MLBP, Delhi.
12. Vedantasara of Sadananda, Acharya Ramamurti Sharma, Eastern Book linkers, Delhi, 2001
13. Vedantasara of Sadananda (English Translation), Swaminikhilananda, AdvaitaAshrama,R.K.Mission, Calcutta, 1974
14. Samkhyatattvakaumudi, Shri. Narayan Chandra Goswami, Sanskrit Pustak Bhandar, Kolkatta

SANS 902C	History of Indian Culture and Civilization	4	0	0	4	100
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At the end of the course student will be able to:

- Explain the idea of Culture and civilization in details
- Describe the general characteristics of Indian philosophy
- Demonstrate critical understanding about the culture of the Vedic period
- Illustrate the features of culture and civilization as reflected in the Epics
- Critically evaluate various themes of Indian culture such as *Varna*, *Ashrama*, *Vivaha* etc.
- Debate and appreciate in the light of reason the philosophy as reflected in the continuous flow of Indian culture and tradition
- Acquire adequate information about the history and development of Buddhism, Jainism, Vaishnavism

Course Contents:

- Culture and Civilization in the *Samhitā*, *Brāhmaṇa* and *Vedāṅga* Period
- Culture and Civilization during the time of the *Rāmāyaṇa*, *Mahābhārata* and *Purāṇas*
- Study of Indian Culture & Civilization in the light of *Varnāśrama* system, *Puruṣārthas*,
- *Saṃskāras*, ancient Indian Education system, Position of Women & downtrodden in ancient India.
- Growth & development of Buddhism, Jainism, Vaishnavism & Saivism

Recommended Books

1. Adbhuta Bharat, A. L. Basam, Shiv Lal Agrawal & Company, Agra
2. Ancient India; R. C. Majumder, Delhi
3. Ancient Indian education; R. K. Mukharjee, MLBD, Delhi
4. Baishnava, Shaivaaur Anya Dharmika Mata (Tra), Maheswari Prasad, Bharatiya Vidya Prakashan, Delhi
5. Bharatasya Sanskritika-nidhih (RP), Ramji Upadhyaya, Chowkhamba Sanskrita Pratistan, Delhi
6. Bharatiya sanskriti ka Uthana, Ramjee Upadhyaya, Chowkhamba Vidyabhawan, Varanasi
7. Bharatiya Sanskriti, Kiran Tandon, Eastern Book Linkers, Delhi
8. Bharatiya Sanskriti, Sivadatta Giani, Rajkamal Prakasani, Delhi
9. Dharma, Samajaur Sanskriti; Krishna Mohan Sriali, Granthasilpi Pvt. Ltd., Delhi
10. Dharmashastra Ka Itihas; P. V. Kane, Uttarpradesh aHindiasansthan, Lacknow
11. Education in Ancient India; A.S. Altekar, Delhi
12. Epic India; C. V. Vaidya, Delhi
13. Glories of India; P. K. Achray
14. Hindu Sanskar, Rajabali Pandeya, Chowkhamba Surabharati Prakashan, Varanasi
15. History of Dharmashastra; Vol. II, P.V. Kane, BORI, Poona
16. Indian Tradition of Chemistry and Chemical Technology, A.R. Murty, Sanskrit Bharati, New Delhi.
17. Life, thought and Culture in India (300-1000 AD); Vol. II, Part-I, K. Sacchidanadamurty, MLBD, Delhi

18. Prachina Bharat ki sanskriti maursabhyata, D. D. Kousambi, Raja Kamal Prakasan, New Delhi
19. Prachina Bharat Men Siksha, A.S. Altekar
20. Pride of India- A Glimpse into India's Scientific Heritage, Ed. by Sanskrit Bharati, New Delhi.
21. The Discovery of India; Jawaharlal Nehru, Penguin Books, New Delhi
22. Vaisnavism, Saivism and minor Religious Systems; R. G. Bhandarkar, Delhi
23. Vedic Religion & Mythology; R. N. Dandekar, University of Poona, 1965
24. The Cultural Heritage of India, Vols I to VI, The Ramakrishna Mission Institute of Culture, Kolkata, 2002-03

SANS 903C	Poetry & Prose	4	0	0	4	100
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At the end of the course student will be able to:

- Acquire basic knowledge about the history and trajectory of classical Sanskrit literature
- Explain and critically analyze selected texts of Sanskrit poetry
- Deal with reading and explaining selected texts of Sanskrit prose
- Present translation and comparative analysis of the suggested texts

Course Contents:

- Study of *Naiṣadhacarita* of Śrīharṣa (1st Canto)
- Study of *Harṣacaritaṃ* of Bāṇa (Chapter - V)
- Study of *Kādamabarī* of Bāṇa (*Mahāśvetā-vṛttāntam*)
- Study of *Meghadūta* of Kālidasa

Recommended Books

1. Meghadūtam, RamashankarTripathy, MLBD, Delhi
2. Meghadūta, (Ed.) M.R. Kale, MLBD, Delhi
3. The Harsacarita of Bana (English Translation), E. B. Cowell and F. W. Thomas, London: Royal Asiatic Society, 1897
4. Harshacharita by Banabhatta (in Hindi), Ashok Kaushik, Diamond Pocket Books, Delhi
5. Kadambari, by Samir Sharma, Choukhamba VidyaBhavan, Varanasi
6. The Kadambari of Banabhatta: Purvabhaga (ed.), P. V. Kane, Motilal Banasidass Publishers, New Delhi 1921
7. Naisadhiyacaritam, Mohan dev Panth, Motilal Banasi Dass, Delhi
8. Naisadhiyacaritam, Surendra dev Shastri, Gokuldas Sanskrit Granthamala, Varanasi
9. Naisadhiyacaritam, SuryadevShastri, Chowkhamba Oriantalia, Varanasi, 1975

SANS 904C	Sanskrit Drama	4	0	0	4	100
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At the end of the course student will be able to:

- Present a fair idea about the history, general characteristics, framework of Sanskrit drama
- Explain , translate and critically analyze selected texts of Sanskrit drama
- To provide an insight the illustrious literature of Sanskrit dramaturgy
- Explain and critically evaluate selected portion of texts on dramaturgy
- Compare and contrast between Indian and western stagecraft
- Relate and compare contemporary trends in drama and dramaturgy with Ancient tradition

Course Contents:

- Study of *Uttararāmacaritan of Bhavabhūti*
- Study of *Ratnāvalī of Harṣa*
- Study of *Natyāśāstra of Bharatamuni I, II, VI*
- Study of *Daśarūpaka of Dhanañjaya (Chapter I)*

Recommended Books

1. Dasarupaka, (Ed.) Srinivash Shastri, Sahitya Bhandar, Meerut
2. Dasarupaka, Kesava Rao Musalgaonkara,(ed) Chowkhamba Prakashan, Varanasi, 2007
3. Dasarupaka, (Ed.) Lokamani Dahal, Chowkhamba Amarbharati, Varanasi,
4. *Natyasastra*, R. S. Nagar (ed), Parimal Publication, Delhi, 1988
5. *Natyashastra of Bharata Muni, (Ed.) N. P. Unni, 1998*
6. *Natyashastra of Bharata Muni, Babulshukla, Chowkhamba Sanskrit Sansthan, Varanasi*
7. *Natyashastra of Bharata Muni, BatukNath Sharma & Pt. Baladev Upadyaya, Kasi Sanskrit series, Varanasi*
8. *Ratnavali, M.R. Kale. MLBD, New Delhi.*
9. *Uttararamacaritam – M. R. Kale, M. L. B. D., Delhi,1962*
10. *Uttararamacaritam _ P. V. Kane, M. L. B. D., Delhi, 1962*
11. *Uttararamacaritam _Ed. C. R. Devadhar, MLBD, Delhi*

SANS 905E	<i>Sahityasastra</i>	4	0	0	4	100
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At the end of the course student will be able to:

- Acquire knowledge about India's contribution in the field of Literary criticism
- Explain, translate, compare and critically evaluate relevant portions of Sanskrit texts on literary criticism.

- Analyze important concepts such as aesthetic experience (*rasa*), the nature and objective of poetry (*kāvya-prayojanam*), *alamkāra* etc.
- Compare and contrast between the ways of Indian and western literary criticism
- Apply methods of literary criticism in literature review

Course Contents:

- Study of *Kavyaprakāśah* (9th & 10th Ullas)
- Study of *Sāhityadarpaṇa* (Chapter I & II)
- Study of *Sāhityadarpaṇa* (Chapter III & IV)
- Study of *Kāvyaṁīmāmsā* (Chapter –I)

Recommended Books

1. *Sāhityadarpaṇa* of KavirajaVisvanatha, (Ed.) P.V. Kane
2. *Sāhityadarpaṇa* of KavirajaVisvanatha, Laksmatika,
3. *Sāhityadarpaṇa* of KavirajaVisvanatha, NirupanaVidyalamkara, SahityaBhandar, Meerut, 2004
4. *Sāhityadarpaṇa* of KavirajaVisvanatha, ShaligramShastri, MLBD, Delhi, 2004
5. *Sāhityadarpaṇa* of KavirajaVisvanatha, Satyabrata Singh, ChowkhambaVidyabhawan, Varanasi 1988
6. *Kavyaprakasha*; (Ed) V. Jhalkikar, BORI, Pune, 1965
7. *Kavyaprakasha* of Mammata; R. C. Dwivedi
8. *Kavyamīmāmsā* of Rājaśekhara, S.Parasara.

M. A. in Sanskrit 4th Semester

M. A. in Sanskrit Fourth (4th) Sem. -500 Marks (C credits:16; E credits: 04)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
SANS 1001C	Sanskrit Poetics and <i>Vakroktijivitam</i>	4	0	0	4	100

At the end of the course student will be able to:

- Analyze basic principles of different schools of Indian Literary criticism
- Illustrate, compare and explain the *Vakrokti* school in relation to other schools
- Explain, translate and critically evaluate relevant portions of the text *Vakroktijivitam*
- Apply knowledge about the theory of *Vakrokti* and related arguments efficiently

Course Contents:

General Introduction to:

- *Alaṃkāra School, GuṇaSchool, Dhvani School, Rīti School, Rasa School, Vakrokti School Aucitya School*

Assessment of works of following authors:

- *Bharatamuni, Bhāmaha, Daṇḍī, Agni Purāṇa, Viṣṇudharmottarapurāna, Rudraṭa, Dhanañjaya, ViśvanathaKaviraja, AppayaDīkṣita, PanditaraajJagannatha Ānandavardhaṇa, Mukulabhaṭṭa, Bhaṭṭanāyaka, Rājaśekhara, Abhinavagupta, Kuntaka, Mahimabhaṭṭa, Bhojaraja, Kṣemendra, Mammaṭa, Ruyyaka,*
- Study of *Vakroktijīvitam of Kuntaka – I*

Recommended Books

1. History of Sanskrit Poetics, S.K. De, Calcutta.
2. History of Sanskrit Poetics, P.V. Kane, MLBD, Delhi
3. Studies on some concepts on *Alaṃkāraśāstra*, V. Raghvan.
4. *Vakroktijīvitam*, Rabishankar Bandyopadhyay, Kolkata.

SANS 1002C	Modern Sanskrit Literature	4	0	0	4	100
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At the end of the course student will be able to:

- Showcase general knowledge about the history and development of modern Sanskrit writings
- Demonstrate their knowledge about the trends of Sanskrit writing in modern times
- Critically appreciate and review general characteristics, subject matter and style of modern Sanskrit writings
- Apply one's knowledge in dealing selected portions of famous literary texts both prose and poetry of modern Sanskrit writers with proficiency

Course Contents:

- History of Modern Sanskrit poetry & prose
- History of Modern Sanskrit Dramas
- Study of *Śrīsvāmīvivekānandacaritam*
- *Kāvyaḷaṅkāraśāstra*

Recommended Books

1. *Ādhunika-Sanskṛta-Sāhityasye-tihāsaḥ*, KalanathaShastri, Jayapur
2. Sanskrit writings in Independent India, V.N. Jha, Poona

3. A Bibliography of modern Sanskrit writings, RadhavallavTripathi, Rastriya Sanskrit Samsthanam, New Delhi,
4. *Viṃśati-śatābdi-saṃskṛta-kāvyaṃṛtaṃ*, Rajendra Mishra, Delhi Sanskrit Academy, Delhi
5. *Sanskrit SahityaKaAbhinavItihāsa*, RadhavallabhaTripathy, Varanasi
6. Śrīsvāmīvivekānandacarita Mahākavya, PanditTryambaka Sharma Bhandarkar, ChowkhambaSanskrit Series Office, Varanasi.
7. KāvyaĀlaṅkārikā of Revāprasād Dvivedi, Varanasi

SANS 1003C	Sanskrit Epics and <i>Prakrit</i> Grammar	4	0	0	4	100
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At the end of the course student will be able to:

- Present a comprehensive treatment to the history, textual tradition, language and philosophy of Indian Epics
- Acquire knowledge about the life and culture of India and the subcontinent along with the reach of Indian Epics to the outer world
- Analyze *Prakrit* language and grammar so to explain the relation among Sanskrit, *Prakrit* and Modern languages

Course Contents:

- Study of *Rāmāyaṇa Ādikāṇḍa* (Chapter – I)
- Study of Mahābhārata(Śāntiparvan)
- Study of *Rajatarāṅginī (Taraṅga – I)*
- Study of *Prākṛita* Grammar (Chapter I & II)

Recommended Books

1. *Rāmāyaṇa* of Vālmīki(Vol. – I) the *Bālakāṇḍa*, Critically Edited by G.H Bhatt, Oriental Institute, Baroda, Gujrat
2. *ŚrīmadvālmīkiyaRāmāyaṇaṃ*, Sri VasudevLaxmanaShastri, Indological Book House, Varanasi
3. *Rāmāyaṇa*, (Ed.) ChinnaSwamiShastrigal, and V. H. SubrahmanyamShastri, N. Ramaratham, Madras, 1958
4. *Mahābhārata*, Critical Edition, BORI, Poona
5. *Mahābhārata* with Nilakantha’s Commentary, Chitrasala Press, Poona
6. *Mahābhārataṃ*, Sripada Damodara Satavalekar, Paradi, Valsad, Gujrat
7. *PrākṛitaPrakāśa* of Vararuci, S.R. Banerjee, Sanskrit PustakBhandar, Kolkata
8. A Grammar of *Prakrit* Language, D.C. Sircar.

SANS 1004E	<i>Mimamsa, Vedanta and Bhagavadgita</i>	4	0	0	4	100
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At the end of the course student will be able to:

- Present a fair idea about major issues raised in *Mimamsa* and *Vedanta* Philosophy
- Explain various schools of *Vedanta* tradition, Vedantic epistemology, metaphysics etc. are dealt with a modern perspective
- Evaluate the philosophy of *Bhagavadgita*, along with the views of both ancient and modern interpreters

Course Contents:

- Study of *Mīmāṃsāsūtras of Jaimini Sutra I – V with Śavarabhāṣya*
- Study of *Mīmāṃsāparibhāṣā*
- Study of *Vedāntaparibhāṣā*
- Study of *Bhagavadgītā (Jñānaśaṭka)*

Recommended Books

1. *Mīmāṃsāparibhāṣa*, Ramkrishna Mission Publication
2. *Mīmāṃsāparibhāṣa*, Narayan Ram Acarya
3. *Pūrvamīmāṃsā in its Sources*, GanganathJha
4. *The Philosophical Tradition of India*, P.T.Raju, New Delhi.
5. *Mīmāṃsāsābarabhāṣyam*, U. Sharma, Chowkhamba, New Delhi.
6. *Śrīmadbhagavadgītā with Śaṅkarabhāṣyam*, Geeta Press, Gorakhpur
7. *Śrīmadbhagavadgītā with Śaṅkarabhāṣyam*, Ramkrishna Mission, Golpark, Kolkata
8. *Vedāntaparibhāṣā*, S.RadhakrishnaDharmarajadhvarindra,SuryanarayanShastri, Adyar Library Research Centre
9. *Vedāntaparibhāṣā*, Pancanana Tarkatirtha(ed.)Sanskrit PustakBhandar, Calcutta

SANS 1005C	Project	4	0	0	4	100
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At the end of the course student will be able to:

- Showcase an aptitude for research
- Present basic understanding about Research Methodology
- Demonstrate knowledge in research trends in Sanskrit
- Apply knowledge in dealing with computer skill, referencing, authorship and date

Project

- Research Methodology: Building Research questions, research methods, referencing, authorship, writing introduction etc.

- Library work: Survey, data collecting research, arrangement, design etc.
- Dissertation writing: Theme of Dissertation-
 - Lexical work
 - Translation and analysis
 - Relation between North-Eastern, local culture with Sanskrit

Written 70

Viva 30

Tripura University Agartala Tripura
Department of Law
M.A Program Outcomes

Programme Learning Outcomes (PLOs)

PLO 1: The student should be able to understand, apply & critically analyses legal issues.
PLO 2: The student should be able to conduct legal research & find relevant solutions.
PLO 3: The student should be able to understand & handle information technology.
PLO 4: The student should be able to critically analyse the situation & also sensitize the society about various socio-legal aspects.
PLO 5: The student should be able to develop through grounding in various aspects of the legal field.
PLO 6: The student should have the ability to act a as group leader in times of need to handle a socio-legal crisis.
PLO 7: The student should act in a way that promotes communal harmony
PLO 8: The student should demonstrate strong ethical values & beliefs as a responsible member of the legal community.
PLO 9: The student should be able to develop acceptability in the market and be industry ready.
PLO 10: The student should be able to develop the ability to state the lifelong learning process & deal with emerging issues.

TRIPURA UNIVERSITY

Department of Education

MASTER OF ARTS

IN

EDUCATION



FIRST & THIRD SEMESTER: JULY-DEC

SECOND & FOURTH SEMESTER: JAN-JUNE

**Tripura University (A Central University)
Suryamaninagar, Agartala, Tripura, West-799022**

Objectives of M.A. in Education:

At the end of the programme the students will be able to understand the subject of education properly and they will be able to develop different skills and attitude related to teaching, research and extension of activities. More specifically, the M.A. in Education programme intends to

- Impart students a comprehensive knowledge, proper understanding of education and appreciate knowledge structures and paradigms of education.
- Develop different skills in the area of measurement and evaluation in education especially construction and standardization of tools.
- Understand the educational psychology as an applied science and acquaint the learner with the process of development of various abilities and traits.
- Familiarize students with modern scientific research techniques.
- Provide an understanding about the need and the importance of value education, teacher education, intelligence and creativity.
- Understand and use descriptive and inferential statistical techniques in education.
- Focus attention on certain major national and social issues and role of education in relation to them.
- Provide learning – experiences, which will enable students to understand Develop expertise for effective participation in educative process in different capabilities.
- Use of critical reflection to explore the relationship between theory and practice in complex situations.
- Bring ability to analyze, judge and critique complex or contradictory areas of wisdom, varied practices.
- Think creatively and flexibly to synthesize and transform variety of practicable ideas.

Eligibility

Passed B.A. (Hons/Pass) in Education

Duration

There will be duration of four semesters. Each six month duration shall comprise a semester. The M.A. in Education Programme can be completed by a student in the period of two years.

Programme outcomes

- (i) **Developing Knowledge about philosophical and value related aspects:** Students will get the clear idea of philosophical aspects of education, come to know about the different Indian and abroad philosophers, their philosophical point of views, different schools of philosophy and their implications in present day education. They will able to build a conception about values, its inculcations and the process of nurturing good values and morality among the students.
- (ii) **Developing knowledge about psychology:** Students will able to understand the basics of human development and adjacent psychological theories, different learning theories, individual differences, personality and many more psychological aspects and

their impact on learning, maturation and development. The students will be able to apply the psychology based knowledge on the practical aspects of their daily life.

- (iii) **Developing knowledge about sociology:** Students will come to know about different social organizations, their attachments in teaching learning process, social factors and their impact on education. They will be able to apply this knowledge in favour of giving positive direction to their community.
- (iv) **Developing knowledge and skills about technology:** Students will develop an understanding regarding models of teaching and its application in classroom learning, become familiar with self-learning reading materials, using assistive technology, develop skills to using TLM in classroom interaction.
- (v) **Gathering knowledge and skills to conduct research:** Students will be able to gather knowledge about different forms of research, develop skills to conduct a good research, skills to write research proposal and research report.
- (vi) **Developing knowledge and skills of administration and management:** Students will be able to develop administrative and managing knowledge and skills, develop knowledge about leadership and leadership styles, human resource management, conflict resolution etc. And also will be able to apply this knowledge of administering and managing over different educational and real life situations.
- (vii) **Understanding about inclusion and Disability:** Students will be able to understand inclusion and different types of disability, how to learn disabled child and role of teacher for improving learning.
- (viii) **Development of the Knowledge and skill about guidance and counselling:** Understanding the knowledge and skill about different types of guidance and counselling. They will be able to give proper guidance to the learners and counselling them as per their requirements.
- (ix) **Development of the conception and skills of measurement and evaluation:** students will be able to understand various measuring scale, assessment, tools, technique and various evaluation system, new trends in evaluation, educational measurement and able to apply these ideas as per the situational demand.
- (x) **Clear idea about higher education:** Students will be able to learn new ways of thinking and acquiring problem-solving skills and learn critical thinking, analytical capacity, written and oral communication and group problem solving etc.
- (xi) **Enable to use statistics:** Students will be able to do grasp different statistical techniques and able to utilize these as per the requirements and able to interpret over any data based on the obtained statistical result. They will be able to develop skills of doing different inferential and descriptive statistics, making graph etc.
- (xii) **Clutch knowledge about intelligence and creativity** – Students will be able to grasp proper knowledge about intelligence, intelligence theories, intelligence measurement,

creativity, creativity measurement, different tests to measure intelligence and creativity and also be able to apply these tests on practical field.

- (xiii) **Seize knowledge about teacher education:** Students will be able to get an idea regarding different teaching models, instructional strategies their application on practical field of teaching learning.
- (xiv) **Knowledge about contemporary issues in Education:** Students will get knowledge about contemporary background of education, different committees and commissions of education, their role in upliftment of Indian educational structure.
- (xv) **Knowledge about great educators:** Students will come to know about great educators and their contribution to education
- (xvi) **Knowledge about open, online and distance learning:** Students will come to know about different sources and agencies of open, online and distance learning and able to apply their knowledge in favour of doing various courses and able to participate different educational programmes.
- (xvii) **Imparting knowledge about comparative education:** Students will be able to compare between different nations on their educational structure and systems. They will be able to get a critical analytical capacity on different educational scenarios.
- (xviii) **Knowledge about practical scenario of women empowerment:** Students will critically understand the practical scenario of the conditions of women in India and be able to think about the necessary initiatives to be taken for the empowerment of the women.

Structure of the programme
M.A. in Education
Total credits: 80

SEMESTER -I

Total Credits: 20 (Core Course: 16 + Computer Skill-1: 4)

Course Code:	Name of the course	Credits	Internal Marks	External Marks	Total Marks
EDCN 701C	Philosophical Foundation of Education	04	30	70	100
EDCN 702C	Psychological Foundation of Education	04	30	70	100
EDCN 703C	Sociological Foundation of Education	04	30	70	100
EDCN 704C	Educational Technology	04	30	70	100

CSK-1	Basic Computer Skill-I	04	30	70	100
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SEMESTER -II

(Three core paper & any two from the elective papers)

Total Credits: 20 (Core Course: 12 + Elective Course: 8)

Course Code:	Name of the course	Credits	Internal Marks	Theory Marks	Total Marks
EDCN 801C	Methodology of Educational Research	04	30	70	100
EDCN 802C	Administration and Management in Education	04	30	70	100

EDCN 803C	Inclusive Education	04	30	70	100
EDCN 804E	Measurement and Evaluation in Education	04	30	70	100
EDCN 805E	Guidance and Counselling in Education	04	30	70	100
EDCN 806E	Higher Education	04	30	70	100

SEMESTER -III

(Three core paper & any two from the elective papers)

Total Credits: 20 (Core Course: 12 + Elective Course: 8)

Course Code:	Name of the course	Credits	Int. Marks	Theory Marks	Total Marks
EDCN 901C	Value Education	04	30	70	100
EDCN 902C	Statistics in Education	04	30	70	100
EDCN 903C	Dissertation I (Review and Proposal)	04	30	70	100
EDCN 904E	Intelligence, Creativity and Education	04	30	70	100
EDCN 905E	Teacher Education	04	30	70	100
EDCN 906E	Curriculum Studies	04	30	70	100

SEMESTER -IV

(Three core papers and any one elective paper)

Total Credit: 20 (Core Course: 16 + Elective: 4)

Course Code	Name of the course	Credits	Internal Marks	Theory Marks	Total Marks
EDCN 1001C	History, Politics and Economics of Education.	04	30	70	100
EDCN 1002C	Thought of Great Educators.	04	30	70	100
EDCN 1003C	Dissertation II (Report writing and viva voce).	08	60 (viva)	140	200
EDCN 1004E	Open, Distance and Online Learning.	04	30	70	100
EDCN 1005E	Comparative Education.	04	30	70	100
EDCN 1006E	Education for Empowerment of Women.	04	30	70	100

C= Core

E= Elective

Evaluation Scheme for the Course:

Internal Exam	End Semester Exam	Total
30	70	100

Internal assessment of the students will be based on assignment, dissertation, presentation, viva voce etc. Students will be graded on the total marks allocated to the respective project/ presentation etc.

M.A in Education

1st semester

Course Code:	Name of the course	Marks Distribution		Total Credit	Total Marks
EDCN 701C	Philosophical Foundation of Education	Internal	External	4	100
		30	70		

Learning outcomes

After undergoing this course the students will be able to—

- Apply the principles of philosophy in education
- Describe the contribution of various Indian Schools of Philosophy in the fields of education.
- Illustrate the impact of Western Philosophies on education.
- Explain the contribution of some of the great Indian as well as Western educational thinkers.
- Summarize the concepts related to social philosophy of education.

COURSE CONTENTS:

UNIT-I

Concept of Education and Philosophy; Meaning of Educational Philosophy and Philosophy of Education; Relation between Education and Philosophy; Scope and functions of Educational Philosophy; Interaction between philosophy of life, aim of life, and aim of Education

UNIT-II

Contribution of Indian Schools of Philosophy (Sankhya Yoga, Vedanta, Buddhism, Jainism) with special reference to Vidya, Dayanand Darshan; and Islamic traditions towards educational aims and methods of acquiring valid knowledge.

UNIT-III

Contribution of Western schools of thought (Idealism, Realism, Naturalism, Pragmatism, Marxism, Existentialism) and their contribution to Education with special reference to information, knowledge and wisdom

UNIT-IV

Contributions of Vivekananda, Tagore, Gandhiji, Aurobindo and Sarvepalli Radhakrishnan, Pestalozzi, Froebel, Montessori, Kierkegaard, John Dewey to educational thinking

UNIT-V

National values as enshrined in the Indian Constitution and their educational implications. Modern concept of Philosophy: Analysis – Logical analysis, Logical empiricism and positive relativism – (Morris L. Prigge.)

Recommended Books:

1. Bramel, D. Patterns of Educational Policy, New York, Hold Rinehart & Winston. 1971.
2. Brown, L. M. Aims of Education, New York, Teachers College Press. 1970.
3. Brubacher, R. S. Modern Philosophies of Education, Chicago, University Press. 1955.
4. Cohen, B. Means and Ends in Education, London, George Allen & Unwin. 1983.
5. Curren Randall (Edited) A Companion to Philosophy of Education, New York Blackwell Publishing. 2003.
6. Curtis, S.J. Introduction to Philosophy of Education, London, London University, Tutorial Press. 1968
7. Dewey, J. Democracy and Education and Introduction into Philosophy of Education, New York, The Free Press, 1966
8. Fitzgibbon, R. E. Making Educational Decision: An introduction to Philosophy of Education, New York, Harcourt Brace Jovanovich, 1981
9. Heyting, Frieda (Edited) Methods in Philosophy of Education, London, Routledge, 2001.
10. Kneller, G. F. Introduction to Philosophy of Education, New York, John Wiley & Sons, 1971.
11. Lawton, D. Class Culture and Curriculum, London, Routledge & Regan Paul, 1975.
12. Luther, M.N. Values and Ethics in School Education, New Delhi, Tata McGraw Hill, 2001.
13. McChellan, J.E. Philosophy of Education, New Jersey, Prentice Hall Inc, 1976.
14. Moon, Bob (Edited) International Companion to Education, London, Routledge, 2000.
15. Morris, V. Existentialism in Education, New York, Harper & Row, 1966.
16. Mukherjee, R. K. Ancient Indian Education, Delhi, Motilal Banarasidas, 1974.
17. Narareth, M. P. Education Goals, Aims and Objectives, New Delhi, Vikash. 1984.

Course Code:	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 702C	Psychological Foundation of Education	Internal	External	4	100
		30	70		

Learning outcomes

After undergoing this course the students will be able to—

- Describe the concept and principles of Educational Psychology as an applied science.
- Apply the implications of leaning and other psychological theories in education.
- Illustrate the concept of individual differences.
- Identify the process of development of various abilities and trait.

Course Contents

UNIT-I

Educational Psychology: Concept, Nature and Scope of Educational Psychology, Relationship between Education and Psychology, Educational psychology as applied field, contribution of the following schools of Psychology towards Education: Behaviourisms, Gestalt, and Psycho-analytical.

UNIT-II

Growth and Development: Concept and principles; Physical, Social, Emotional and Cognitive Development; Development of concept, logical reasoning, problem solving, language.

Individual differences: determinants, role of heredity and environment; educational implications

UNIT-III

Intelligence- Concepts, theories and measurement

Creativity-concepts, process, identification, measurement and fostering

Relationship between intelligence and creativity

UNIT-IV

Principles and Theories of learning: Behaviouristic, Cognitive and Social theories of learning, Factors affecting social learning, social competence, Concept of social cognition, understanding social relationship and socialization goals; Learning and motivation; Transfer of learning and its theories.

UNIT-V

Psychology and education of exceptional children—Creative, Gifted, Backward, Learning Disableds and Mentally Retarded; Concept of Personality—type and trait theories of Personality—measurement of personality

Mental health and hygiene—process of adjustment, conflict and defence mechanism. Sex Education

Recommended Books:

1. Bhat B.D. Sharma Educational Psychology ,Kanishka Publishing House, New Delhi , (1993).
2. Bigge, M.L. Psychological Foundations of Education. Harper and Row, New York.
3. Bruner, J.(1977). The Process of Education, USA: Harvard University Press.
4. Chaube ,S.P. Development Psychology , M/S Vikas Publishing House, Agra ,(1986)
5. Chauhan, S.S. (1998). Advanced Educational Psychology. Vikash Publishing House, New Delhi.
6. Choube, S.P. &Choube.(1996). Educational Psychology and Experiments. Himalay Publishing House, New Delhi.
7. Crow, L.D. & Crow, Educational Psychology, Revised Edition, Eurasia Publishing House, New Delhi.(1964)
8. Dash, M. (2004) Educational Psychology, Deep & Deep Publishing Pvt. Ltd, New Delhi.
9. Gagne, R.M The Conditions of Learning, N.Y. HOLT, Rinehart &Winston Publishing House. New York (1970)
10. Gardner, H.(1983). Frames of Mind: The theory of multiple intelligence. New York: Basic Books
11. Irvine, J.J.(2003). Educating teachers for diversity: Seeing with a cultural eye. New York: Teacher College Press.
12. JitendraMohan Educational Psychology, Wiley Eastern LTD., New Delhi. (1993)
13. Kaur, R School Psychology, Deep & Deep Publishing PVT, LTD, New Delhi. (2006)
14. Laggard, G.L. (2005). Promoting Reflective Thinking in Teachers, Crowin Press.
15. Linda, Darling Hammond & John Bransford (ed) (2005) . Preparing Teachers for a Changing World. San Francisco: Jossey – Bass.
16. Mangal , S.K. (2007) Educational Psychology, Prentice Hall of India, New Delhi.
17. Martin, D.J. & Kimberly S. Loomis. (2006). Building Teachers: A constructivist approach to introducing education. USA: Wadsworth Publishing.
18. Maslow ,A.H.(1970).*Motivation and Personality* (2nd Edition). New York. Harper and Row.
19. Mathur, S.S. Educational Psychology. BinodPustakMandir, Agra.
20. Narayan Rao Educational Psychology, Wiley Eastern LTD., New Delhi. (1993)
21. NCERT(2005) National Curriculum Framework. New Delhi: (Author).
22. Piaget, J.(1999). Play, Dreams and Imitation. London: Routledge.
23. Schon,D. (1987): Educating the Reflective Practioner; Towards a New Design for Teaching and Learning in the Professions. New York: Basic Books.
24. Sharma,R.N. (1996). Advanced Educational Psychology, Eastern Book House, Guwahati.
25. Skinner, C.E . Educational Psychology, Printice Hall of India.,New Delhi(1999)
26. Vygotsky, L.(1986). Thought and language (A. Kazulin, Trans). Cambridge, M.A: MIT Press.
27. Vygotsky, L.S. (1978) Mind in Society: The Development of Higher Order Psychological Processes, USA: Harvard University Press.
28. Vygotsky, L.S. (1999) Educational Psychology, M/S S.K.Enterprise, Book Seller and Distributors, Shillong.
29. Woolfold, A.E. (2011) Educational Psychology. DerlingKinderslay (India) Pvt. Ltd.
30. Walla, J.S. Foundations Educational Psychology, Jalandhar Publishing , Jalandhar (1997).

Course Code:	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 703C	Sociological Foundation of Education			4	100
		30	70		

Learning outcomes

After undergoing this course the students will be able to—

- Enumerate Meaning and nature of educational sociology, sociology of education and social organization.
- Explain the concept of Group dynamics, social interaction, social change and the contribution of education to these aspects.
- Estimate various social factors and their impact on education.

Course Contents

UNIT-I

Relationship of Sociology and Education; Meaning and nature of Educational Sociology and Sociology of education; Education—as a social sub-system—specific characteristics; Education and the Home, Education and the Community with special reference to Indian society

UNIT-II

Education and Modernization

Education and politics

Education and religion

Education and culture

Education and democracy

UNIT-III

Approaches to Sociology of Education (Symbolic Interaction, Structural Functionalism and Conflict Theory); Concept and types of social Institutions and their functions (family, school and society); Concept of Social Movements, Theories of Social Movements (Relative Deprivation, Resource Mobilization, Political Process Theory and New Social Movement Theory)

UNIT-IV

Socialization and Education; Education and Social change—Meaning and nature of social change; Contribution of thinkers (J. Krishnamurthy, Paulo Freire, Wollstonecraft, Nel

Noddings and Savitribai Phule) to the development of educational thought for social change; Constraints on social change in India (caste, ethnicity, class, language, religion, regionalism)

UNIT-V

Education as related to social stratification and social mobility; Education as related to social equity and equality of educational opportunities; Education of the socially and economically disadvantaged sections of the society with special reference to Scheduled Castes and Scheduled Tribes, Women and Rural Population

Recommended Books:

1. Adisesiah. W.T.V & Sociology in Theory and Practice, New Delhi, Santhi Pavanasam. R. Publishers, 1974
2. Barry, H. & Johnson, L.V Classroom Group behavior: Group Dynamics in Education. New York, John Wiley & Sons, 1964
3. Blackledge, D.& Hunt, Barry Sociological Interpretations of Education, London, Groom Helin, 1985.
4. Chandra S.S. & Sharma R.K Sociology of Education, New Delhi, Atlantic Publisher, 2002
5. Chandra S.S. Indian Educational Development, Problems and Trends, New Delhi, Kanishka Publishers, 2002
6. Chandra S.S. Sociology of Education, Guwahati, Eastern Book House, 1996.
7. Cook L, A & Cook, E Sociological Approach to Education, New York, McGraw Hill, 1970
8. D'Souza A.A The Human Factor in Education, New Delhi, Orient Longmans, 1969
9. Durkheim, E. Education and Sociology, New York, The Free Press 1966
10. Goode & Hatt Methods in Social Research, Japan, McGraw Hill, Kogakusha, Ltd. 1952
11. Hemlata, T. Sociological Foundations of Education, New Delhi Kanishka Publishers, 2002
12. Inkeles, A.& Smith Becoming Modern, New York, Hanoman, 1982
13. Jayaram, Sociology of Education, New Delhi, Rawat, 1990
14. Joyee L. Epstein & Sanders M.G School, Family and Community partnership, Guwahati, Nivedita Book Distributors, 2002
15. Mishra. B.K.& Mohanty R. Trends and issues in Indian Education, New Delhi, Kanishka publishers, 2002
16. Mohanty, J. Indian Education in Emergency Society, New Delhi, Sterling Publishers, 1982
17. Rogers B. Classroom Behaviour, Guwahati, Nivedita Book Distributors, 2002
18. Shukla, S. & K.Kumar Sociological Perspective in Education, New Delhi, Chanakya Publication, 1985.
19. Swift, D.F Basic Readings in the Sociology of Education, London, Routledge and Kegan Paul, 1970.
20. UNESCO Inequalities and Educational Development, Paris,

Course Code:	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 704C	Educational Technology			4	100
		30	70		

Learning outcomes

After undergoing this course the students will be able to—

- Analyze the nature of educational technology.
- Apply the knowledge about models of teaching and its principles in classroom learning.
- Judge the self- learning reading materials.
- State the role of technology in education

Course Contents

UNIT-I

Meaning, nature, and scope of Educational Technology; Components of Educational Technology—Hardware, Software; Systems approach in Educational Technology; Multimedia approach in Educational Technology; Concept of Educational Technology (ET) as a Discipline: (Information Technology, Communication Technology & Information and Communication Technology (ICT) and Instructional Technology,

UNIT-II

Applications of Educational Technology in formal, non formal (Open and Distance Learning), informal and inclusive education systems, Overview of Behaviourist, Cognitive and Constructivist Theories and their implications to Instructional Design (Skinner, Piaget, Ausubel, Bruner, Vygotsky), Relationship between Learning Theories and Instructional Strategies (for large and small groups, formal and non formal groups).

UNIT-III

Systems Approach to Instructional Design, Models of Development of Instructional Design (ADDIE, ASSURE, Dick and Carey Model Mason's), Gagne's Nine Events of Instruction and Five E's of Constructivism, Nine Elements of Constructivist Instructional Design, Application of Computers in Education—CAI, CAL, CBT, CML; Concept, Process of preparing ODLM, Concept of e-learning, Approaches to e-learning (Offline, Online, Synchronous, Asynchronous, Blended learning, mobile learning).

UNIT-IV

Emerging Trends in e learning: Social learning (concept, use of web 2.0 tools for learning, social networking sites, blogs, chats, video conferencing, discussion forum), Open Education Resources (Creative Common, Massive Open Online Courses; Concept and application), E Inclusion—Concept of E Inclusion, Application of Assistive technology in E learning, Quality of E Learning – Measuring quality of system: Information, System, Service, User Satisfaction and Net Benefits (D&MIS Success Model, 2003), Ethical Issues for E Learner and E Teacher -Teaching, Learning and Research.

UNIT V

Use of ICT in Evaluation, Administration and Research: E portfolios, ICT for Research - Online Repositories and Online Libraries, Online and Offline assessment tools (Online survey tools or test generators) – Concept and Development; Integrating Technology across the curriculum

Recommended Books:

- 1) Bloom B.S.Taxonomy of Educational Objectives, Handbook 1, Cognitive Domain, London, Longman Group Ltd, 1974.
- 2) Chauhan S.S.A Text Book of Programmed Instruction, New Delhi, Sterling Publishers, 1987
- 3) Deceeco J.P. The psychology of Learning and Instructional Technology New Delhi, Prentice Hall of India.1970.
- 4) Flanders N.Analysing Teaching Behavior, London, Addison Wesley Pub.Co., 1971.
- 5) Goel, A and GoelS.L.Distance Education in the 21st Century. New Delhi, Deep and Deep Publication, 2000.
- 6) Jose Chander Management of distance Education, New Delhi, Sterling Publishers, 1991.
- 7) Joyce B. &.Weil M.Models of Teaching (4th edition), New Delhi, Prentice Hall of India Pvt. Ltd., 1992.
- 8) Mohanty, J. Educational Technology, New Delhi, Deep &Deep Publication, 2001.
- 9) Rastogi, S. Educational Technology for Distance Education, Guwahati, EASTERN Book House, 1998.
- 10) Sampath K. Instruction to Educational Technology, (3rd revised Edition), New Delhi, Sterling Publishers, 1992.
- 11) Sharma R.A. Technology of Teaching, Meerut, International Publishing House, 1991.
- 12) Sharma R.A.Programmed Instruction: An Instructional Technology, Meerut, International Publishing House, 1982.
- 13) Skinner B.F.The Technology of Teaching, New York, Appleton Century Croft, 1968.

Course Code:	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
CSK-1	Computer skill 1	Internal	External	4	100
		30	70		

Learning outcomes

After completion of the course students will be able to—

- Outline the History of computers, evaluation of computers, and generation of computers.
- Draw the Structure of computers (H/w and S/w), and their types.
- State the Application of computers.
- Explain the Idea of algorithm.
- Illustrate the Basics of Programming Language.
- Apply Internet in daily life.
- Describe about Office package (word/ Excel/PPT); Word – features, word menu, table, page setup, background, font, paragraph, formatting, symbol, equating, formatting of numbers, mail-merge, protected documents.

Course Contents

- a) History of computers, evaluation of computers, generation of computers.
- b) Structure of computers (H/w and S/w), types.
- c) Application of computers.
- d) Idea of algorithm.
- e) Basics of Programming Language.
- f) Internet.
- g) Office package (word/ Excel/PPT); Word – features, word menu, table, page setup, background, font, paragraph, formatting, symbol, equating, formatting of numbers, mail-merge, protected documents.
- h) Excel- features, cell, worksheet, workbook, excel menu, simple formulas with basic function viz, avg, sum, min, max etc, sorting, chart.
- i) Power point – features, ppt menu, and creation of slides, animation, auto presentation and mouse click presentation.
- j) Introduction to open source software.

Suggested Readings:

1. **Introduction to computer science, IIT Education solution Limited, 2 Ed, pearson**
2. **Fundamentals of computers by P.K Sinha, BPB Publication**

M.A. in Education

2nd Semester

Course code	Name of the course	Marks Distribution		Total Credit	Marks
EDCN 801C	Methodology of Educational Research	Internal 30	External 70	4	100

Learning outcomes

After undergoing this course the students will be able to—

- Explain and describe the meaning of scientific method, scientific inquiry paradigm theory and their implications for educational research.
- Explain and adopt different strategies of research to solve educational problems.
- Write research problems.

COURSE CONTENT

Unit -I

Meaning, nature, scope and classification of educational research; Meaning and steps of scientific method; characteristics of scientific method (Replicability, Precision, Falsifiability, and Parsimony); Types of scientific Method (Exploratory, Explanatory and Descriptive), Aims of research as a scientific activity: Problem–Solving, Theory Building and prediction;

Unit -II

Identification and formulation of a research problem, Criteria and sources for identifying the problem; Statement of the research problems; Types of Research (Fundamental, Applied, and Action); Variables: Meaning of Concepts, Constructs and Variables; Types of Variables (Independent, Dependent, Extraneous, Intervening and Moderator), Hypothesis—Concept, Sources, Types (Research, Directional, Non-directional, Null); Testing the hypothesis (Type I and Type II Errors)

Unit -III

Steps of writing research proposal; Review related literature, concept of Universe and Sample, characteristics of a good Sample, techniques of Sampling (Probability and Non-probability Sampling), Tools of Research— Validity, Reliability and Standardisation of a Tool; Types of Tools (Rating Scale, Attitude Scale, Questionnaire, Aptitude Test and Achievement Test, Inventory); Techniques of Research (Observation, Interview and Projective Techniques);

Unit-IV

Approaches to educational research (Quantitative and Qualitative); Designs in educational research (Descriptive, Experimental and Historical); Research design in quantitative research,

Survey Research, Ex-post facto Research, Experimental Research, Field Studies, Historical Research.

Unit—V

Qualitative Research Designs: Grounded Theory Designs (Types, Characteristics, Designs, steps in conducting a GT Research, Strengths and Weakness of GT); Narrative Research Designs (Meaning and key Characteristics, steps in conducting NR designs), Case study (Meaning, Characteristics, components of a CS design, types of CS design, steps of conducting a CS research, Strengths and Weakness), Ethnography (Meaning, characteristics, underlying assumptions, Steps of conducting ethnography research, Writing ethnographic account, Strengths and Weaknesses); Mixed Method Designs: Characteristics, types of MM designs (Triangulation, Explanatory and Exploratory designs), Steps in conducting a MM designs, Strengths and weakness of MM research.

Recommended Books:

1. Best, J.W & Kahn, J.V Research in Education, (6 th Edition) New Delhi Prentice Hall, 1989
2. Buch, M.B A Survey of Research in Education, Baroda, CASE, M.S.University, 1974
3. Fox, D.J The Research Process in Education, New York, Holt Rhinehart and Winston, Inc 1969.
4. Garret H.E Statistics in Psychology and Education, Bombay. Vikils, Feiffer & Semen's Ltd, 1988
5. Good, Barr & Scates Methodology of Educational Research, New Work Appleton Crofts, 1962
6. Guildford, J.P & Fruchter, B Fundamental Statistics in Psychology & Education, New York, McGraw Hill, 1974
7. Kerlinger F.N Foundation of Behaviour Research, Delhi, Surjeet Publications, 1978
8. Koul, L Methodology of Educational Research, New Delhi Vikash Publications, 1998
9. Kurtz, A.K. & Mayo, S.T Statistical Methods in Education and Psychology, New Delhi, Narosa Publishing House, 1980
10. Sax, G Empirical Foundation of Educational Research, New Jersey, Englewood Cliffs, 1968
11. Scigal, Sydne, Y. Non-parametric Statistics for Behavioural Science, New Delhi, McGraw Hill, 1978
12. Singh, Arun Kumar Text, Measurement and Research Methods in Behavioural Sciences, New Delhi, McGraw Hill, 1986
13. Sukia S.P, & Other Elements of Educational Research, (3 rd Edition), Bombay, Allied Publishers, 1974
14. Tuckman, B.W Analyzing and Designing Educational Research, New York, Harcourt Brace Jovanovich, Inc, 1978
15. Tuckman, B.W Conducting Educational Research (2 nd Edition), New York, Harcourt Brace Javanovich, Inc., 1979
16. Van Dalen, D.B. & Meyer, W.J Understanding Educational Research, New York,

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 802C	Administration and Management in Education	30	70	4	100

Learning outcomes

After completion the course the students will able to—

- Describe meaning, nature, scope, function, principle and approaches of educational management.
- Illustrate various approaches to educational planning.
- Elaborate the concept of educational leadership and accountability to be maintained by the teacher and administrator.
- Explain the concept of quality management, process of quality management
- Discuss about time management, human resource management, conflict management.
- Outline various aspects of educational management and administration.

COURSE CONTENTS

UNIT-I

Educational Management and Administration—Meaning, Principles, Functions and importance, Institutional building, POSDCORB, CPM, PERT, Management as a system, SWOT analysis, Taylorism; Administration as a process, Administration as a bureaucracy, Human relations approach to Administration, Organizational compliance, Organizational development, Organizational climate , Meeting the Psychological needs of employees,

UNIT-II

Leadership in Educational Administration—Meaning, Nature and other related terms, Approaches to leadership—Trait, Transformational, Transactional, Value based, Cultural, Psychodynamic and Charismatic, Models of Leadership (Blake and Mouton’s Managerial Grid, Fiedler’s Contingency Model, Tri-dimensional Model, Hersey and Blanchard’s Model), Theories of Leadership(The Great Man Theory, The Situational Leadership Theory, The Contingency Theory, Leader-Member Exchange Theory), Styles of Leadership (Autocratic Style, Authoritative Style, Pacesetter Style, Democratic Style, Laissez-Faire Style, Paternalistic Style); Measurements of Leadership

UNIT-III

Educational Planning: Meaning, Nature, and importance; Approaches to Educational Planning—Social Demand Approach, Social Justice Approach, Rate of Returns Approach, Manpower Planning Approach; Various types of Planning—Perspective Planning, Institutional Planning, Educational Supervision—Meaning, Nature and importance;

Supervision as service activity; Supervision as a process; Supervision as educational leadership

UNIT-IV

Aspect of Educational Management—planning, Organizing and controlling; Human Resource Management—Ways and procedures; Conflict Management and Time Management; Change Management: Meaning, Need for Planned change, Three- Step-Model of Change (Unfreezing, Moving, Refreezing), The Japanese Models of Change: Just-in-Time, Poka yoke, Cost of Quality: Appraisal Costs, Failure costs and Preventable costs, Cost Benefit Analysis, Cost Effective Analysis,

UNIT-V

Quality Management—Concept of Quality and Quality in Education; Indian and International perspective; Evolution of Quality—Inspection, Quality Control, Quality Assurance, Total Quality Management (TQM), Six sigma; Quality Gurus—Walter Shewart, Edward Deming, C.K Pralhad; Indian and International Quality Assurance Agencies—Objectives, Functions, Roles and Initiatives (National Assessment Accreditation Council [NAAC], Performance Indicators, Quality Council of India [QCI], International Network for Quality Assurance Agencies in Higher Education [INQAAHE])

RECOMMENDED BOOKS:

1. Kimbrough, S.Ralph, Michall& Nunnery, Educational Administration, New York: Mc.MillanCompay.
2. Robin StepherP.OrganizationalBehaviour, Prentice Hall Pub.Pvt.Ltd.
3. Adolph and Turner Harold, E.Supervision for change and Innovation. Houghton Miffin Company.
4. Simon, Herbart A. Administrative Behaviour, New York: McMillan Company.
5. Maleya, K.C.ShikshaPrashaasan and Oaryaveshana. Bhopal: Madhya Pradesh Granth Academy.
6. Bhatnagarand Verma. Educational Supervision. Meerut: International Pub.House.
7. Newman and Summer. The process of Management: Concept, Behaviour and Practice. New Delhi: Prentice Hall of India Pvt.Ltd.
8. Waber, Clarence A. Fundamentals of Educational Leadership. New York: Exposition Press.\

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 803C	Inclusive Education	Internal	External	4	100
		30	70		

Learning outcomes

After completion the course the students will able to—

- Elaborate the concept of Inclusive education.
- Describe about different areas of disability (Physically impaired, Visual, Hearing & Orthopedically impaired, mentally retarded).
- Discuss about government Policies, Legislatures & National Institutes related to the disabled.
- Outline the Educational Programmes, Equipments and Aids for education of the disabled.
- Explain the role of parents, peers and society in rehabilitation of the disabled.

COURSE CONTENTS:

Unit I

Inclusive Education: Concept, Principles, Scope and Target Groups (Diverse learners; Including Marginalized group and Learners with Disabilities); Evolution of the Philosophy of Inclusive Education: Special, Integrated, Inclusive Education; Legal Provisions: Policies and Legislations (National Policy of Education (1986), Program of Action (1992), Persons with Disabilities Act (1995), National Policy of Disabilities (2006) National Curriculum Framework (2005); Concession and Facilities to Diverse Learners (Academic and Financial), Rehabilitation Council of India Act (1992), Inclusive Education under Sarva Shiksha Abhiyan (SSA); Features of UNCRPD (United Nations Convention on the Rights of Persons with Disabilities) and its Implication.

Unit II

Concept of Impairment, Disability and Handicap, Classification of Disabilities based on ICF Model, Readiness of School and Models of Inclusion, Prevalence, Types, Characteristics and Educational Needs of Diverse learners'; Intellectual, Physical and Multiple Disabilities— Causes and Prevention of Disabilities; identification of Diverse Learners for Inclusion; Educational Evaluation—Methods, Techniques and Tools

Unit-III

Planning and Management of Inclusive Classrooms: Infrastructure, Human Resource and Instructional Practices, Curriculum and Curricular Adaptations for Diverse Learners, Assistive and Adaptive Technology for Diverse learners: Product (Aids and Appliances) and Process (Individualized Education Plan, Remedial Teaching), Parent Professional Partnership: Role of Parents, Peers, Professionals, Teachers, School.

Unit-IV

Barriers and Facilitators in Inclusive Education: Attitude, Social and Educational; Current Status and Ethical issues of inclusive education in India; Research Trends of Inclusive Education in India.

Unit-V

Educational Empowerment of Marginalized Genders: Educational Problems, Present Educational Status and Schemes / Programs for Educational Empowerment of Women: Third Gender: Concept, Equalize acceptance, Social Equality: Equal Rights and Opportunities; Human Rights issues)

RECOMMENDED BOOKS:

1. Aggarwal, J.C. (2013). Landmarks in History of Modern Indian Education. New Delhi: Vikas Publishing House Pvt.Ltd.
2. Agrawal, R. (2011). Education for Disabled Children. New Delhi - Shipra Publications
3. Ainscow, M. & Booth, T. (2003). The Index for Inclusion Developing Learning and Participation in Schools. Bristol: Center for Studies in Inclusive Education.
4. Baver, A. M. & Shea, M. (1989). Teaching exceptional students in your classroom. Boston: Allyn and Bacon
5. Chauhan, s. S. (1989). Education of Exceptional Children. New Delhi: Indus Publishing Company.
6. Dash, N. (2006). Inclusive Education New Delhi: Atlantic Publication,
7. Hallahan.D.P.& Kauffman, M. (2010). Exceptional Learners Introduction to Special Education. Oxford: Oxford University Press.
8. jha, M. (2002). Inclusive Education for Ail: Schools without Walls. Chennai: Heinemann Educational publishers, Multivista Global Ltd.
9. Mangal, S.K. (2007). Educating Exceptional Children: An Introduction to Special Education Delhi: PHI Learning Private Limited.
10. Mani, M.N.G. (2000). Inclusive Education in Indian Context Coimbatore: IHRDC, Sri Ramakrishna Mission Vidyalaya,
11. Martha. L. I lames. EY.&Algozzine, B. (1999). Critical issues in Special Education. Vol.1 & II. Massachusetts: Houghton Mifflin Harcourt (HMH).
12. National focus group report on education of SCs and STS - 2006, New Delhi; NCERT. Panda, K.C. (1997). Education of Exceptional Children, New Delhi: Vikas Publication.
13. Punani, B. and Rawal, NS. (2000). Visual Impairment Hand Book. Ahmedabad: Blind People's Association
14. Punani.B. and Rawal, N.S. (2004). Manual Community Based Rehabilitation Ahmedabad: Blind People's Association
15. Sharma, PL (2003). Planning Inclusive Education in Small Schools. Mysore: RIE Mysore UNESCO. (2004). Education for All: The Quality Imperative. EFA Global Monitoring Report. Paris.

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 804E	Measurement and Evaluation in Education	Internal	External	4	100
		30	70		

Learning outcomes

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

- Explain Nature, scope and need of measurement and evaluation in education.
- Elaborate the Method of construction of achievement test and its standardization.
- Enumerate the Characteristics of attitude scale, interest inventory personality tests.
- Describe the Concept and method of determining reliability and validity coefficient.
- Identify the Method of determining item effectiveness-difficulty value and discriminating power.
- Illustrate the Uses of derived scores in interpreting test results and use of norms.
- State the Application of non-parametric tests in education evaluation.
- Discuss About different assessment tools and techniques.
- Analyse Data for interpretation of result in evaluation.
- Examine the feedback system of evaluation.

COURSE CONTENTS

UNIT-I

Meaning, Nature and importance of measurement, assessment and evaluation; distinctions between test, exam, assessment, evaluation and their interrelationship; Different types of measuring scales; perspectives of assessment (Assessment of learning and Assessment for Learning), types of assessment (Placement, diagnostic, formative and summative); Role of teachers in evaluation Programme; Taxonomy of educational objectives—cognitive, affective and psychomotor; Assessment of Cognitive domains (Anderson and Krathwohl), Affective (Krathwohl) and Psychomotor domains (R. H. Dave) of learning – specification of objectives steps in the process of evaluation.

UNIT-II

Major tool and techniques for educational evaluation; Essential qualities of good measuring instrument; Different types of tests—teacher made vs. standardized, criterion-referenced vs. norm-referenced test. Testing tools and non-testing tools—Testing devices (achievement test, diagnostic test, proficiency test etc) & non-techniques devices (assignment, projects, observation, interview etc) and their application in learning situation; Diagnostic test—construction and usefulness; Evaluating Training and development programme.

UNIT-III

Examination reforms—Various Commissions and Committees of India on reforming and restructuring of examination and evaluation system. Examination system—current strategies & Recent trends in evaluation; Grading—Grading pupil performance (ways and procedures); Choice Based Credit System (CBCS); Continuous Comprehensive Evaluation (CCE), online

assessment, open book examination, Computer in Evaluation—computer based test(CBT), semester system— Evaluation in Semester courses. Feedback for assessment and/or evaluation purposes—meaning and types; Feedback as an essential component of assessment; Characteristics of effective feedback, Assessment of portfolios, Reporting student's performance: (progress report, Cumulative report card, Anecdotal record).

UNIT-IV

Nature of data gathered (Qualitative & Quantitative), Statistical treatment of data— tabulation, frequency distribution and graphic representation; measures of central tendency— Mean, Median, Mood; measures of variability—range, Average/mean deviation(AD/MD), quartile deviation(QD), standard Deviation(SD); Co-efficient of correlation—Rank difference and product Moment methods; Percentile and Percentile rank; Normal Probability Curve— meaning, properties and application; divergence from normality— Skewness and Kurtosis; Derived scores—Z score, Standard score and T-Score.

UNIT-V

Acquaintance with psychological tests and Assessment of attributes (Aptitude, Attitude, Interest, Intelligence, Creativity and personality). Assessing students Achievement— construction of achievement test and standardization; Relative merits and demerits of using different types of test items; Reliability—concept, determining factors, methods of determining different reliability coefficient; Validity—concept, types, determination of validity co-efficient and uses; Relation between validity and reliability

RECOMMENDED BOOKS:

1. Bhat B.D. Sharma Educational Psychology, Kanishka Publishing House, New Delhi , (1993).
2. Bigge, M.L. Psychological Foundations of Education. Harper and Row, New York.
3. Bruner, J.(1977). The Process of Education, USA: Harvard University Press.
4. Chaube ,S.P. Development Psychology , M/S Vikas Publishing House, Agra ,(1986)
5. Chauhan, S.S. (1998). Advanced Educational Psychology. Vikash Publishing House, New Delhi.
6. Choube, S.P. &Choube.(1996). Educational Psychology and Experriments. Himalay Publishing House, New Delhi.
7. Crow, L.D. & Crow, Educational Psychology, Revised Edition, Eurasia Publishing House, New Delhi.(1964)
8. Dash, M. (2004) Educational Psychology, Deep & Deep Publishing Pvt. Ltd, New Delhi.
9. Gagne, R.M The Conditions of Learning, N.Y. HOLT, Rinehart &Winston Publishing House. New York (1970)
10. Gardner, H.(1983). Frames of Mind: The theory of multiple intelligence. New York: Basic Books
11. Irvine, J.J.(2003). Educating teachers for diversity: Seeing with a cultural eye. New York: Teacher College Press.
12. JitendraMohan Educational Psychology, Wiley Eastern LTD., New Delhi. (1993)
13. Kaur, R School Psychology, Deep & Deep Publishing PVT, LTD, New Delhi. (2006)

14. Laggard, G.L. (2005). Promoting Reflective Thinking in Teachers, Crowin Press.
15. Linda, Darling Hammond & John Bransford (ed) (2005) . Preparing Teachers for a Changing World. San Francisco: Jossey – Bass.
16. Mangal , S.K. (2007) Educational Psychology, Prentice Hall of India, New Delhi.
17. Martin, D.J. & Kimberly S. Loomis. (2006). Building Teachers: A constructivist approach to introducing education. USA: Wadsworth Publishing.
18. Maslow ,A.H.(1970).*Motivation and Personality* (2nd Edition). New York. Harper and Row.
19. Mathur, S.S. Educational Psychology. BinodPustakMandir, Agra.
20. Narayan Rao Educational Psychology, Wiley Eastern LTD., New Delhi. (1993)
21. NCERT(2005) National Curriculum Framework. New Delhi: (Author).
22. Piaget, J.(1999). Play, Dreams and Imitation. London: Routledge.
23. Schon,D. (1987): Educating the Reflective Practioner; Towards a New Design for Teaching and Learning in the Professions. New York: Basic Books.
24. Sharma,R.N. (1996). Advanced Educational Psychology, Eastern Book House, Guwahati.
25. Skiner, C.E.(1999) Educational Psychology, Prentice Hall of India, New Delhi.
26. Skinner, C.E . Educational Psychology, Printice Hall of India.,New Delhi(1999)
27. Vygotsky, L.(1986). Thought and language (A. Kazulin, Trans). Cambridge, M.A: MIT Press.
28. Vygotsky, L.S. (1978) Mind in Society: The Development of Higher Order Psychological Processes, USA: Harvard University Press.
29. Vygotsky, L.S. (1999) Educational Psychology, M/S S.K.Enterprise, Book Seller and Distributors, Shillong.
30. Woolfold, A.E. (2011) Educational Psychology. DerlingKinderslay (India) Pvt. Ltd.

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 805E	Guidance & Counselling in Education	30	70	4	100

Learning outcomes

After completion of the course the students will be able to

- Explain the concept and nature of educational & vocational guidance and counselling and their necessity in making career choices.
- Discuss about the various techniques of guidance and counselling.
- Specify the roles of parents, teachers and counsellors in guidance programme.

COURSE CONTENTS

UNIT-I

Guidance and Counselling: Meaning, Nature, Principles and Need; aims and objectives of guidance & counselling; Difference between guidance and counselling, counselling and psychotherapy; Types of guidance (educational, vocational, personal, health and social); Types of Counselling (Directive, Non-directive and Eclectic); Approaches to counselling—Cognitive-Behavioural (Albert Ellis – REBT) & Humanistic, Person-centred Counselling (Carl Rogers); Theories of Counselling (Behaviouristic, Rational, Emotive and Reality)

UNIT-II

Tools and techniques of guidance—Collection of pupil data for guidance; Provisions for Psychological Testing in guidance (Intelligence, achievement, interest, aptitude, adjustment & interpersonal relations, personality) and their uses & limitation; Recording of pupil data—Anecdotal and Cumulative record card; Non-testing techniques (systematic case study, Interview, observation, sociometric devices)—role & methods; Individual and Group Guidance techniques—principles, objectives and procedures

UNIT-III

Organization of guidance service at different levels of education—Essentials of good guidance programme, principles and purpose; Kinds of services—Information services, Placement Service, follow-up service; Methods of reporting the results; Role of major personnel or stakeholders in guidance programme(Role of Parents, Teachers, Head of the institution and school Counsellor); School and Community in guidance programme

UNIT-IV

Psychology of careers & dynamics of vocational developments; job analyses, job description & job satisfaction, work & productivity, Decision making and group counselling; Behavioural counselling for vocational decisions; Educational & occupational information for career choice—Needs, types, Sources, collection & dissemination of information;

UNIT-V

Counselling & inter-professional interaction, Selection & training of counselling, Professional issues in counselling, counselling process—relationships & its characteristics; Parental counselling, Student counselling, Group and Individual Counselling—Need, purpose and techniques, Qualities of counsellor for guidance programme, child guidance clinic—Meaning, types, needs and functions

RECOMMENDED BOOKS:

1. Bengalee, M.D Guidance and Counseling, Bombay, Sheth Publishers, 1984
2. Bhattacharya Guidance in Education, Bombay, Asian Publishing House
1964.
3. Bernard, H.W.&
Fullner, D.W Principles of Guidance, A Basic Text (Indian Education), New
Delhi, Allied Publishers Pvt. Ltd, 1987
4. Chandra, R Guidance and Counseling, New Delhi, Kalpaz Publishers,
2002.
5. Crobach, Lee Essentials of Psychological Testing. London, Harper &
Row, 1964
6. Crow, L.D. & Crow, A An Introduction to Guidance, New York, American Book,
Co.,
1951
7. David, A Guidance & Counseling, DVS Publishers and Distributors,
Guwahati, 2004
8. Fuster, J.M. Psychological Counseling in India, Bombay, McMillan and
Co.,
Ltd., 1964
9. Gururani, R Guidance & Counseling, DVS Publishers and Distributors,
Guwahati, 2005
10. Gibson, D. Introduction to Counseling and Guidance, Pearson Education,
New Delhi, 2007
11. Jayaswal S. Guidance & Counseling, Lucknow, Prakashan Kendra. 1981
12. Kochhar, S.K Guidance in Indian Education, New Delhi, Sterling Publishers
Pvt.Ltd, 1979
13. Mathewson,
Robert, H Guidance Policy and Practice, New York, Harper and Row,
1962
14. Mishra, R.C Guidance and Counseling (2 Vols) APH, Publishing
Cooperation,
New Delhi-2005
15. Nayak, A.K Guidance & Counseling, APH, Publishing Cooperation, New

- Delhi-1997.
16. PasrishaPrem&
Srek, Thomas C. A Handbook for Developing Guidance Services in Secondary
Schools, Baroda, M.S.University, 1964
17. PasrishaPrem,
Guidance and Counseling in Indian Education, New Delhi,
NCERT, 1976
18. Safaya, Rai
2002. Guidance and Counseling, Chandigarh, Abhishek Publishers,
19. Swamy R.V.(ed) Guidance Service in Colleges and Universities, Bangalore,
Bangalore University and Directorate of Employment and
Training, 1971.
20. Sharma, A. Guidance & Counseling, DVS Publishers and Distributors,
Guwahati, 2006

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 806E	Higher Education	Internal	External	4	100
		30	70		

Learning outcomes

After completion of the course the Students will able to—

- Elaborate the aims and development of higher Education in India.
- State the constitutional provisions, policy perspectives, problems and different issues of higher education in India.
- Outline the instructional system, strategies, teacher competencies and emerging communication information technologies involved in higher education.
- Explain the concept and approaches of cognition, classroom management, motivation and stress management.
- Illustrate the planning, management, structure and organisation of higher education in India.
- Explicate the managerial skills for teachers from different perspectives.
- Describe the curriculum, planning, development, transaction and evaluation.

Unit-1

- Aims of higher Education
- Higher education and development
- The constitutional provision regarding higher education
- The evolving policy perspectives in higher education
- Higher education and problems of contemporary Indian society
- Quality assurance and accreditation in higher education
- Teachers intervention in social change: some issues in higher education

Unit-2

- Instructional system in higher education
- Evolving instructional strategies
- Unit and topic planning in higher education
- Teacher competence in higher education
- Skills associated with the conduct of interaction sessions
- Skills of using communication aids
- Emerging communication and information technologies

Unit-3

- Profiling the Indian college student
- Cognition: concept and approaches
- Understanding institutions: psycho- social perspectives

- Dynamics of classroom management and their implications for practice
- Communication and interpersonal relationships: concepts and implications for classroom management
- Motivation and stress management: basic issues and classroom implications

Unit-4

- Planning and management of higher Education
- Structure and organisation of higher education in India
- Universities in India
- University and its structure
- Evaluation Perspectives in Higher Education
- Evaluation in Higher Education: Mechanics and Processing.

Unit-5

- Managerial skills for teachers: communication, motivation and teamwork in higher education
- Managing classrooms: climate, tasks and learning
- Management of extension, community centred and co-curricular activities
- Curriculum planning
- Curriculum development
- Curriculum transaction
- Curriculum evaluation

RECOMMENDED BOOKS:

1. Azad, J.L (1976) “ State Grants to Collegiate Institutions – A Study of Patterns and procedures”. Journal of Higher Education, 2, (2) Autumn.
2. Azad, J.L (1988) Higher Education in India : The Deepening Financial Crises, New Delhi : Radiant.
3. Annual Report 2002-2003, Department of Elementary Education and Literacy, Department of Secondary and Higher Education, MHRD, Government of India.
4. Ahmed, Shakti R. (1983), Management of Laboratory and science Programme Report of orientation Programme in Educational Planning and Administration, New Delhi : NIEPA, (Mimco)
5. Brown, George and Madeleine Atkins, (1988), Effective Teaching in Higher Education, Methuen : London.
6. Castaldi, Basil, (1997) Educational Facilities: Planning, Modernization, and Management, Boston Allyn and Bacon, Inc.
7. Chauhan, S.S (1997) , Innovations in Teaching Learning Process. New Delhi: Vikas Publishing Pvt. Limited.
8. Chauhan , S.S. (1985), A Textbook of Programmed Instruction. New Delhi: Sterling Publishers Private Ltd.

9. Ellington, H. Percival, Fred and Race, Phil(2003), Handbook of Educational Technology, New Delhi: Kogan Page India Private Limited.
10. Eggenpaul and kauchak Dan (1999) Educational psychology, New Jersey: Prentice Hall.
11. Hamachek Don (1990) Psychology in Teaching, Learning and Growth, Boston: Allyn and Bacon.
12. Institution Building in Education and Research : from Stagnation to self-renewal, New Delhi: All India Management association, pp. 89-104.
13. Kumar, Grija, et.al., (1997) “college Libraries in India: A survey Report”. In Journal of Library and Information Science, (4) pp.I—23.
14. KulandaiSwamy ,V.C, (2003) Higher Education in India: Crisis in Management , New Delhi: Viva Books.
15. KulandaiSwamy ,V.C, (2003) Higher Education in India: Crisis in Management , New Delhi: Viva Books.
16. Kumar ,Grija, et.al.(1979)”College libraries in India: a Survey report” in Journal of Library and Information science(4), pp. 1-23.
17. Malhotra, Nirmal, Administration of the college Library, NIPEA(Mimco).
18. Malhotra, Nirmal, administration of the college Library, NIPEA (Mimco).7218 SOURCES Aspects of institutional Management-III.
19. Mathai, Ravi J. (1977), “Problems of Academic Administration Institution Building: a Layman’s Experience” in RJ. Mathai; U. Pareek and T.V. Rao(eds).
20. Naik ,j.p. (1972) Access, Structures and Quality in Higher Education :Some Suggestions for Reorganization, (Princes Lilavathi Memorial Lecture-2) Prasaraanga: University of Mysore.
21. Naik J.P.(1968) , Educational Planning in India, Bombay: Allied Publishers.
22. Naik , J.P (1970) , “ Union- State Relations in Education : Their Implications for Educational Administration” , Indian Journal of Public Administration, XVI (3).
23. Powar, K.B. (2002) Indian Higher Education . A Conglomerate of Concepts, Facts and Practices, New Delhi: Concept Publishing Co.
24. Powar, K.B. (eds.) (1998), State Funding of Higher Education, New Delhi : Association of Indian Universities.
25. Pareek, Udai (1981), Beyond Management: Essays on the processes of Institution’s building’s, New Delhi: Oxford & IBH.
26. Raza, M.(ed), (1991) Higher Education in India : Retrospect and Prospect, New Delhi: Association of Indian Universities.
27. School of education (2003) ,ES-331: Curriculum Instruction, Block-2 : Instructional System. IGNOU : New Delhi.
28. Sampath, K. panneersewam, A. and Santhanam, S. (1998), Introduction of Educational Technology. New Delhi :Stering Publishers Pvt. Ltd.
29. Singh, Amrik (1995),The Craft of Teaching (ed) , New Delhi: Konark Publishing House.
30. Singh, Amrik (1970), “ The Reconstituted UGC” . Economic and Political Weekly,V (33) , 15 August.
31. Singh, Amrik (1965), Educational Planning in India, Benaras: Allied Publishers.
32. Singh, Amrik and G.D Sharma (1988) Higher Education in India : The Social context (ed.) New Delhi: Konark Publishers.
33. Singh, Amrik and G.D Sharma (1989) Higher Education in India : The Intuitional context (ed.) New Delhi: Konark Publishers.

34. Singh, Amrik (1988) “ Foundation and Role of UGC” in Amrik Singh and G.D sharma (Eds.) Higher Education in India: The Social Context, Delhi : Konark Publishers Pvt. Ltd., 234-51.
35. UNESCO, (1982) , “A Training Module on Institution Building and Institutional Management, Bnagkok; UNESCO Regional Office for Education in Asia and the Pacific (Mimco).
36. World Bank (1994), Higher Education : The Lessons of Experience, Washington DC: The World Bank.
37. Woolfolk, Anita (2001) Educational Psychology, Boston: Allyn and Bacon.
38. Yelon R. and Weinstein (1978) A Teacher’s World, New York: McGraw Hill.

M.A. in Education

3rd Semester

Learning outcomes

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 901C	Value Education	Internal	External	4	100
		30	70		

It is expected that on completion of the course, the students will be able to:

- Explain the nature of human values and their importance in guiding life.
- Recognize the importance of peace, values and human rights in the context of India.
- Develop capacity to act rightly on peace and values in and outside the classroom through various intervention strategies,
- Illustrate different human rights and its constituting bodies
- Describe the concept of peace, peace education, value, and values education,
- Discuss the need of human rights for peace- and values-governed life of individuals.
- Apply the strategies for promoting values among individuals.

COURSE CONTENTS:

UNIT – I:

Concept of Values—meaning, nature and the significance of values; Classification of Values—Social, Professional, Religious, Aesthetic, National and International; Nature, Concept and The Socio-Cultural Context of Value Education—Historical perspective of Value Education; Aims and Objectives of Value Education; Need, Importance and Role of Value Education in the present emerging Indian society; Components of value education

UNIT – II:

Concept of Peace; Meaning, Nature and scope of Peace Education; Aims and objectives of Peace Education; National integration, International Understanding and Peace; Need and Importance of Education for Peace; Characteristics of Peace Loving Persons; Six major media of integrating peace Education in the Curriculum—subject context, subject perspectives, Teaching methods, co-curricular activities, staff development, classroom and school management; Peace through Yoga and Meditation.

UNIT-III:

Constitutional Values, Democratic Values as reflected in the constitution of India, Universal Human values; Characteristics of Values Based Educated person, Concept and Evolution of Human Rights, human Right as reflected in the preamble, fundamental Right and Directive

Principle of the State Policy in India. Roles of National Human Right Commission in India; Human Right as prerequisites for peace Loving and values-Governed Life of Individual

UNIT – IV:

Values through Curriculum—Formal, Informal and Hidden Curriculum; Curriculum Onion: Through Subject Areas, The Lessons Taught, Hidden curriculum and External Factors— school's surroundings, parental background of students and societal priorities; Inculcating of Values through Continuous and Comprehensive Activities—The Classroom, Teaching Methods; Values Education and Subjects—Teaching Values through Core Subjects; Fostering Values through Co-curricular Activities; Integration of Values in the Teaching-Learning Process.

UNIT-V:

Education in Values and Values in Education; The identified Values—Core Universal Values and Specific values; Five Basic Approaches to Values Education: Inculcation, Analysis, Values Clarification, Action Learning and Moral Development—Kohlberg's View; Experiences in Values through Imitation, Indoctrination, Inculcation, and Internalization; Teachers as Values Facilitators; Other Approaches promoting Values among Individuals— Classroom and School Atmosphere Approach(CAA), Direct Pedagogical Input(DPI), Integrated Concurrent Approach(ICA), Total Atmosphere Approach(TAA), Critical Inquiry Approach(CIA); Learning Styles: A Multiple Intelligences Approach

Suggested Books:

1. Central Board of Secondary Education (2003). *Value Education, A Handbook for Teachers*. New Delhi, CBSE
2. Chakrabarty, S.K. (2009). *Values and ethics for Organizations: Theory and Practice*, New Delhi: Oxford University Press.
3. Jed, P. K. (2002). *Educating human rights*. Agra: Bhargava Book House.
4. Jois, R. M. (1997). *Human rights and Indian values*. New Delhi: NCERT.
5. Kar, N. N. (1999). *Value education: A philosophical study*. Ambala Cantt: The Associated publisher.
6. Karlekar, M. (1964). *Education in India*. In Douglas, R. et al. (Eds.), *Education for human Rights: An international perspective*. Paris: UNESCO International Bureau of Education.
7. M.G. Chitakra: *Education and Human Values* (2003). New Delhi: A.P.H. Publishing Corporation.
8. Mahanty, S. B. (1999). *Education for human rights*. *University News*, Vol-37, No. 49, pp. 14– 19.
9. National Council of Educational Research and Training (2003). *Values Education in Indian Schools: Experiences and Strategies of Implementation*. New Delhi, NCERT
10. National Council of Educational Research and Training (2011). *Education for Values in Schools – A Framework*. New Delhi, NCERT
11. Piaget, J. (1932). *The moral judgment of the child*. Chicago: The Free Press.
12. Radhakrishna, S. (1979). *An idealist view of life*. Bombay: Blackie & Son Ltd.

13. Raths, L. E., Harmin, M. & Simon, S. B. (1978). Values and teachings. London: Charles & Merrill.
14. Rokeach, M. (1973). The nature of human values. New York: The Free press.
15. Ruhela, S.P.(2012). Human Values and education, New Delhi: Sterling Publications,
16. Satchidananda, M.K. (2001). Ethics, Education, Indian Unity and Culture, Delhi: Ajantha Publications,
17. Seshadri, C., Khader, M. A. & Adhya, G. L. (1992). Education in values: A source book. New Delhi: NCERT.
18. UNESCO. (1996). Learning the treasure within. Paris: UNESCO publishing.
19. United Nations Educational Scientific and Cultural Organization (2001). *Learning the Way of Peace – A Teacher’s Guide to Peace Education*. New Delhi, UNESCO

Course code	Name of the course	Marks Distribution		Total Credit	Marks
EDCN 902C	Statistics in Education	Internal	External	4	100
		30	70		

Learning outcomes

It is expected that on completion of the course, the students will be able to:

- Explain the concept of descriptive and inferential statistical techniques in education.
- Outline various measures of central tendency and measures of variability.
- State the nature of normal probability curve.
- Apply the normal probability curve in statistics and research.
- Describe various types of correlation and their uses.
- Calculate various descriptive and inferential statistics.
- Elaborate various method of parametric and non-parametric test.

COURSE CONTENTS

UNIT-I

Meaning of statistics: Statistics as a Tool in Educational Research. Statistical Tables, Frequency Distribution, Graphical Representation of data. Meaning, Advantages and Modes of Graphical Representation of data.

UNIT-II

Measures of Central Tendency. Arithmetic Mean, Median Mode: Calculation, Interpretation and use of measures of Central Tendency. Measures of variability-Meaning of the measures of variability, Range, Quartile Deviation, Average Deviation, Standard Deviation. When and where to use the various Measures of variability.

UNIT-III

Correlation and Regression. Correlation- Meaning and Types. The calculation of the correlation by the product moment method. Linear Regression, The Regression line in Prediction, Partial and Multiple correlation.

UNIT-IV

Normal Distribution: Meaning, Significance. Characteristics of Normal Curve. Computing Percentiles and Percentile Ranks. Standard Errors of Measurement. Measuring Divergence from Normality. Need and importance of Significance of the Difference between Means and other Statistics. Null hypothesis, Level of Confidence, one-tailed and two tailed tests of significance. The significance of the difference between Means, percentages and correlation coefficients.

UNIT-V

Analysis of variance, Non-parametric Tests. When to use Parametric and Non-Parametric test in Education. Median Test, Mann-Whitney 'U' Test, Chi-square Test, Rank-difference correlation.

Recommended Books:

1. Garrett, H.E., Statistics in Psychology and Education, 6th Indian ed.. Vakils, Feffer and Simon, Bombay, 1971.
2. Guilford, J.F., Psychometric Methods, 2nd ed., Tata McGraw-Hill, New Delhi, 1954.
3. Fundamental Statistics in Psychology and Education, 5th International Student ed., McGraw-Hill, New York, 1973.
4. Health, R.W. and N.M. Downie, Basic Statistical Methods 3rd ed. Harper International, New York, 1970
5. Hicks, C.R., Fundamental concepts in the design of Experiments, Holt, Rinehart and Winston, New York, 1964.
6. Lindquist, E.C, Education Measurement, The American Council on Education, Washington DC, 1951.
7. Lindquist, E.F, Statistical Analysis in Educational Research, Indian ed., Oxford and IBH, New Delhi, 1970.
8. McNemar, J., Psychological Theory, McGraw-Hill, New York, 1967.
9. Siegel Sidney, Non-Parametric Statistic for the Behavioural Sciences International student edition, McGraw-Hill, New York, 1956.
10. Tate, M.W., Statistics in Education, McGraw-Hill, New, 1948.
11. Walker, H.M and J. Lev, Statistical inference, Henry Holt, New York 1953.

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 904E	Intelligence, Creativity and Education	Internal	External	4	100
		30	70		

N.B: Administration of an Intelligence or Creativity Test on a small sample and submission a report will also be treated as an Internal Exam.

Learning outcomes

It is expected that on completion of the course, the students will be able to:

- Explain the nature, meaning and concept of intelligence.
- Describe the meaning and concept of creativity along with the educational procedures for fostering creativity among individuals.
- Outline the stages of intellectual development, creativity development and compatibility between them at various levels of Education.
- Identify creative children and at the same time nurture their creative talent.

COURSE CONTENTS

UNIT-I

Nature of Thinking, The structure of intelligence: An examination of various theories of intelligence, a review of some Intelligence Tests

UNIT-II

Nature and scope of creativity, Creativity process, Creative product, Creative person and Creative situation, Creativity Theory, Relationship between Creativity and Intelligence, Need to foster Creative thinking Process, discovering creative potentialities and teaching for creativity, problem solving and Creativity, a review of some Creativity Tests

UNIT-III

Creative Learning Methodology: Understanding creative learning, learning with joy & developing creativity through games, four pillars of creative learning, Development of creativity, The Environmental and psychological Factors, The role of Teacher in developing creativity in students, Education and Creativity,

UNIT-IV

Problems of creative children: Problems in maintaining creativity, Problems when creativity is repressed. Stress and Creativity , Fostering creativity, Creative management , Brain and the creative act, Artificial Intelligence, Multiple Intelligence, Metacognition, and Emotional Intelligence

UNIT-V

Research in Creativity-in India and Abroad: Review of related research literature, Creativity and Intellectual Property Right, Paradigm shifts & Creativity, Barriers to Creativity and Creative Attitudes, Technique of Creativity.

Recommended Books:

1. Amabile, T. (1990) *Creativity in Context*, New York, Springer Verlag
2. Barron, F. – *Creative Person and Creative Process* : New York : Holt, 1969.
3. Boden, M. – *The Creative Mind*. New York : Basic Books, 1990.
4. Boden, M. (Ed.) – *Dimensions of Creativity*. Cambridge, M.A. : MIT Press, 1994.
5. Brown, R.T. – *Creativity : What are we to measure?* In J.A. Glover, R. Ronuing and C.R. Reynolds (Eds.). *Handbook of creativity*, New York, plenum; 1989.
6. Buch, M.B., (Ed.) – *Fourth Survey of Research in Education*, M.S. University of Baroda, Baroda, 1991.
7. Butcher, H.J., *Human Intelligence: Its natures and assessment*, London: Methuen,1968.
8. Crawford, R.T. – *The Technique of Creative Thinking*, New York, Hawthorne Books, Inc., 1954.
9. Cronbach, L.J., *Essentials of Psychological Testing* (3rd ed.) New York : Harper &Row, 1970.
10. Crow, L.D. and Crow ,A., *Educational Psychology*, New Delhi: Eurasia Publishing House, 1973, p. 160.
11. Csikszentmihalyi, M. (1996) *Creativity: Flow and the Psychology of Discovery and Invention*, New York, HarperCollins.
12. Csikszentmihalyi, M. (2006) ‘A systems perspective on creativity’, in Henry, J. (ed) *Creative Management and Development*, 3rd edn, London, Sage.
13. De Bono, E. (1984) *Lateral Thinking for Management*, Harmondsworth, Penguin.
14. DeCecco, John, P., *The Psychology of Learning and Instruction : Educational Psychology*, Prentice Hall of India Private Limited, New Delhi, pp.453-462, 1970.
15. Deshmukh, M.N. – *Creativity in classrooms*, Vikash Publishing House, New Delhi, 1984.
16. Gardner, H., *Frames of Mind: The theory of multiple intelligence*, New York: Basic Books, 1983.
17. Gowan , J., Khatena, J., & Torrance , E. P. (1981). *Creativity: Its educational implications*. NewYork., NY: Hunt Publishing Company.
18. Guilford, J. (1959) ‘Trends in creativity’, in Anderson, H., (ed) *Creativity and its Cultivation*, New York, Wiley.
19. Guilford, J.P., *the Nature Of Human Intelligence*, New York: McGraw-Hill, 1967.
20. Handy, C. (1997) *Beyond Certainty*, London, Arrow.
21. Henry, J. (1994) ‘The nature and development of creativity’, *Co-Design*,
22. Henry, J. (2001) *Creativity and Perception in Management*, London, Sage.
23. Hurlock, E.B. – *Child Development*, Third Ed, New York, McGraw Hill, 1967.
24. Kirton, M. (2003) *Adaption-Innovation in the Context of Diversity and Change*, Hove, Routledge.
25. Kirton, M. J. (1989) *Adaptors and Innovators: Styles of Creativity and Problem-Solving*, London, Routledge, also 2nd edn, 1994.
26. Passi, B.K. –*Creativity in Education*, Agra : National Psychological Corporation, 1982.
27. Piaget, J., *The Origins of Intelligence in Children*, New York: International Universities Press, 1952.
28. Simon, H. (1988) ‘Understanding creativity and creative management’, in Kuhn. R. *Handbook for Creative and Innovative Managers*, New York, McGraw-Hill.

29. Sternberg, R.J., Beyond I.Q.: A triarchic theory of human intelligence, London: Cambridge University press, 1985, p.45.
30. Torrance, E.P. – ‘Encouraging Creativity in the Classroom’. DubuquaLowa WM, C. Brown, 1970.
31. Torrance, E.P. (1974) Torrance Tests of Creative Thinking: Norms – Technical Manual, Lexington, MA, Ginn.
32. Wechsler, D., Wechsler Scale Of Intelligence, (WAIS, WISE), New York: Psychological Corporation, 1939.
33. Wolfe, D.(Ed.), The Discovery of Talent, Cambridge (Mass.): Harvard university Press,1969.

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 905E	Teacher Education	Internal	External	4	100
		30	70		

Learning outcomes

It is expected that on completion of the course, the students will be able to:

- Explain the meaning, Scope, objective of teacher education and its development in India
- Elaborate different agencies of teacher education in India and their role and functions.
- Discuss about the important research findings in teacher education.
- State various teaching skills, competencies and methods
- Describe various Professional organizations for various levels of teachers and their role
- Discuss teaching as a profession.

Course Contents

Unit 1:

Teacher Education—Meaning, Nature and Scope of Teacher Education; Types of Teacher Education Programs, The Structure of Teacher Education Curriculum and its Vision in Curriculum Documents of NCERT and NCTE at Elementary, Secondary and Higher Secondary Levels, Organization of Components of Pre-service Teacher Education; Transactional Approaches (for foundation courses) Expository, Collaborative and Experiential learning.

Unit 2:

Understanding Knowledge base of Teacher Education from the view point of Schulman, Deng and Luke & Habermas, Meaning of Reflective Teaching and Strategies for Promoting Reflective Teaching, Models of Teacher Education—Behaviouristic, Competency-based and Inquiry Oriented Teacher Education Models

Unit 3:

Concept, Need, Purpose and Scope of In-service Teacher Education, Organization and Modes of In-service Teacher Education, Agencies and Institutions of In-service Teacher Education at District, State and National Levels (SSA, RMSA, SCERT, NCERT, NCTE and UGC), Preliminary Consideration in planning in-service teacher education programme (Purpose, Duration, Resources and Budget)

Unit 4:

Concept of Profession and Professionalism, Teaching as a Profession, Professional Ethics of Teachers, Personal and Contextual factors affecting Teacher Development, ICT Integration, Quality Enhancement for Professionalization of Teacher Education, Innovation in Teacher Education.

Unit 5:

Professional organizations for various levels of teachers and their role; performance appraisal of teachers, faculty improvement programme for teacher education, Areas of research, Teaching effectiveness, Criteria of admission, Modification of teacher behaviour, School effectiveness

Recommended Books:

1. UNESCO (2006): Teachers and Educational Quality: UNESCO Institute for Statistics Montreal.
2. NCTE (2009) : National Curriculum Framework of Teacher Education, New Delhi.
3. NCERT (2005) : National Curriculum Framework.
4. NCERT (2006) : Teacher Education for Curriculum renewal.
5. NCTE (1998) : Perspectives in Teacher Education.
6. The Reflective Teacher : Organisation of In-Service Training of the Teachers of Elementary Schools under SSA, Guidelines, 2006 by NCERT.
7. Cohen, Louis, Minion Lawrence & Morrison, Keith (2004). A Guide to Teaching Practice (5th edition). Routledge Falmer. London and New York.
8. Herne Steve, Jessel John & Griffith, Jenny (2000). Study to Teach: A Guide to Studying in Teacher Education. Routledge Falmer. London and New York.
9. Korthagen, Fred A. J. et al. (2001). Linking Practice and Theory: The Pedagogy of Realistic Teacher Education. Lawrence Erlbaum Associates.
10. NCTE (1998) : Policy Perspectives in Teacher Education. New Delhi.
11. NCTE (1998). Competency Based and Commitment Oriented Teacher Education for Quality School Education : Pre-service Education, New Delhi.
12. Rao, D. B. (1998). Teacher Education in India. Discovery Publishing House, New Delhi.
13. Yadav, M. S. and Lakshmi, T. K. S. (2003) : Conceptual inputs for Secondary Teacher Education : The Instructional Role. India, NCTE.
14. Joyce, B. and Weil, M. (2003). Models of Teaching (7th Ed.) Boston: Allyn and Bacon.
15. Ram, S. (1999). Current Issues in Teacher Education. Sarup & Sons Publication, New Delhi.

16. Schon, D. (1987). *Educating the Reflective Practitioner: Towards a New Design for Teaching and Learning in the Profession*. New York, Basic Books.
17. Day, C. and J. Sachs, J. (Ed.) (2004). *International Handbook on the Continuing Professional Development of Teachers*. Maidenhead, Brinks Open University Press.
18. Mohan, R. (2011). *Teacher Education*. New Delhi: PHI Learning Pvt. Ltd.
19. Aggarwal, P. (2010). *Teacher Education*. New Delhi: Saurabh Publishing House.
20. Tomar, S. M. (2004). *Teacher Education: Making Education Effective*. New Delhi: Isha Books. CBCS Curriculum M.A. /M.Sc. (Education) Dept. of Education, University of Klayani 27
21. Ali, L. (2011). *Teacher Education*. New Delhi: APH Publishing Corporation.
22. Aggarwal, J. C. (2010). *Teacher and Education in a Developing Society (5th ed.)*. New Delhi: Vikas Publishing House.
23. Mishra, L. (2013). *Teacher Education: Issues and Innovation*. New Delhi: Atlantic Publications.
24. Pany, S. and Mohanty, S. P. (2013). *Teacher Education in India*. New Delhi: Shipra Publication.
25. Sharma, S. R. (2008). *A Handbook of Teacher Education*. New Delhi: Sarup & Sons.

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 906E	Curriculum Studies	Internal	External	4	100
		30	70		

Learning outcomes

It is expected that on completion of the course, the students will be able to:

- Describe various Approaches to curriculum and curriculum design.
- State Principles of curriculum development and implementation.
- Discuss the Principles of curriculum evaluation.
- Identify Nation and international curriculum concerns.

COURSE CONTENTS

Unit 1:

Concept and Principles of Curriculum, Strategies of Curriculum Development, Stages in the Process of Curriculum development, Foundations of Curriculum Planning—Philosophical Bases (National, Democratic), Sociological Basis (Socio Cultural Reconstruction), Psychological Bases (Learner's Needs and Interests), Benchmarking and Role of National level Statutory Bodies—UGC, NCTE and University in Curriculum Development.

Unit 2:

Models of Curriculum Design: Traditional and Contemporary Models (Academic / Discipline Based Model, Competency Based Model, Social Functions/Activities Model [Social Reconstruction], Individual Needs & Interests Model, Outcome Based Integrative Model, Intervention Model, C I P P Model (Context, Input, Process, Product Model)

Unit 3:

Instructional System, Instructional Media, Instructional Techniques and Material in enhancing curriculum Transaction, Approaches to Evaluation of Curriculum: Approaches to Curriculum and Instruction (Academic and Competency Based Approaches), Models of Curriculum Evaluation: Tyler's Model, Stake's Model, Scriven's Model, Kirkpatrick's Model.

Unit 4:

Meaning and types of Curriculum change, Factors affecting curriculum change, Approaches to curriculum change, Role of students, teachers and educational administrators in curriculum change and improvement, Scope of curriculum research and Types of Research in Curriculum Studies.

Unit 5:

Curriculum research in India, Australia and USA

Modes of curriculum evaluation – formative, summative, interpretation of evaluation result.

Recommended Books

1. Aggarawal, J. CI Curriculum Reform in India: Delhi, Doaba,1990
2. Brent, Allen Philosophical foundations for the Curriculum, Boston, Allen and Unwin, 1978.
3. Das, R.C Curriculum and Evaluation, New Delhi, NCERT, 1987.
4. Dell Ronald C. Curriculum Improvement: Decision Making & Process, (6" edition)
5. Diamond, Robert M. Education A London, Allyn& Bacon, Inc, 1986. Designing & Improving Courses & Curricula in Higher. Systematic Approach, California, Jossey Bass inc. publishers, 1989.
6. English, F.W. Deciding what to Teach and Test, CA, Corwin Press, Stage Publications, Thousand Oaks, 2000.
7. Erickson, H.L Stage Concept based Curriculum and Instruction, CA, Corwin Press, Publications, Thousand Oaks,2000.
8. Flinders D. J (Ed) 1977 The Curriculum Studies, New Delhi, Altalantic Pubulishers,.
9. Mamidi, Malla Reddey & Ravishankar (eds) Delhi, Curriculum Development & Deucational Technology, New Sterling Publishers, 1984.
10. NCERT Curriculum & Evaluation, New Delhi, NCERT 1984
11. NCERT National Curriculum for Elementary & Secondary Education, Frame Work, New Delhi, NCERT, 1988
12. Saylor J. Galen, William (4thedition), Curriculum planning for Better Teachnig& Learning Alexander & Arthur J. Lewis New York, Holt Rinehart & Winstone, 1980.
13. Trum j. Lyod. Prentice Secondary school Curriculum Improvement, New York, Hall, 1967.
14. Tyler, Ralp. W. Curriculum Development: Theory and practice, New York, Harcourt Brace, Jovenovichtcn., 1962
15. Tyler, Ralp. W Basic principles of Curriculum & Instruction, Chicago, The University of Chicago Press, 1974.
16. UNESCO Curricula and Lifelong Education, Paris, UNESCO. 1981
17. Wheeler D.K. 1967. Curriculum Process, London, University of London Press,
- 18.P.V.V. Satyanarayana Curriculum Development and Management.
- 19.R.P. Vashisht. Curriculum Development
20. P.P.Ghosh. Effective Curriculum Construction
- 21.Dr.T.Mrunalini. Curriculum Developments 3
- 22.N.B. Biswas. Curriculum Studies
- 23.David Scott. Curriculum Studies: Major Themes in Education
- 24.Denis Lawton. Theory and Practice of Curriculum Studies Curriculum
- 25.Murry Print. Development and Design
- 26.G.Glenys. Response Curriculum Development
- 27.Collin Richards. Curriculum Studies

M.A in Education

4th Semester

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 1001C	History, Politics and Economics of Education	30	70	4	100

Learning Outcomes

It is expected that on completion of the course, the students will be able to:

- Explain the nature of developmental History of education.
- Analyse the status of education in the different Commissions and Committees.
- Describe Economical perspective of Education.
- State the relationship between politics and Education.
- Tell the features of various reports, commissions and policies of education during pre and post-independence development of Education - in India.
- Discuss about the government initiatives to make education accessible for every citizen of the nation.

COURSE CONTENT

UNIT -1

A synoptic and critical review of the landmarks in educational development in pre-independence era in India; the educational clause of 1813,-Macaulay's Minute – Wood's Despatch – Hunter's commission- National Education Movement- Calcutta University-Sargent Report.

UNIT-2

Committees and Commissions' Contribution to Teacher Education; Secondary Education Commission (1953), Kothari Commission (1964-66), National Policy of Education (1986,1992),National Education Policy 2020, National Commission on Teachers (1999), Delors Commissions(1996), National Curriculum Framework (2005), National Knowledge Commission (2007), Yashpal Committee Report (2009), National Curriculum Framework for Teacher Education (2009), Justice Verma Committee Report (2012), RTE Act. 2009.

UNIT-3

Relationship between Policies and Education, Linkage between Educational Policy and National Development, Determinants of Educational Policy and Process of Policy formulation: Analysis of the existing situation, generation of policy options, evaluation of policy options, making the policy decision, planning of policy implementation, policy impact

assessment and subsequent policy cycles. Sarva Shiksha Abhiyan(SSA), Rastriya Madhyamik Shiksha Abhiyan(RMSA), Rastriya Ucctara Shiksha Abhiyan(RUSA), Educational schemes for ST, SC, and other Marginalized group.

UNIT-4

Concept of Economics of Education: Cost Benefit Analysis Vs Cost Effective Analysis in Education, Economic returns to Higher Education Signalling Theory Vs Human Capital Theory, Concept of Educational Finance; Educational finance at Micro and Macro Levels, Concept of Budgeting.

UNIT-5

Relationship Between Politics and Education, Perspectives of Politics of Education— Liberal, Conservative and Critical, Approaches to understanding Politics (Behaviouralism, Theory of Systems Analysis and Theory of Rational Choice), Education for Political Development and Political Socialization.

Recommended Books:

1. Aggarwal, J.C. (2004) Modern Indian Education. New Delhi: Shipra.
2. Blaug, Mark (1972): An Introduction to Economics of Education. Allen Lane the Penguin, London
3. Dhankar, N. (2010). Education In Emerging Indian Society. New Delhi: APH Publishing Corporation.
4. Fagerling, I., and Saha, L. J.O. (1989). Education and National Development (2nd Ed.). England: Pergamon Press.
5. Hough J.R. (1990): Education, Policy-An International Survey. Croom Helm, London.
6. Kakkar, S. B. (1995). Changing Perspectives in Education. New Delhi: Vikas Publishing House Pvt. Ltd.
7. Kabir, H. (1959) Education in New India. London: Allen &Unwin Ltd.
8. Less Bell & Howard Stevenson (2006): Education Policy: Process, Themes and Importance. Routledge.
9. Mehta D. D. (2009). Education in Emerging Indian Education, Ludhiyana: Tondan Publications, Books Market.
10. Murthy, S. K. (2009). Philosophical and Sociological Foundation of Education. Ludhiyana: Tondan Publication, Books Market.
11. Narayan, D. (2005): Local Governance without Capacity Building: Ten Years of Panchayat Raj. Economic and Political Weekly, June 25, pp. 2822-32.
12. Nurullah, S. and Naik, J.P. (1975) A Student's History of Education in India (1800-1961) Revised Fourth Edition. Bombay:MacMillan and Co. Ltd.
13. Pathak, K. R. (2007). Education in the Emerging India. New Delhi: Atlantic Publishers.
14. Report of the University Education Commission (1948-49) Ministry of Education Government of India.
15. Sharma,S. (2005) History and Development of Higher Education in free India. Jaipur; ABD Publishers.
16. Singh, B.P. (1990). Aims of Education in India. New Delhi: Ajanta Publication.
17. Sharma, R L. (2006) Comprehensive History of Modern Education. New Delhi: Cyber Tech Publications.
18. Tilak, J.B.G. (1988). Cost of Education In India: International Journal of Educational Developmen

19. Tilak, J.B.G. (1992). Educational Planning at Grassroots. Ashish Publications. New Delhi.
20. MHRD, Gov. of India (1992), National policy on education (revised) New Delhi.
21. MHRD, (1992), Programme of action. Govt. of India, New Delhi.

Course code	Name of the course	Marks Distribution		Total Credit	Marks
EDCN 1002C	Thought of Great Educators	Internal	External	4	100
		30	70		

Learning Outcomes

It is expected that on completion of the course, the students will be able to:

- Describe educational thoughts of Vidyasagar, Vivekananda, Gandhiji, Tagore, Aurobindo, Radhakrishnan, Rousseau, Pestalozzi, Froebel, Montessori, Dewey, Spencer.
- Apply the educational thoughts of Vidyasagar, Vivekananda, Gandhiji, Tagore, Aurobindo, Radhakrishnan, Rousseau, Pestalozzi, Froebel, Montessori, Dewey, Spencer.

UNIT-1

- Swami Vivekananda.
- Gandhiji.

UNIT-2

- Rabindranath Tagore.
- Sri Aurobindo.

UNIT-3

- Vidyasagar.
- Sarvarpalli Radhakrishnan

UNIT-4

- Jean Jacques Rousseau.
- Pestalozzi.
- Friedrich August Froebel.

UNIT-5

- Maria Montessori.
- John Dewey.
- Herbert Spencer.
-

Recommended books:

1. Educational Idea of the Great in India--S.P. Chaube and A. Chaube.
2. Ideas of the Great Western Education-- S.P. Chaube and A. Chaube.
3. Thinkers on Education—EDUTRACK series.

4. Educational Thinkers—V.R. Taneja and S. Teneja.
5. Fifty major Thinkers on Education – Joy A Palmer, LioraBresler& David Coopar.
6. Fifty major Thinkers on Education – LioraBresler, David Coopar&J.A. Palmer.
7. Educational Thinkers of India—Shehzad Ahmed.
8. Great Ideas in Educariion—Rozer Miller.
9. Appadorai, A.1987.*Indian political Thinking in the 20th Century*, New Delhi: South Asian Publishers.
10. Mehta, V.R. 1996. *Indian Political Thought*. New Delhi; Manohar.
11. Mehta, V.R. and T.Panthan, T.2006. *Political Ideas in Modern India; Thematic Explorations*. New Delhi: Sage Publications.
12. Lohia, R. 1976. Marx, *Gandhi and Socialism*. Hyderabad: Educational Trust.
13. Bhikhu, P. 1995. *Gandhis political Philosophy*. New Delhi: Ajanta International.
14. Locke, J.1989. *Two Treaties of Government*. London: Everyman Publication.
15. Froebel, friedrich.2012.*The Education of Man*. North Chelmsford, US: Courier Corporation.
16. Dewey, John.2004. *Democracy and Education*. Massachusetts, US: Courier Corporation.
17. Dewey, John.2007 *Experience and Education*. New York, US: Simon and Schuster.
18. Montessori, Maria.2012.*The Montessori Method*. Massachusetts, US: Courier Corporation.

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 1004E	Open, Distance and Online Education	Internal	External	4	100
		30	70		

Learning Outcomes

It is expected that on completion of the course, the students will be able to:

- Explain the Concept, Features, Objectives and Scope of Distance, Online and open Education.
- Analyze the growth of distance education and explain the socio-economic relevance and philosophical basis of Distance Education
- Identify the issues related to Planning, Management, Promotion and Coordination of Distance Education.
- Apply the implications of Theories of Learning and Communication for Course Designing to Distance Learners.
- Describe the process of Designing and Development of Self-Learning Print Material.
- Analyze the qualities of various media used in education and their relative merits and demerits
- Classify New Technologies in the Preparation of Print Material for Distance Learners.
- Discuss the mechanism for Learner Support Services in Distance Education.
- State the Role of Different forms of Communication Media in Distance Education.

UNIT-1

Concept of Distance Education: Meaning, Characteristics and significance of distance education, Present status of distance education, Meaning of open learning, characteristics and differences between open and distance learning, Policy perspectives on open and distance learning

UNIT- 2

Technical and vocational programs in distance education, Communication issues and role of ICT in distance education, Multimedia approach in distance education, Uses of satellite technology and internet for distance education.

UNIT- 3

Intervention strategies in distance education; Distance education and rural development, Designing and preparing SLM- their roles and types, Self support service, Role of DEB, IGNOU, NIOS, and their prominent institution for ODL

UNIT- 4

Concept and need of evaluation in distance education, differences between evaluation in traditional learning and distance learning, Comprehensive and continuous evaluation in

distance learning, Techniques of evaluation in distance education, Problems of evaluation in online and distance education and their remedies

UNIT- 5

Quality assurance and cost effectiveness—Meaning and concept of quality assurance in distance education, Role of Distance Education Council in maintaining quality assurance in distance education, Cost effectiveness in distance education; measures and importance, IQAC

Recommended books:

1. Chib, S.S. (1986): Distance Education. Chandigarh: Chadda Publication.
2. Criscito Pat; (2004): Barron's Guide To Distance Learning. Barron's E Publisher.
3. Daniel, J. S. et al; (1982): Learning at a Distance: A world Perspective. Athabasca University, Edmonton.
4. Garrison, D. R. (1989): Understanding Distance Education Framework for future. Routledge, Chapman and Hall, London.
5. Holmberg, B. (1985): Status and Structure of Distance Education (2nd Ed.). Lector Publishing.
6. Holmberg, B. (1986): Growth and Structure of Distance Education. London: Croom Helm.
7. Holmberg, B. (1989): Theory and Practice of Distance Education. Routledge, Chapman & Hall, London.
8. IGNOU (1988): Growth and Philosophy of Distance Education. (Block 1, 2 &3). IGNOU, New Delhi.
9. Joshi P.K. (2007): Modern Distance Education. New Delhi: Anmol Publications.
10. Kaye, & Rumble (Ed) (1981): Distance Teaching for Higher and Adult Education, London: Croom Helm.
11. Keegan, D. (1989): Foundations of Distance Education, London: Routledge.
12. Race, Phil (1944): The Open Learning Handbook, Second Edition, London: Kogan Page.
13. Rathore, H. C. S. (1993): Management of Distance Education in India. New Delhi: Ashish Publishing House.

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 1005E	Comparative Education	Internal	External	4	100
		30	70		

Learning Outcomes

It is expected that on completion of the course, the students will be able to:

- Enumerate the concept, significance and scope of Comparative Education.
- Describe the various approaches to study of comparative education; and also factors affecting development of education.
- Compare the concept, practice teaching and evaluation system of teacher education on focused countries.
- Identify the recent trends and best practices in education such as distance and open learning, vocational education and educational administration.
- Reflect on comparison of the educational systems of USA, UK, and India with special reference to Primary Education, Secondary Education and Higher Education.
- Outline the prevailing problems and issues in education and also know the role of various agencies which acts for the progress of education system.

UNIT-1

Conceptual framework of Comparative Education

Concept, significance and scope of comparative education; Factors affecting development of Comparative education; Determinants of National system.

UNIT- 2

Perspectives in comparative Education

Comparative education as a academic discipline and applied discipline of Education; Approaches to study Comparative Education: Historical, philosophical, sociological, analytical, synthetically, statistical and descriptive views

UNIT- 3

Structure of Educational system

A comparative study of Education system of following countries with special reference to primary, secondary and higher Education

- i) USA
- ii) UK
- iii) India
- iv) China

UNIT- 4

Contemporary trends in world Education scenario

Role and programs of Educational activities of UNO, SAARC, UNESCO, UNICEF in the member countries.

UNIT- 5

Types of Education across nation

Vocational, Technical, Formal, Adult and Teacher Education in USA, India, UK, Norway, Australia

Recommended books :

1. Bereday, G.Z.F. (1967) : Comparative Methods in Education. New York: Oxford University Press.
2. Chaube, Sarayu Prasad (2005) : Comparative Education: a study of some contemporary national system(s) of U.S.A., U.S.S.R., Great Britain, Japan and Turkey. Agra : Ram Prasad,
3. Chaube&Chaube, (2006); Comparative Education, Vikash Publishing House, New Delhi.
4. Dutta, B.S.V. (2004) : Comparative Education: A Comparative Study of Educational Systems. Guwahati: DVS Publishers & Distributors.
5. Halls, W.D. (1990) : Comparative Education: Contemporary Issues and trends. Paris: UNESCO.
6. John, Philip H. (1971) : Comparative Education, Purpose and Methods. Australia: University of Greenland Press.
7. Kaushik, V.K. (2006) : Comparative Education, New Delhi: Anmol Publication.
8. Nicholas A. Hans (1958) : Comparative Education: A study of educational factors and traditions. London: Routledge&Kegan Paul.
9. Pawar, N.G. (2004) : Development of Education System in India. Guwahati: Eastern Book House.
10. Rao, V.K. (2004) : Comparative Education. The Methods of Analysis and Enquiry. Guwahati: DVS, Publishers and Distributors
11. Rao, V.K. & Reddy, R.S. (1997): Comparative Education. New Delhi: Commonwealth Publishers.
12. Robert, F., Arnove, Carlos, A. & Torres (2007) : Comparative Education: The dialectic of the global and the local.
13. Rahaman, M. (2009), Education of Administration, PravatiLibray, Dhaka.
14. Rai, B.C. (2010); Comparative Education, Prakashan Kendra, Lucknow.
15. Sharma, Y.K. (2008); Comparative Education: A Comparative Study of Educational System, Kanishka Publications, and New Delhi.
16. Sodhi, T.S. (2000); A Text Book of Comparative Education, Vikash Publishing House, New Delhi

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 1006E	Education for Empowerment of Women	Internal	External	4	100
		30	70		

Learning Outcomes

It is expected that on completion of the course, the students will be able to:

- Explain the expected roles (Political, Social and Economic) of India women in developing countries including India.
- Enumerate the types of modes of preparation needed for them in playing such roles effectively and efficiently in tune with the constitutional directives.
- Describe the concept of women as change agents for the transformation of third world countries as studied by the World Bank and other world Organization ILD.

UNIT- 1

Concept of women Empowerment, Women's Empowerment in Today's World, Global Gender Gapes, Women's Rights, Women's Movement.

UNIT-2

Health conditions. Sex Ratio. Family Planning and welfare, Education Literacy & Gender Bias, Worked related issue Existing Prejudication, Sex related Violence, Gender Discrimination.

UNIT- 3

Political Participation, Lack of Women's Representation, Economic Conditions Prostitution, Social Conditions divorce, rape, domestic violence.

UNIT-4

Approaches to Women's Education, Education for achievement quality of life, Equality of opportunity and equality.

UNIT-5

Women in developing countries with special reference to India, Women in national Development, Women in Decision Making.

Recommended books:

1. Agarwal, S.P. (2501) : Women's Education in India. Guwahati: Eastern Book House.
2. Arya, Sadhna (1999) : Women, Gender Equality and the State. New Delhi: Deep & Deep Publicatins.

3. Dutt, Suresh (2500) : Women and Education. New Delhi: Anmol Publications.
4. Jayapalan, N.(2502) : Women and Human Rights. Guwahati: DVS Publishers.
5. Joshi, S.T. (2503) : Women and Development: The Changing Scenario. Guwahati: Nivedita Book Distributor.
6. Kuma, Hajira and Varghese, J.(2505) : Women's Empowerment: Issues, Challenges and Strategies .Regency.
7. Menon, Latika (1998) : Women Empowerment and Challenges of Change. New Delhi: Kanishka Publishers.
8. Mukherjee, Debashree (2508) : Women Education and Empowerment: A Global Perspective. ICFAI Publication.
9. Narasimhan, Sakuntala (1999) : Empowering Women. New Delhi: Sage Publications.
10. Raju, M.L. (2507) : Women Empowerment: Challenges and Strategies. New Delhi: Deep & Deep Publications.
11. Ranganathan, Sarala (1998) : Women and Social Order: A Profile of Major Indicators and Determinants. New Delhi: Kanishka Publishers.

Course code	Name of the course	Marks Distribution		Total Credit	Marks
		Internal	External		
EDCN 1003C	Dissertation II (report writing and viva voce).			8	200
		60	140		

Learning Outcomes

It is expected that on completion of the course, the students will be able to:

- Do qualitative and quantitative research
- Apply different statistical techniques as per the requirements of the study
- Outline various Testing of hypotheses
- Describe educational significance of the study
- Elaborate the conception about different sampling techniques and their use.
- Discuss about writing of research report.

Tripura University
Department of Physical Education
M.P.Ed CBCS Syllabus

Master of Physical Education (M.P.Ed)
2 Years Full Time Programme

Programme Outcomes (POs)

- PO1. Students will be highly skilled scholars in the field of Physical Education.
- PO2. Students will master the competencies and skills needed to become professional Physical Education and sport resource person.
- PO3. Students will be sensitive about emerging issues in Physical Education & sports.
- PO4. Students will develop reasoning, rational thinking, critical thinking in the problems & issues relating to the field.
- PO5. Students will be creative, self-expressive & continue their pursuit towards professional growth.
- PO6. Students will understand and analyze the importance of sound health and fitness principles as they relate to better health.
- PO7. To learn fundamental movements and its development in relation to growth.
- PO8. Students will demonstrate proficiency through knowledge and acquired skills.
- PO9. Nurture the talents in sports and make them to participate in the Competitive sports.
- PO10. To create fit and healthy society

Programme Specific Outcomes (PSOs)

- PSO1. Recognize the physical and mental benefits of increased activity.
- PSO2. Understand the concept and applied knowledge of Sports Science principles.
- PSO3. Determine factors involved with growth, maturation and physical activity.
- PSO4. Examine the effect of nutrition, rest and other lifestyle factors.
- PSO5. Utilize physical activity as a tool to manage stress.
- PSO6. Participate in a motivating and nurturing environment resulting in a greater sense of well-being and self-esteem.
- PSO7. Participate in active learning to stimulate continued inquiry about physical education, health and fitness.
- PSO8. Understand and utilize various training methods.
- PSO9. Assess individual levels of fitness components.
- PSO10. Preparing the individual for competition as per their talent and specialization.
- PSO11. To plan developmentally appropriate physical education lessons and units of instruction in physical education.
- PSO12. Demonstrate an expert knowledge of the playing strategies and skills of the sports.
- PSO13. To use critical thinking skills during a competitive situation in order to compete to the best of one's ability against opponents.
- PSO14. Embody the traits of good sportsmanship and a sense of team in both competition and practice.

Department of Physical Education, Tripura University
Course: Master of Physical Education (M.P.Ed)
Semester – I

Part A :Theoretical Course						
Paper Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Core Course						
PE-701-C	Research Process in Physical Education & Sports Sciences	4	4	30	70	100
PE-702-C	Physiology of Exercise.	4	4	30	70	100
PE-703-C	Tests, Measurement and Evaluation in Physical Education	4	4	30	70	100
PE-704-E	Yogic Sciences	4	4	30	70	100
PE-705-E	Sports Journalism and Mass Media					
Part–B Practical Course						
PE-706-C	Specialization Activity 1. Track & Field 2. Football 3. Yoga 4. Basketball 5. Volleyball (*Any one)	6	4	30	70	100
PE-707-C	Advanced Activity Kho-Kho/ Kabaddi/ Judo/ Wrestling (*Any one)	6	4	30	70	100
PE-708-C	Yoga	6	4	30	70	100
PE-709-C	Advanced Activity Gymnastic/ Swimming (*Any one)	6	4	30	70	100
Total		40	32	240	560	800

Department of Physical Education, Tripura University
Course: Master of Physical Education (M.P.Ed)
Semester – II

Part A: Theoretical Course						
Paper Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Core Course						
PE-801-C	Applied Statistics in Physical Education & Sports	4	4	30	70	100
PE-802-C	Kinesiology	4	4	30	70	100
PE-803-C	Athletic Care and Rehabilitation	4	4	30	70	100
Elective Course (Anyone)						
PE-804-E	Sports Technology	4	4	30	70	100
PE-805-E	Sports Management and Curriculum Designs in Physical Education					
Part-B Practical Course						
PE806-C	Specialization Activity 1. Track & Field 2. Football 3. Yoga 4. Basketball 5. Volleyball (*Any one)	6	4	30	70	100
PE-807-C	Advance level Games Activity Badminton / Table Tennis / Lawn Tennis	6	4	30	70	100
PE-808-C	Teaching Lessons of theory and practical of Indigenous Activities and Different games & Sports-5 (both Internal & External)	6	4	30	70	100
PE-809-C	Class room Teaching-Theory-5 (both Internal & External) Leadership Training and Adventure Camp	6	4	30	70	100
Total		40	32	240	560	800

Department of Physical Education, Tripura University
Course: Master of Physical Education (M.P.Ed)

Semester – III

Part A: Theoretical Course						
Paper Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Core Course						
PE-901-C	Scientific Principles of Sports Training	4	4	30	70	100
PE-902-C	Sports Biomechanics	4	4	30	70	100
PE-903-C	Health Education and Sports Nutrition	4	4	30	70	100
Elective Course (Anyone)						
PE-904-E	Sports Medicine	4	4	30	70	100
PE-905-E	Physical Fitness and Wellness					
PE-906-E	Sports Engineering					
Part–B Practical Course						
PE-907-C	Specialization Activity 1. Track & Field 2. Football 3. Yoga 4. Basketball 5. Volleyball (*Any one)	6	4	30	70	100
PE-908-C	Advance level Games Activity: Football/ Yoga/ Track & Field/ Cricket/ Handball (*Any One)	6	4	30	70	100
PE-909-C	Coaching Lessons of Game Specialization - 05Lessons (4 Internal & 1 External)	6	4	30	70	100
PE-910-C	Coaching Lessons on advance level Games Activity – 5 Lessons (4 Internal & 1 External)	6	4	30	70	100
Total		40	32	240	560	800

Department of Physical Education, Tripura University
Course: Master of Physical Education (M.P.Ed)

Semester – IV

Part A: Theoretical Course						
Paper Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Core Course						
PE-1001-C	Information & Communication Technology in Physical Education	4	4	30	70	100
PE-1002-C	Sports Psychology	4	4	30	70	100
PE-1003-C	Adapted Physical Education	4	4	30	70	100
Elective Course (Anyone)						
PE-1004-E	Value and Environmental Education	4	4	30	70	100
PE-1005-E	Education Technology in Physical Education					
PE-1006-E	Dissertation					
Part-B Practical Course						
PE-1007-C	Specialization Activity 1. Track & Field 2. Football 3. Yoga 4. Basketball 5. Volleyball (*Any one)	6	4	30	70	100
PE-1008-C	Advance Level Games Activity- Boxing/ Taekwondo/ Archery (any One)	6	4	30	70	100
PE-1009-C	Officiating Lessons of Games Specialization - 5 Lessons (4 Internal & 1 External)	6	4	30	70	100
PE-1010-C	Officiating Lessons of Advance Game Activity - 5 Lessons (4 Internal & 1 External)	6	4	30	70	100
Total		40	32	240	560	800
		160	128	960	2240	3200

Department of Physical Education, Tripura University
Course: Master of Physical Education (M.P.Ed)
Semester – I

Part A :Theoretical Course						
Paper Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Core Course						
PE-701-C	Research Process in Physical Education & Sports Sciences	4	4	30	70	100
PE-702-C	Physiology of Exercise.	4	4	30	70	100
PE-703-C	Tests, Measurement and Evaluation in Physical Education	4	4	30	70	100
PE-704-E	Yogic Sciences	4	4	30	70	100
PE-705-E	Sports Journalism and Mass Media					
Part-B Practical Course						
PE-706-C	Specialization Activity 1. Track & Field 2. Football 3. Yoga 4. Basketball 5. Volleyball (*Any one)	6	4	30	70	100
PE-707-C	Advanced Activity Kho-Kho/ Kabaddi/ Judo/ Wrestling (*Any one)	6	4	30	70	100
PE-708-C	Yoga	6	4	30	70	100
PE-709-C	Advanced Activity Gymnastic/ Swimming (*Any one)	6	4	30	70	100
Total		40	32	240	560	800

M.P.Ed (SEMESTER-I)
RESEARCH PROCESS IN PHYSICAL EDUCATION AND SPORTS SCIENCES
(PE-701-C)

Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. know the concept and meaning of Research
- CO2. understand the fundamentals of Research
- CO3. know the methods of Research
- CO4. know different tools of data collection for Research

UNIT I – Introduction

- Meaning and Definition of Research, Need, Nature and Scope of research in Physical Education.
- Classification of Research, Location of Research Problem, Criteria for selection of a problem,
- Qualities of a good researcher.

UNIT II – Methods of Research

- Descriptive Methods of Research: Survey Study, Case study
- Introduction of Historical Research, Steps in Historical Research, Sources of Historical Research: Primary Data and Secondary Data
- Historical Criticism: Internal Criticism and External Criticism.

UNIT III – Experimental Research

- Experimental Research – Meaning, Nature and Importance
- Meaning of Variables, Types of Variables.
- Experimental Design - Single Group Design, Reverse Group Design, Repeated Measure Design, Static Group Comparison Design, Equated Group Design, Factorial Design.

UNIT IV – Sampling

- Meaning and Definition of Sample and Population.
Types of Sampling:
- Probability Methods; Systematic Sampling, Cluster sampling, Stratified Sampling. Area Sampling – Multistage Sampling.
- Non- Probability Methods; Convenience Sample, Judgement Sampling, Quota Sampling.

UNIT V – Research Proposal and Report

- Chapterization of Thesis / Dissertation, Front Materials, Body of Thesis – Back materials. Method of Writing Research proposal, Thesis / Dissertation;
- Method of writing abstract and full paper for presenting in a conference and to publish in journals and proceedings
- Mechanics of writing Research Report, Footnote and Bibliography writing.

REFERENCE :

Best J. W (1971) Research in Education, New Jersey; Prentice Hall, Inc

Clarke David. H & Clarke H, Harrison (1984) Research processes in Physical Education, New Jersey; Prentice Hall Inc.

Craig Williams and Chris Wragg (2006) Data Analysis and Research for Sport and Exercise Science, Londonl Routledge Press

Jerry R Thomas & Jack K Nelson (2000) Research Methods in Physical Activities; Illonosis; Human Kinetics;

Kamlesh, M. L. (1999) Reserach Methodology in Physical Education and Sports, New Delhi

Moses, A. K. (1995) Thesis Writing Format, Chennai; Poompugar Pathippagam

Rothstain, A (1985) Research Design and Statistics for Physical Education, Englewood Cliffs: Prentice Hall, Inc

M.P.Ed (SEMESTER-I)
PHYSIOLOGY OF EXERCISE (PE-702-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. understand the physiological effect of Exercise on different system or/and on the body as a whole.
- CO2. understand bioenergetics & role of energy systems in sports activities.
- CO3. understand the role of nutrition & its relevance in energy production.

UNIT I – Skeletal Muscles and Exercise

- Macro and Micro Structure of the Skeletal Muscle,
- Types of Muscle fibre and their relation with sports performances
- Sliding Filament theory of Muscular Contraction.
- Chemical Composition, Muscle Tone
- Chemistry of Muscular Contraction
- Effect of exercises and training on the muscular system.

UNIT II – Cardiovascular System and Exercise

- Structure of human Heart and Direction of the Blood Flow
- Conduction System of the Heart – Cardio-respiratory blood circulation – Cardiac Cycle – Stroke Volume – Cardiac Output – Heart Rate
- Factors Affecting Heart Rate, Cardiac Hypertrophy
- Effect of exercises and training on the Cardio vascular system.

UNIT III – Respiratory System and Exercise

- Respiratory organs of the body
- Mechanics of Breathing, Respiratory Muscles, Minute Ventilation, Ventilation at Rest and During Exercise.
- Diffusion of Gases, Exchange of Gases in the Lungs, Exchange of Gases in the Tissues Control of Ventilation, Ventilation and the Anaerobic Threshold.
- Oxygen Debt and EPOC (Excess Post- Exercise Oxygen Consumption), Lung Volumes and Capacities.
- Effect of exercises and training on the respiratory system.

UNIT IV – Metabolism and Energy Transfer

- Metabolism – ATP – PC or Phosphagen System – Anaerobic Metabolism – Aerobic Metabolism
- Aerobic and Anaerobic Systems during Rest and Exercise. Short Duration High Intensity Exercises – High Intensity Exercise Lasting Several Minutes – Long Duration Exercises.

UNIT V – Climatic conditions and sports performance and ergogenic aids

- Variation in Temperature and Humidity – Thermoregulation – Sports performance in hot climate, Cool Climate, high altitude.
- Influence of: Amphetamine, Anabolic steroids, Androstenedione, Beta Blocker, Choline, Creatine,
- Human growth hormone on sports performance: Narcotic, Amphetamines, Caffeine, Ephedrine, Sympathomimetic amines. Stimulants and sports performance.

Laboratory Practical (to be conducted under supervision of Subject Teacher) topics:

1. Identification of Bone and Joints of the Body and measuring of body segments
2. Measurement of BP by Sphygmomanometer, HR measurement
3. Use of Hemometer
4. Measurement of Blood glucose
5. Use of Body Composition Analyzer
6. Use of Lactate analyzer
7. Use of Gas analyzer

Note: Laboratory Practicals be designed and arranged internally.

REFERENCES:

- Amrit Kumar, R, Moses. (1995). Introduction to Exercise Physiology. Madras: Poompugar
- Clarke, D.H. (1975). Exercise Physiology. New Jersey: Prentice Hall Inc., Englewood Cliffs.
- David, L Costill. (2004). Physiology of Sports and Exercise. Human Kinetics.
- Fox, E.L., and Mathews, D.K. (1981). The Physiological Basis of Physical Education and Athletics. Philadelphia: Sanders College Publishing.
- Guyton, A.C. (1976). Textbook of Medical Physiology. Philadelphia: W.B. Sanders co.
- Richard, W. Bowers. (1989). Sports Physiology. WMC: Brown Publishers.
- Sandhya Tiwaji. (1999). Exercise Physiology. Sports Publishers.
- William, D. Mc Aradle. (1996). Exercise Physiology, Energy, Nutrition and Human Performance. Philadelphia: Lippincott Williams and Wilkins Company.

M.P.Ed (SEMESTER-I)
TEST, MEASUREMENT AND EVALUATION IN PHYSICAL EDUCATION
(PE-703 C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

1. know terminologies & methods of evaluation in sports & Physical Education.
2. understand the evaluation process.
3. evaluate the human performance.
4. prepare & conduct measurement & evaluation.

UNIT I – Introduction

- Meaning and Definition of Test, Measurement and Evaluation
- Need and Importance of Measurement and Evaluation
- Criteria for Test Selection
- Procedure to establish Scientific Authenticity.
- Meaning, definition and establishing Validity, Reliability, Objectivity. Norms and Administrative Considerations.

UNIT II – Motor Fitness Tests

- Meaning and Definition of Motor Fitness.
- Steps for Construction of Motor Fitness Test: Indiana Motor Fitness Test (for elementary and high school boys, girls and College Men) Oregon Motor Fitness Test (Separately for boys and girls), JCR test.
- Steps for Construction of Motor Ability Test: Barrow Motor Ability Test, Newton Motor Ability Test, Kraus Weber Minimum Muscular Fitness Test.

UNIT III – Physical Fitness Tests

Steps for Construction of Physical Fitness Test and Administering of Physical Fitness Test:

- AAHPERD Health Related Fitness Battery (revised in 1984),
- ACSM Health Related Physical Fitness Test
- Roger's physical fitness Index.
- Cardio vascular test; Harvard step test,
- 12 minutes run / walk test,
- Multi-stage fitness test (Beep test)

UNIT IV – Anthropometric and Aerobic-Anaerobic Tests

- Aerobic Capacity: The Bruce Treadmill Test Protocol, 1.5 Mile Run test for college age males and females.
- Anaerobic Capacity: Margaria-Kalamen test, Wingate Anaerobic Test,
- Anthropometric Measurements: Method of Measuring Height: Standing Height, Sitting Height. Method of measuring Circumference: Arm, Waist, Hip, Thigh. Method of Measuring Skin folds: Triceps, Sub scapular, Suprailiac.

UNIT V – Sports Skill efficiency and Psychological Test

Specific Spots Skill Test:

- Badminton: Miller Wall Volley Test.
 - Basketball: Johnson Basketball Test, Harrison Basketball Ability Test.
 - Cricket: Sutcliff Cricket test.
 - Hockey: Friendel Field Hockey Test, Harban’s Hockey Test,
 - Volleyball: Russel Lange Volleyball Test, Brady Volleyball Test.
 - Football: Mor-Christian General Soccer Ability Skill Test, Johnson Soccer Test, Mc-Donald Volley Soccer Test.
 - Tennis: Dyer Tennis Test.
-
- Meaning , Factors associated with the items , rating scale and interpretation criteria of testing the following psychological variables:
 - Competition anxiety
 - Team cohesion,
 - Motivation,
 - Aggression,

Note: Practicals of indoor and out-door tests be designed and arranged internally.

REFERENCES :

- Authors Guide (2013) ACSM’s Health Related Physical Fitness Assessment Manual, USA: ACSM Publications
- Collins, R.D., & Hodges P.B. (2001) A Comprehensive Guide to Sports Skills Tests and Measurement (2nd edition) Lanham: Scarecrow Press
- Cureton T.K. (1947) Physical Fitness Appraisal and Guidance, St. Louis: The C. Mosby Company
- Getchell B (1979) Physical Fitness A Way of Life, 2nd Edition New York, John Wiley and Sons, Inc
- Jenson, Clayne R and Cynt ha, C. Hirst (1980) Measurement in Physical Education and Athletics, New York, Macmillan Publising Co. Inc
- Kansal D.K. (1996), “Test and Measurement in Sports and Physical Education, New Delhi: DVS Publications
- Vivian H. Heyward (2005) Advance Fitness Assessment and Exercise Prescription, 3rd Edition, Dallas TX: The Cooper Institute for Aerobics Research

M.P.Ed (SEMESTER-I)
YOGIC SCIENCES (PE-704-E)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. understand the foundation & background of Yoga.
- CO2. know stages Students will & importance of practicing yoga.
- CO3. understand the benefits & effects of Kriyas, Bandhas, Pranayama.
- CO4. understand relation of yoga, health & mental health.
- CO5. know the researches in yoga and its contributions

Unit I – Introduction

- Meaning and definition of Yoga. Astanga Yoga: Yama, Niyama, Asana, Pranayama, Prathyahara, Dharana, Dhyana, Samadhi, Concept of Yogic Practices;
- Preparation for Yoga (Medical Check-up, Learn from a Teacher, Follow Traditional Method, Condition Your Mind, Confidence, Patience, Regularity, Time, Place, Seat, Dress, Silence)
- Precautions for Beginners: Keep Stomach Empty, Preparing the Body, Avoid Strain, Avoid Fatigue, How to Practice Asana, Principles of Breathing – Awareness-Relaxation.

Unit II – Aasanas and Pranayam

- Suryanamsakar: Methods and benefits. Asanas: Meaning, Definitionas, Aim and Objectives, Characteristics, Classification, Importance.
- Pranayama: Meaning, Asana for Pranayama, Basic Pattern of Pranayama Breathing, Types – Methods and Benefits, Nadis: Meaninf, Methods and Benefits, Chakras: Major Chakras – Benefits of cleaning and balancing Chakras.

Unit III – Kriyas and Bandhas

- Shat Kriyas: Meaning, Techniques and Benefits of Neti – Dhati – Kapalbhathi – Trataka – Nauli.
- Bandhas: Meaning, Techniques and Benefits of Jalendra Bandha, Jihva Bandha, Uddiyana Bandha, Mula Bandha.

Unit IV – Mudras

- Meaning, Techniques and Benefits of Hasta Mudras, Asamyukta hastam, Samyukta hastam , Mana Mudra, Kaya Mudra, Banda Mudra, Adhara Mudra.
- Meditation: Meaning, Techniques and Benefits of Meditation – Passive and active, Saguna Meditation and Nirguna Meditation.

Unit V – Yoga and Sports

- Importance of Yoga for Sports. Application of Yoga for Specific Types of Sports (Target Sports/Sports using one side of body/ Endurance Sports/Strength and Balance Sports/Team Sports)
- Role of Yoga in Psychological Preparation of athlete: Mental Wellbeing, Anxiety, Depression Concentration, Self Actualization.
- Effect of Yoga on Physiological System: Circulatory, Skeletal, Digestive, Nervous, Respiratory, Excretory System.

Note: Laboratory Practicals be designed and arranged internally.

REFERENCE:

George Feuerstein, (1975). Text Book of Yoga. London: Motilal Bansaridass Publishers (P) Ltd.

Gore, (1990), Anatomy and Physiology of Yogic Practices. Lonavata: Kanchan Prkashan.

Helen Purperhart (2004), The Yoga Adventure for Children. Netherlands: A Hunter House book.

Iyengar, B.K.S. (2000), Light on Yoga. New Delhi: Harper Collins Publishers.

Karbelkar N.V.(1993) Patanjali Yogasutra Bhashya (Marathi Edition) Amravati: Hanuman Vyayam Prasarak Mandal

Kenghe. C.T. (1976). Yoga as Depth-Psychology and para-Psychology (Vol-I): Historical Background, Varanasi: Bharata Manishai.

Kuvalyananda Swami & S.L. Vinekar, (1963), Yogic Therapy – Basic Principles and Methods. New Delhi: Govt. of India, Central Health Education and Bureau.

Moorthy A.M. & Alagesan. S. (2004) Yoga Therapy. Coimbatore: Teachers Publication House.

Swami Kuvalayanda, (1998), Asanas. Lonavala: Kaivalyadhama.

Swami Satyananda Sarasvati. (1989), Asana Pranayama Mudra Bandha. Munger: Bihar School of Yoga.

Swami Satyananda Sarasvathi. (1984), Kundalini and Tantra, Bihar: Yoga Publications Trust.

M.P.Ed (SEMESTER-I)
SPORTS JOURNALISM AND MASS MEDIA (PE-705-E)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. know basic concepts of Journalism and Sports Journalism
- CO2. prepare sports bulletin
- CO3. know ways to use media in Journalism
- CO4. review major Competitions and Games with respect to media and journalism
- CO5. prepare reports in Sports and Journalism

UNIT I Introduction

- Meaning and Definition of Journalism,
- Ethics of Journalism – Canons of journalism- Sports Ethics and Sportsmanship
- Reporting Sports Events. National and International Sports News Agencies.

UNIT II Sports Bulletin

- Concept of Sports Bulletin: Journalism and sports education – Structure of sports bulletin – Compiling a bulletin – Types of bulletin
- Role of Journalism in the Field of Physical Education:
- Sports as an integral part of Physical Education
 - Sports organization and sports journalism
 - General news reporting and sports reporting.

UNIT III Mass Media

- Mass Media in Journalism: Radio and T.V. Commentary – Running commentary on the radio – Sports expert's comments.
- Role of Advertisement in Journalism. Sports Photography: Equipment- Editing – Publishing.

UNIT IV Report Writing on Sports

- Brief review of Olympic Games, Asian Games, Common Wealth Games World Cup, National Games and Indian Traditional Games.
- Preparing report of an Annual Sports Meet for Publication in Newspaper.
- Organization of Press Meet.

UNIT –V Journalism

- Sports organization and Sports Journalism – General news reporting and sports reporting. Methods of editing a Sports report. Evaluation of Reported News. Interview with and elite Player and Coach.

(Practical assignments to observe the matches and prepare report and news of the same; visit to News Paper office and TV Centre to know various departments and their working. Collection of Album of newspaper cuttings of sports news.)

REFERENCE:

Ahiya B.N. (1988) Theory and Practice of Journalism: Set to Indian context Ed3. Delhi : Surjeet Publications

Ahiya B.N. Chobra S.S.A. (1990) Concise Course in Reporting. New Delhi: Surjeet Publication

Bhatt S.C. (1993) Broadcast Journalism Basic Principles. New Delhi. Haranand Publication

Mohit Chakrabarti (2008): Value Education: Changing Perspective, New Delhi: Kanishka Publication,.

Padmanabhan. A & Perumal A (2009), Science and Art of Living, Madurai: Pakavathi Publication

Shiv Khera (2002), You Can Win, New Delhi: Macmillan India Limited.

Varma A.K. (1993) Journalism in India from Earliest Times to the Present Period. Sterling publication Pvt. Ltd.

Venkataiah. N (2009) Value Education,- New Delhi: APH Publishing Corporation

**M.P.Ed-I Semester
Practical Courses
Track and Field Specialization Activity (PE-706-C-1)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. Introduction to Track and Field (History, Scope & Importance)
2. Events of Track and Field
3. Ancient and Modern Olympic Games
4. Basic measurement of standard track
5. World Athletic Rules Regulations and officiating in semester practicum events.

Part B – Practicum:

1. Sprint Start

- a. Preparation for start and teaching steps
- b. Starting command and procedure
- c. Leaving the block
- d. Identification of faults and corrective measures

2. Distance running start

- a. Running style and running economy, ABC exercises of running

3. Technique of Running Broad Jump

- a. Approach
- b. Take-off
- c. Hang/Sale/Hitch kick
- d. Landing

4. Shot Put

- a. Safety measures
- b. Introduction to implement and the sector with measurements
- c. Perry O'Bryan/ Rotation Technique
- d. Teaching steps
- e. Execution of faults and corrective measures

**M.P.Ed-I Semester
Practical Courses
Football Specialization Activity (PE-706-C-2)**

Total Marks :100
External Marks :70
Internal Marks :30

History of Football

1. Origin and development of Football
2. Formation, Structure and Functions of FIFA & AIFF

Laws of The Game and Their Interpretations

3. Interpretation and critical analysis of Laws of The Game and practical implications in match situation
4. Signal by the referee and assistant referee

Skills

5. Learning advance skills and identification of faults and proper correction of skills
6. Development of performance and demonstration ability in different skills

**M.P.Ed-I Semester
Practical Courses
Yoga Specialization Activity (PE-706-C-3)**

Total Marks :100
External Marks :70
Internal Marks :30

Part- A

1. Brief Introduction to Origin, History and Definition of Yoga.
2. Misconceptions of Yoga.
3. Four Schools of Yoga (Jana Yoga, Bhakti Yoga, Karma Yoga and Raj Yoga).
4. Fundamental Principles of Yoga (Pancha Kosha, Pancha Bhuta, Pancha Prana)

Part- B

- | | |
|----------------------------------|---|
| 1. Shavasana | 2. Crocodile Variations |
| 3. Uttan Padasana | 4. Ardha Halasana (One leg/Two leg) |
| 5. Pawanmuktansana (Ardha/Purna) | 6. Setubandhasana |
| 7. Naukasana (Supine) | 8. Sarvangasana |
| 9. Halasana | 10. Makarsana |
| 11. Bhujangasana | 12. Ardha Shalabhasana |
| 13. Naukasana (Prone) | 14. Vajrasana |
| 15. Bhadrasana | 16. Parvatasana |
| 17. Janusirasana | 18. Paschimuktansana |
| 19. Vakrasana | 20. Yoga Mudra |
| 21. Padmasana | 22. Swastikasana |
| 23. Tadasana | 24. Ardhakati-Chakrasana (Side Bending) |
| 25. Padahastasana | |

References:

1. "A Text Book on Yoga and Health" – Dr. Sanjib Kumar Bhowmik (Sports Publication, New Delhi)
2. "Asana Pranayama Mudra Bandha"- Swami Satyananda Saraswati (Yoga Publication Trust, Munger, Bihar)
3. "Asanas"- Swami Kunalayananda (Published by Kaivalyadhama, Lonavla).
4. "Asana Why & How"- O.P. Tiwari (Published by Kaivalyadhama, Lonavla)

**M.P.Ed-I Semester
Practical Courses
Basketball Specialization Activity (PE-706-C-4)**

Total Marks :100
External Marks :70
Internal Marks :30

Part- A

- Introduction to Basketball.
- History of FIBA & BFI.
- Teaching Stages of Skills.
- Layout of Court and Dimensions.
- Basic rules 1-4

Part- B

- Basic Fundamental Skill of Basketball (Passing and Receiving, Shooting, Dribbling, Rebounding, Stance & Footwork)
- Different teaching stages of Skills and Techniques (Stance, Execution and Follow throw)
- Identification of faults and corrective measures
- Basic playing ability practices.

**M.P.Ed-I Semester
Practical Courses
Kho-Kho Games Activity (PE-707-C-1)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. Dimensions and layout of Kho-Kho playing arena and technical area
2. Rules and Regulations of play
3. Officiating in Kho-Kho

Part B – Practicum

Skills of Kho-Kho-

1. Chasing Skills:

- a. Sudden change of direction
- b. Tapping, Grasping Direction, Diving, Pole Diving
- c. Fake Kho, Late Kho, Giving Kho, Trapping
- d. Getting in square and getting off from square

2. Running Skills:

- a. Running: Zigzag
- b. Avoiding: Dodging (Front, Back, Round the Post), Position on Kho-Kho Playground

**M.P.Ed-I Semester
Practical Courses
Kabaddi Games Activity (PE-708-C-2)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. Dimensions and layout of Kabaddi playing arena and technical area
2. Rules and Regulation of playing
3. Officiating in Kabaddi

Part B – Practicum

Skills of Kabaddi:

1. Cant, Entry, Footwork
2. Tackle: Block, Chain Tackle, Waist Hold, Ankle Hold, Thigh Hold
3. Raiding: Hand Touch, Toe Touch, D

**M.P.Ed-I Semester
Practical Courses
Judo Games Activity (PE-707-C-3)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. Dimensions and layout of Judo playing arena and technical area
2. Rules and Regulation of playing
3. Officiating/ Umpiring in Judo

Part B – Practicum

- Basic Fundamental Skill of Judo
- Different teaching stages of Skills and Techniques (Stance, Execution and Follow throw)
- Identification of faults and corrective measures
- Basic playing ability practices.

**M.P.Ed-I Semester
Practical Courses
Wrestling Games Activity (PE-707-C-4)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

4. Dimensions and layout of Wrestling playing arena and technical area
5. Rules and Regulation of playing
6. Officiating/ Umpiring in Wrestling

Part B – Practicum

- Basic Fundamental Skill of Wrestling
- Different teaching stages of Skills and Techniques (Stance, Execution and Follow throw)
- Identification of faults and corrective measures
- Basic playing ability practices.

**M.P.Ed-I Semester
Practical Courses
Yoga Games Activity (PE-708-C)**

Total Marks :100
External Marks :70
Internal Marks :30

Part – A

1. Brief Introduction to Origin, History and Definition of Yoga.
2. General guidelines for practice of Yoga
3. Introduction to Asanas
4. Introduction to Pranayama

Part – B

1. Surya Namaskar
2. Relaxative Asanas: Savasana, Makarsana
3. Meditative Asanas: Sukhasana, Padmasana, Vajrasana
4. Cultural Asanas: Uttan Padasana, Sarvangasana, Halasana, Matsyasana, Pawanmuktasana, Naukasana (Supine/Prone), Bhujangasana, Shalabhasana, Dhanurasana, Paschimuktanasana, Ardha-Matsyendrasana, Ardha-kati-chakrasana, Chakrasana, Padahastana, Vrikshasana, Tadasana
5. Pranayama: Deep Breathing, Anuloma-Viloma, Suriyabhedan, Ujjai
6. Kriya: Kapalbhata

**M.P.Ed-I Semester
Practical Courses
Gymnastics Games Activity (PE-709-C-1)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

7. Introduction and History of Gymnastics
8. Rules and Regulation of playing
9. Officiating/ Judging in Gymnastics

Part B – Practicum:

- Basic Fundamental Techniques of Gymnastics
- Different teaching stages of Techniques (Stance, Execution and Follow throw)
- Identification of faults and corrective measures
- Basic practices on Artistic Gymnastics.

**M.P.Ed-I Semester
Practical Courses
Swimming Games Activity (PE-709-C-2)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

10. Dimensions and layout of Swimming arena and technical area
11. Rules and Regulation of playing
12. Officiating/ Judging in Swimming

Part B – Practicum

- Basic Fundamental Techniques of Swimming
- Different teaching stages of Techniques (Stance, Execution)
- Identification of faults and corrective measures
- Basic Swimming ability practices.

Department of Physical Education, Tripura University
Course: Master of Physical Education (M.P.Ed)
Semester – II

Part A: Theoretical Course						
Paper Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Core Course						
PE-801-C	Applied Statistics in Physical Education & Sports	4	4	30	70	100
PE-802-C	Kinesiology	4	4	30	70	100
PE-803-C	Athletic Care and Rehabilitation	4	4	30	70	100
Elective Course (Anyone)						
PE-804-E	Sports Technology	4	4	30	70	100
PE-805-E	Sports Management and Curriculum Designs in Physical Education					
Part-B Practical Course						
PE806-C	Specialization Activity 1. Track & Field 2. Football 3. Yoga 4. Basketball 5. Volleyball (*Any one)	6	4	30	70	100
PE-807-C	Games Activity: Badminton / Table Tennis / Lawn Tennis	6	4	30	70	100
PE-808-C	Teaching Lessons of theory and practical of Indigenous Activities and Different games & Sports-5 (both Internal & External)	6	4	30	70	100
PE-809-C	Class room Teaching-Theory-5 (both Internal & External) Leadership Training and Adventure Camp	6	4	30	70	100
Total		40	32	240	560	800

M.P.Ed (SEMESTER-II)
APPLIED STATISTICS IN PHYSICAL EDUCATION AND SPORTS (PE-801-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. know the basics of computer, data entry in computer and mining of data
 CO2. know the format of Research Report
 CO3. understand the concept, need and importance of statistics
 CO4. understand the use of statistical software and MS Excel for statistical operations
 CO5. interpret and make inferences based on the statistical Operations

UNIT I – Introduction

- Meaning and Definition of Statistics, Types of Statistics.
- Need and importance of Statistics in Physical Education.
- Meaning of the terms: Population, Sample, Data.
- Variables: Discrete, Continuous.
- Parametric and non-parametric statistics.

UNIT II – Data, Graph, Frequency and Measures of Central Tendency:

- Nature of Data: Nominal, Ordinal, Interval & Ratio.
- Graphical Representation of Data: Line Diagram, Pie Diagram & Bar Diagram.
- Frequency Distribution: Frequency Polygon, Frequency Curve, Histogram & Ogives.
 Application of measure of Central Tendency & variability and their characteristics (Mean, Median & Mode).

UNIT III – Measures of Dispersions, Scales and Normal Distribution

- Meaning, Purpose, Calculation and advances of Range, Quartile Deviation, Mean Deviation, Standard Deviation, Probable Error.
- Meaning, Purpose, Calculation and advantages of scoring scales; Sigma scale, Z Scale, Hull scale
- Normal Distribution: Properties of Normal Curve, Skewness & Kurtosis, Problems based on Normal distribution.

UNIT IV – Correlation & Regression

- Concept of Correlation and Regression: Scatter Diagram, Liner Correlation & Rank Correlation.
- Liner regression equation with two variables.
- Partial correlation co-efficient of first and second order
- Multiple correlation coefficients involving three variables.

UNIT V – Inferential and Comparative Statistics

- Tests of significance, Independent “t” test, Dependent “t” test.
- Z-TEST (Large sample test).
- Chi – square test.
- One way Analysis of Variance (ANOVA), Post –hoc test- LSD & Scheffe

Note : It is recommended that the theory topics be accompanied with practical, based on computer software of statistics.

REFERENCE

- Verma, J.P. (2013), Data Analysis in Management with SPSS Software Springer.
- Verma, J.P. (2011), Statistical Methods for Sports and Physical Education . Tata McGraw Hill Education, New Delhi
- Best J. W (1971) Research in Education, New Jersey; Prentice Hall, Inc
- Clark D.H. (1999) Research Problem in Physical Education 2nd edition, Eaglewood Cliffs, Prentice Hall, Inc.
- Jerry R Thomas & Jack K Nelson (2000) Research Methods in Physical Activities; Illinois; Human Kinetics;
- Kamlesh, M. L. (1999) Research Methodology in Physical Education and Sports, New Delhi
- Rothstein A (1985) Research Design and Statistics for Physical Education, Englewood Cliffs: Prentice Hall, Inc
- Sivaramakrishnan. S. (2006) Statistics for Physical Education, Delhi; Friends Publication
- Thirumalaisamy (1998), Statistics in Physical Education, Karaikudi, Senthilkumar Publications.

M.P.Ed (SEMESTER-II)
KINESIOLOGY (PE-802-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. understand the science of kinesiology in relation to human performance.
 CO2. analyze various fundamental movements and understanding the relevance of analysis.
 CO3. understand the body structure and apply the knowledge in analysis of movements.

Note: Ten questions will be set from all the units. Five questions are to be attempted selecting one from each unit and each question will carry 14 marks.

Unit-I: Introduction:

- Nature and concept of kinesiology
- Historical development of kinesiology
- Relationship with other sciences
- Application of knowledge of kinesiology in physical education and sports science.

Unit II – Anatomical and Physiological Fundamentals of human motion:

- Types of joints their structure and functions.
- Various types of movements around the joints.
- Muscles: Origin, Insertion and function related to human movement.
- Study of muscular movements of various joints: (Shoulder Joints, Elbow Joints, Hip Joint, Knee Joint).

Unit-III: Kinesiological aspects of Postures and gait

- Concept of posture and gait.
- Characteristics of good erect standing posture.
- Common postural deformities of spine, leg and foot – nature, problems and corrections
- Analysis of human Gait.
-

Unit IV- Underlying principles of basic motor skills

- Characteristics of Skillful motions and classification of skills
- Basic Principles of Receiving impetus from external objects.
- Basic Principles of Giving impetus to external objects.
- Principles of Giving impetus to and Receiving impetus from one's own body.

Unit V- Kinesiological Analysis and Application of Kinesiological Principles in Fundamental movements and daily living skills

- Outline of kinesiological analysis
- Kinesiological principles involved in daily living skills
- Kinesiological analysis of running, jumping and throwing

REFERENCES

- Gowitzke, B.A and Milner, M (1988). Scientific Basis of Human Movement (3rd.ed.) Baltimore: Williams and Wilkins.
- Groves, R and Camaine, D. (1983). Concepts in Kinesiology. (2nd.ed) Philadelphia:Saunders College Publishing.
- Hay, J. & Reid, J (1982). The Anatomical and Mechanical Basis of Human Motion.Englewood Cliffs: Prentice – Hall

M.P.Ed (SEMESTER-II)
ATHLETIC CARE AND REHABILITATION (PE-803-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. understand the body posture in defining different deformities of postures.
 CO2. give a thorough understanding about the restoration and rehabilitation from injuries.
 CO3. understand the active and passive movements and massage and their utilities in rehabilitation process.
 CO4. identify different forms of injuries and their process of recovering which is related with the sports.

Unit-I: Corrective Physical Education

- Definition, objectives and scope of corrective Physical Education.
- Application of corrective programme at different levels of schools.
- Equipments and facilities required for schools,
- Evaluation and measurement of corrective physical education.
- Posture and body mechanics, Standards of Standing Posture. Value of good posture, Drawbacks and causes of bad posture. Posture test – Examination of the spine.

Unit-II: Posture

- Normal curve of the spine and its utility
- Deviation in posture: Kyphosis, Lordosis, Flat Back, Scoliosis, Round shoulders, Knock Knee, Bow Leg, Flat Foot.
- Causes for deviations and treatment including exercises.

Unit-III: Rehabilitation Exercises

- Therapeutic Exercises (Introduction, Definition, Aims, Goals, Essential Steps to be considered for an Approach to Therapeutic Exercise, Scope of Therapeutic Exercises).
- Active Movements (Classification, Technique, Effects and Uses of Free Exercise, Assisted Exercise, Assisted – Resisted Exercise, Resisted Exercise, Progressive Resistance Exercise, Types of Resisted Exercise: Isometric, Isotonic, Isokinetic).
- Passive Movements (Classification, Technique, Effects and Uses of Relaxed Passive Movements, Forced Passive Movements, Manipulation Under Anaesthesia).

Unit-IV: Massage

- Introduction, Brief history of Massage, Meaning, Definitions of Massage.
- Types and Benefits of Massage.
- Uses of Massage
- Principles of Massage
- Effect of Massage on human body.

Unit-V: Sports Injuries Care, Treatment and Support

- Introduction, Types of Sports injuries
- Common Sports Injuries, Treatment of sports Injuries, Immediate care of Injuries
- Prevention of Sports Injuries, Basic steps to reduce the Risk of sports injuries.
- Principles and techniques of Strapping and Bandages
- Therapeutic Modalities (Hydrotherapy, Whirlpool, Contrast bath, Cryo therapy, Diathermy, Ultrasound)

References:

Doherty. J. Meno.Wetb, Moder D (2000) Track & Field, Englewood Cliffs, Prentice Hal Inc.

Lace, M. V. (1951) Massage and Medical Gymnastics, London: J & A Churchill Ltd.

McOoyand Young (1954) Tests and Measurement, New York: Appleton Century.

Naro, C. L. (1967) Manual of Massage and, Movement, London: Febra and Febra Ltd.

Rathbome, J.I. (1965) Corrective Physical education, London: W.B. Saunders & Co.

Stafford and Kelly, (1968) Preventive and Corrective Physical Education, New York.

A F Morris (1984) Sports Medicine, Wm.C Brown, Iowa

F.G.O'Connor , Sports Medicine, McGraw-Hill ,USA

M.P.Ed (SEMESTER-II)
SPORTS TECHNOLOGY (PE-804-E)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. know about different technological concepts and types
- CO2. use technology to its fullest potential.
- CO3. use technology for better communication in instructional system.
- CO4. know and use different audio-visual media in physical education
- CO5. know about new technological advancements in educational setting and their uses.

Unit I – Sports Technology

- Meaning, definition, purpose, advantages and applications
- General Principles and purpose of instrumentation in sports, Workflow of instrumentation and business aspects
- Technological impacts on sports.

Unit II – Science of Sports Materials

- Adhesives- Nano glue, nano moulding technology, Nano turf.
- Foot wear production, Factors and application in sports, constraints.
- Foams- Polyurethane, Polystyrene, Styrofoam, closedcell and open-cell foams, Neoprene, Foam.
- Smart Materials – Shape Memory Alloy (SMA), Thermo chromic film, High-density modelling foam.

Unit III – Surfaces of Playfields

- Modern surfaces for playfields, construction and installation of sports surfaces.
- Types of materials – synthetic, wood, polyurethane. Artificial turf.
- Modern technology in the construction of indoor and outdoor facilities.
- Technology in manufacture of modern play equipments.
- Use of computer and software in Match Analysis and Coaching.

Unit IV – Modern equipment

- Playing Equipments: Balls: Types, Materials and Advantages, Bat/Stick/ Racquets: Types, Materials and Advantages.
- Clothing and shoes: Types, Materials and Advantages.
- Measuring equipments: Throwing and Jumping Events.
- Protective equipments: Types, Materials and Advantages.
- Sports equipment with nano technology, Advantages.

Unit V – Training Gadgets

- Basketball: Ball Feeder, Mechanism and Advantages.
- Cricket: Bowling Machine, Mechanism and Advantages,
- Tennis: Serving Machine, Mechanism and Advantages,
- Volleyball: Serving Machine Mechanism and Advantages.
- Lighting Facilities: Method of erecting Flood Light and measuring luminous.

- Video Coverage: Types, Size, Capacity, Place and Position of Camera in Live coverage of sporting events.

Note: Students should be encouraged to design and manufacture improvised sports testing equipment in the laboratory/workshop and visit sports technology factory/sports goods manufacturers.

REFERENCE:

Charles J.A. Crane, F.A.A. and Furness, J.A.G. (1987) "Selection of Engineering Materials" UK: Butterworth Heiremann.

Finn, R.A. and Trojan P.K. (1999) "Engineering Materials and their Applications" UK: Jaico Publisher.

John Mongilo, (2001), "Nano Technology 101" New York: Green wood publishing group.

Walia, J.S. Principles and Methods of Education (Paul Publishers, Jullandhar), 1999.

Kochar, S.K. Methods and Techniques of Teaching (New Delhi, Jullandhar, Sterling Publishers Pvt. Ltd.), 1982

M.P.Ed (SEMESTER-II)
SPORTS MANAGEMENT AND CURRICULUM DESIGN IN PHYSICAL EDUCATION (PE-805-E)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. get acquainted with duties & responsibilities of managers.
 CO2. understand the importance of management in Physical Education
 CO3. know the basic concept & principles of management in Physical Education.

UNIT I – Introduction to Sports Management

- Definition, Importance. Basic Principles and Procedures of Sports Management.
- Functions of Sports Management.
- Personal Management: Objectives of Personal Management, Personal Policies, Role of Personal Manager in an organization, Personnel recruitment and selection.

UNIT II – Program Management

- Importance of Programme development and the role of management
- Factors influencing programme development. Steps in programme development,
- Competitive Sports Programs and its Benefits,
- Management Guidelines for School, Colleges Sports Programs, Management Problems in instruction programme, Community Based Physical Education and Sports program.

UNIT III – Equipments and Public Relation

- Guidelines for selection of Equipments and Supplies, Purchase of equipments and supplies, Equipment Room, Equipment and supply Manager.
- Guidelines for checking, storing, issuing, care and maintenance of supplies and equipments.
- Public Relations in Sports: Planning the Public Relation Program – Principles of Public Relation – Public Relations in School and Communities – Public Relation and the Media.

UNIT IV – Curriculum

- Meaning and Definition of Curriculum.
- Principles of Curriculum Construction: Students centred, Activity centred, Community centred,
- Principles of integration,
- Theories of curriculum development, Conservative (Preservation of Culture),
- Relevance, flexibility, quality, contextually and plurality.
- Approaches to Curriculum; Subject centred, Learner centred and Community centred, Curriculum Framework.

UNIT V – Curriculum Sources & Evaluation

- Factors that affecting curriculum
- Sources of Curriculum materials – text books – Journals – Dictionaries, Encyclopaedias, Magazines, Internet.
- Integration of Physical Education with other Sports Sciences – Curriculum research, Objectives of Curriculum research – Importance of Curriculum research.
- Evaluation of Curriculum, Methods of evaluation.

Reference:

Aggarwal, J.C (1990). Curriculum Reform in India – World overviews, Doaba World Education Series – 3 Delhi: Doaba House, Book seller and Publisher.

Arora, G.L. (1984): Reflections on Curriculum, New Delhi: NCERT.

Bonnie, L. (1991). The Management of Sports. St. Louis: Mosby Publishing Company, Park House.

Bucher A. Charles, (1993) Management of Physical Education and Sports (10th ed.,) St. Louis: Mobsy Publishing Company.

Carl, E, Willgoose. (1982. Curriculum in Physical Education, London: Prentice Hall.

Chakraborty & Samiran. (1998). Sports Management. New Delhi: Sports Publication.

Charles, A, Bucher & March, L, Krotee. (1993). Management of Physical Education and Sports. St. Louis: Mosby Publishing Company.

Chelladurai, P. (1999). Human Resources Management in Sports and Recreation. Human Kinetics.

John, E, Nixon & Ann, E, Jewett. (1964). Physical Education Curriculum, New York: The Ronald Press Company.

McKernan, James (2007) Curriculum and Imagination: Process, Theory, Pedagogy and Action Research,. U.K. Routledge

Williams, J.F. (2003). Principles of Physical Education. Meerut: College Book House. Yadvnider Singh. Sports Management, New Delhi: Lakshay Publication.

NCERT (2000). National Curriculum Framework for School Education, New Delhi: NCERT.

NCERT (2005). National Curriculum Framework-2005, New Delhi: NCERT.

**M.P.Ed-II Semester
Practical Courses
Track and Field Specialization Activity (PE-806-C-1)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. History of running events
2. Philosophy of Officiating and Coaching
3. Technique and Tactics of Middle distance and long distance running events
4. Use of modern technology in Track and Field events
5. Layout of standard track
6. World Athletics Rules Regulations and officiating in semester practicum events

Part B – Practicum:

1. Discus Throw

- a. Safety measures
- b. Introduction to implement and the sector with measurements
- c. Rotation Technique
- d. Teaching Steps
- e. Release/Execution of throw
- f. Identification of faults and corrective measures

2. Triple Jump

- a. Approach
- b. Phases of Take-off
- c. Hop/Step/Jump – Distribution of energy and arm action
- d. Landing

3. Relay Races

- a. Visual Exchange Technique
- b. Non Visual Exchange
- c. Composition and arranging of relay team
- d. Measurement of relay zones and stagger
- e. Finishing technique of a sprint
- f. Use of FAT and hand timing system at finishing line

**M.P.Ed-II Semester
Practical Courses
Football Specialization Activity (PE-806-C-2)**

Total Marks :100
External Marks :70
Internal Marks :30

Techniques

1. Development of football techniques and identification of faults and proper correction of techniques
2. Methodical phase of different techniques and its mechanical analysis

Tactics & Strategies

3. General and applied tactics and strategies and their implications
4. Individual : Attack & Defence
5. Group : Attack & Defence
6. Principles of tactical play in attack and defence

**M.P.Ed-II Semester
Practical Courses
Yoga Specialization Activity (PE-806-C-3)**

Total Marks :100
External Marks :70
Internal Marks :30

Part- A

1. Introduction to Patanjali Yoga Sutras
2. Introduction to Hatha Yoga
3. Asanas, Pranayama, Bandhas, Mudras, Pratyahara, Dhayana and Samadhi as described in Hatha Yoga Pradipika
4. Asanas, Pranayama, Bandhas, Mudras, Pratyahara, Dhayana and Samadhi as described in Gheranda Samhita.

Part- B

- | | |
|-------------------------------------|-----------------------------|
| 1.Suryanamaskar | 2.Nasarga Dristi |
| 3.Matsyasana | 4.Jalandhara Bandha |
| 5.Shalavasana | 6. Uddiyana Bandha |
| 7. Dhanurasana | 8.Mula Bandhasana |
| 9. Gomukhasana | 10.Moolbandha |
| 11.Mandukasana | 12.Vrikshasana |
| 13. Preparatory Breathing Practices | 14.Anuloma-Viloma Pranayam |
| 15.Trikonasana | 16.Ujjayi Pranayama |
| 17.Ardha-Matsyendrasana | 18.Suryabhedan Pranayama |
| 19.Akarnadhanurasana | 20.Kapalbhati |
| 21.Tolangulasana | 22.Jala Neti |
| 23.Bhrumadhya | 24.Dristi Rubber/Sutra Neti |
| 25.Vaman Dhauti | |

References:

1. Patanjali Yoga Sutras – P.V. Karambelkar (Published by Kaivalyadhama, Lonavla).
2. Four Chapters on Freedom- Swami Satyananda Saraswati (Yoga Publication Trust, Munger, Bihar)
3. “A Text Book on Yoga and Health” – Dr. Sanjib Kumar Bhowmik (Sports Publication, New Delhi)
4. “Hathapradipika of Svatmarama”- Swami Digambarji & Raghunath Shastri Kokaje (Published by Kaivalyadhama, Lonavla)
5. “Gheranda Samhita” - Swami Digambarji & M.L. Gharote (Published by Kaivalyadhama, Lonavla)
6. “Asana Pranayama Mudra Bandha”- Swami Satyananda Saraswati (Yoga Publication Trust, Munger, Bihar)
7. Asanas – Swami Kuvalayaananda (Published by Kaivalyadhama, Lonavla).
8. “Pranayama” – Swami Kuvalayaananda (Published by Kaivalyadhama, Lonavla).
9. “Asana Why & How”- O.P. Tiwari (Published by Kaivalyadhama, Lonavla)

**M.P.Ed-II Semester
Practical Courses
Basketball Specialization Activity (PE-806-C-4)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. Fundamental rules 5 – 10
2. Interpretation of above mentioned rules and regulations.
3. Common Injuries: Prevention & care.
4. Evaluation technique.

Part B – Practicum:

1. Fundamental skills of Basketball
(Passing & Receiving, Shooting, Rebounding, Dribbling, Footwork & Stance)
2. Different teaching stages of different skills/techniques
(Stance, execution & follow through)
3. Identification of faults and corrective measures
4. Basic playing ability practices.

**M.P.Ed-II Semester
Practical Courses
Badminton Games Activity (PE-807-C-1)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

4. Dimensions and layout of Badminton playing arena and technical area
5. Rules and Regulations of Game
6. Officiating/ Umpiring of Badminton game

Part B – Practicum

1. Fundamental skills /Techniques of Badminton game
2. Different teaching stages of different skills/techniques
(Stance, execution & follow through)
3. Identification of faults and corrective measures
4. Basic playing ability practices.

**M.P.Ed-II Semester
Practical Courses
Table Tennis Games Activity (PE-807-C-2)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

7. Dimensions and layout of Table Tennis playing arena and technical area
8. Rules and Regulations of Game
9. Officiating/ Umpiring of Table Tennis game

Part B – Practicum

5. Fundamental skills /Techniques of Table Tennis game
6. Different teaching stages of different skills/techniques
(Stance, execution & follow through)
7. Identification of faults and corrective measures
8. Basic playing ability practices.

**M.P.Ed-II Semester
Practical Courses
Lawn Tennis Games Activity (PE-807-C-3)**

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

10. Dimensions and layout of Lawn Tennis playing arena and technical area
11. Rules and Regulations of Game
12. Officiating/ Umpiring of Lawn Tennis game

Part B – Practicum

9. Fundamental skills /Techniques of Lawn Tennis game
10. Different teaching stages of different skills/techniques
(Stance, execution & follow through)
11. Identification of faults and corrective measures
12. Basic playing ability practices.

Department of Physical Education, Tripura University
Course: Master of Physical Education (M.P.Ed)

Semester – III

Part A: Theoretical Course						
Paper Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Core Course						
PE-901-C	Scientific Principles of Sports Training	4	4	30	70	100
PE-902-C	Sports Biomechanics	4	4	30	70	100
PE-903-C	Health Education and Sports Nutrition	4	4	30	70	100
Elective Course (Anyone)						
PE-904-E	Sports Medicine	4	4	30	70	100
PE-905-E	Physical Fitness and Wellness					
PE-906-E	Sports Engineering					
Part-B Practical Course						
PE-907-C	Specialization Activity 1. Track & Field 2. Football 3. Yoga 4. Basketball 5. Volleyball (*Any one)	6	4	30	70	100
PE-908-C	Advance level Activity: Football/ Yoga/ Track & Field/ Cricket/ Handball (*Any One)	6	4	30	70	100
PE-909-C	Teaching & Coaching Lessons of Specialization Activity- 05Lessons (4 Internal & 1 External)	6	4	30	70	100
PE-910-C	Teaching & Coaching Lessons on advance level Games Activity -5 Lessons (4 Internal & 1 External)	6	4	30	70	100
Total		40	32	240	560	800

M.P.Ed (SEMESTER-III)
Scientific Principles of Sports Training (PE-901-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

CO1. understand the scientific sports training process & principles.

CO2. develop attitudes and skills in designing sports training programs.

CO3. be a good sports trainer.

Unit-I: Introduction

- Sports training: Definition- Aim, Characteristics and Principles of Sports Training, Over Load: Definition, Causes of Over Load, Symptoms of Overload. Remedial Measures -Super Compensation - Altitude Training -Cross Training.

Unit- II: Components of Physical Fitness and Methods of Development (Strength, Speed and Endurance)

- Strength: Meaning, Characteristics and Methods to improve Strength: Weight Training, Isometric, Isotonic, Circuit Training, Speed: Methods to Develop Speed: Repetition Method, Downhill Run, Parachute Running, Wind Sprints, Endurance, Methods to Improve Endurance: Continuous Method, Interval Method, Repetition Method, Cross Country and Fartlek Training.

Unit-III: Components of Physical Fitness and Co-ordination abilities

- Flexibility: Meaning, Characteristics and Methods to Improve the Flexibility- Stretch and Hold Method, Ballistic Method, Special Type Training: Plyometric Training. Training for Coordinative abilities: Meaning, Characteristics and Methods to improve Coordinative abilities: Sensory Method, Variation in Movement Execution Method, Variation in External Condition Method, Combination of Movement Method, Types of Stretching Exercises.

Unit-IV: Concept of Technique, Tactics and Strategy in Sports

- Definition and Meaning of Technique, Tactics and Strategy. Purpose of Technique, Tactics and Strategy in Sports. Motor and Skill Training. in Sports, Various Phases of Skill Training.
- Tactical Training in different Sports.
- Strategic plan for Competition.

Unit-V: Training Plan

- Training Plan: Macro Cycle, Meso-Cycle and Micro cycle. Short Term Plan and Long Term Plans- Periodisation: Meaning, Single, Double and Multiple Periodisation, Preparatory Period, Competition Period and Transition Period.

References:

J.N. (1998) Scientific Principles of Coaching, New Jersey Engle Wood Cliffs, Prentice Hall Inc.

E. Klafs & Daniel, D Arnheim (1999) Modern Principles of Athletic Training St. Louis

Daniel, D. Arnheim (1991) Principles of Athletic Training, St. Luis, Mosby Year Book

David R. Mottram (1996) Drugs in Sport, School of Pharmacy, Liverpool: John Moore University

Gary, T. Moran (1997) Cross Training for Sport, Canada: Human Kinetics

Hardayal Singh (1991) Science of Sports Training, New Delhi, DVS Publications

Jensen, C.R. & Fisher A.G. (2000) Scientific Basic of Athletic Conditioning, Philadelphia

Ronald, P. Pfeiffer (1998) Concepts of Athletics Training 2nd Edition, London: Jones and Bartlett Publications

Yograj Thani (2003), Sports Training, Delhi: Sports Publications

M.P.Ed (SEMESTER-III)
Sports Biomechanics (PE-902-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

CO1. understand the science of Biomechanics in relation to human performance.

CO2. analyze various fundamental movements and understanding the relevance of analysis.

CO3. understand the body structure and apply the knowledge in analysis of movements.

Unit-I Introduction

- Basic nature and scope of the subject area- Biomechanics of sports;
- Historical development;
- Relationship with other sciences;
- Importance in teaching, coaching and research in physical education and sports science.

Unit-II Linear and angular Kinematics

- Motion – concept and characteristics; Geometrical classification of motion; Kinematic parameters for linear and angular motion; Relationship among kinematic parameters; Relation between linear and angular kinematic parameters and its implications in sports;
- Projectile motion – concept; Important parameters of projectile motion; Types of projectiles, Performance parameters of different projectiles in games and sports, Principles of projectile motion for practical application in sports.

Unit-III Linear kinetics

- Newton's laws of motion - First law, Second law and Third law; Significance and application of each law in games and sports;
- Kinetic factors – Inertia, Force, Momentum, Impulse.
- Work, Power, Energy: Work – concept, measurement and relevance in sports;
- Power – concept, measurement and relevance in sports;
- Energy – Concept, measurement and relevance in sports.

Unit IV Machine function of human body, Equilibrium and stability

Machine function of human body:

- Classifications of levers; Major functions of levers as machine, Skeletal levers – characteristics and functions;
- Pulley – Characteristics and function; Pulley function in human body;
- Wheel & Axle – Characteristics and function, Functions of Wheel & Axle in human body.

Equilibrium and Stability:

- Equilibrium – concept and conditions, Types of equilibrium –Static (Stable, Unstable and Neutral), and Dynamic;

- Stability – Concept, Factors influencing degree of stability –Physiological, Psychological and Mechanical – Area of base, Position of Cg, Weight, Frictional force etc.

Unit V Biomechanical analysis

- Concept of Biomechanical analysis and its importance in teaching and coaching;
- General outline of Biomechanical analysis
- Types of biomechanical analysis- Quantitative and qualitative
- Biomechanical analysis of fundamental movements – walking, jumping, throwing and catching,

REFERENCE:

- Deshpande S.H.(2002). Manav Kriya Vigyan – Kinesiology (Hindi Edition) Amravati :Hanuman Vyayam Prasarak Mandal.
- Hoffman S.J. Introduction to Kinesiology (Human Kinesiology publication In.2005.
- Steven Roy, & Richard Irvin. (1983). Sports Medicine. New Jersey: Prentice hall. Thomas.
- (2001). Manual of structural Kinesiology, New York: Me Graw Hill.
- Uppal A.K. Lawrence Mamta MP Kinesiology(Friends Publication India 2004)
- Uppal, A (2004), Kinesiology in Physical Education and Exercise Science, Delhi Friends publications.
- Williams M (1982) Biomechanics of Human Motion, Philadelphia; Saunders Co.
- G. Dyson – Mechanics of Athletics.
- J. W. Bunn – Scientific Principle of Coaching.
- Jerry N. Barham – Mechanical Kinesiology.
- James G Hay – Biomechanics of Sports Techniques.
- Grieve, Miller, Mirchelton, Paul& Smith – Techniques for the Analysis of Human Movement.
- Hochumth – Biomechanics of Athletics Movements.

M.P.Ed (SEMESTER-III)
HEALTH EDUCATION AND SPORTS NUTRITION (PE-903-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. understand the concept & importance and determinants of health.
 CO2. understand the changing concept of health education, need of a comprehensive health education program and approaches to health education.
 CO3. understand reasons, effects & preventive ways of substance use & abuse.
 CO4. understand typical stages of diseases, and help them understand certain communicable and non-communicable diseases.

Unit I: Health Education

- Concept, Dimensions, Spectrum and Determinants of Health
- Definition of Health, Health Education, Health Instruction, Health Supervision, Aim, objective and Principles of Health Education
- Health Service and guidance instruction in personal hygiene

Unit II: Health Problems in India

- Meaning of Communicable and Non Communicable Diseases
- Communicable Diseases (Sexually Transmitted Diseases, Tuberculosis, Malaria, Dengue and DHF, Viral Hepatitis)
- Non Communicable Diseases (Cardiovascular Diseases, Obesity, Diabetes, Stress, Accidents and Injuries)
- Malnutrition, Adulteration in food, Environmental sanitation, Population Explosion
- Objective of school health service, Role of health education in schools
- Health Services - Care of skin, Nails, Eye health service, Nutritional service, Health appraisal, Health record, Healthful school environment, first- aid and emergency care etc.

Unit III: Introduction to Sports Nutrition

- Meaning and Definition of Sports Nutrition, Role of nutrition in sports, Basic Nutrition guidelines
- Role of carbohydrates, Fat and protein during exercise.
- Hydration and Sports Performance, Supplements in Sports Nutrition,
- Special Circumstances (Vegetarian Athlete, High Altitude, Hot Environments, Cold Environments),
- Ergogenic Aids and Performance
- Role of a Sports Dietician

Unit IV: Nutrition and Weight Management

- Concept of BMI (Body mass index), Dieting versus exercise for weight control maintaining a Healthy Lifestyle, Weight management program for sporty child, Role of diet and exercise in weight management, Design diet plan and exercise schedule for weight gain and loss.

Unit V: Health Statistics and Demography

- Biostatistics: (Presentation of Statistics, variability and error, analysis and interpretation of data, sampling, sampling variations, tests of significance)
- Demography and Vital Statistics: (Demography, vital statistics, Interpretation, conclusion, recommendations)

REFERENCE:

Bucher, Charles A. "Administration of Health and Physical Education Programme".

Delbert, Oberteuffer, et. al." The School Health Education".

Ghosh, B.N. "Treaties of Hygiene and Public Health".

Hanlon, John J. "Principles of Public Health Administration" 2003.

Turner, C.E. "The School Health and Health Education".

Moss and et. At. "Health Education" (National Education Association of U.T.A.)

Nemir A. "The School Health Education" (Harber and Brothers, New York).

Nutrition Encyclopedia, edited by Delores C.S. James, The Gale Group, Inc. Boyd-Eaton S. et al (1989) The Stone Age Health Programme: Diet and Exercise as Nature Intended. Angus and Robertson.

Terras S. (1994) Stress, How Your Diet can Help: The Practical Guide to Positive Health Using Diet, Vitamins, Minerals, Herbs and Amino Acids, Thorons.

M.P.Ed (SEMESTER-III)
SPORTS MEDICINE (PE-904-E)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1.know the historical background & development of sports medicine
 CO2.know common injuries and healing process
 CO3.get acquainted with injury management of common injuries
 CO4. know various modalities & its uses

UNIT I – Introduction

- Meaning, definition and importance of Sports Medicine, Definition and Principles of therapeutic exercises. Coordination exercise, Balance training exercise, Strengthening exercise, Mobilization exercise, Gait training, Gym ball exercise Injuries: acute, sub-acute, chronic. Advantages and Disadvantages of PRICE, PRINCE therapy, Aquatic therapy.

UNIT II – Basic Rehabilitation

- Basic Rehabilitation: Strapping/Tapping: Definition, Principles Precautions Contraindications. Proprioceptive neuromuscular facilitation: Definition hold, relax, repeated contractions. Show reversal technique exercises. Isotonic, Isokinetic, isometric stretching. Definition. Types of stretching, Advantages, dangers of stretching, Manual muscle grading.

UNIT III – Spine Injuries and Exercise

- Head, Neck and Spine injuries: Causes, Presentational of Spinal anomalies, Flexion, Compression, Hyperextension, Rotation injuries. Spinal range of motion. Free hand exercises, stretching and strengthening exercise for head neck, spine. Supporting and aiding techniques and equipment for Head, Neck and Spine injuries.

UNIT IV – Upper Extremity Injuries and Exercise

- Upper Limb and Thorax Injuries: Shoulder: Sprain, Strain, Dislocation, and Strapping. Elbow: Sprain, Strain, Strapping. Wrist and Fingers: Sprain Strain, Strapping. Thorax, Rib fracture. Breathing exercises, Relaxation techniques, Free hand exercise, Stretching and strengthening exercise for shoulder, Elbow, Wrist and Hand. Supporting and aiding techniques and equipment for Upper Limb and Thorax Injuries.

UNIT V – Lower Extremity Injuries and Exercise

- Lower Limb and Abdomen Injuries: Hip: Adductor strain, Dislocation, Strapping. Knee: Sprain, Strain, Strain, Strapping. Ankle: Sprain, Strain, Strapping. Abdomen: Abdominal wall, Contusion, Abdominal muscle strain. Free exercises – Stretching and strengthening exercise for Hip, knee, ankle and Foot. Supporting and aiding techniques and equipment for Lower limb and Abdomen injures.

- *Practicals: Lab. Practical and visit to Physiotherapy Centre to observe treatment procedure of sports injuries; data collection of sports injury incidences, Visit to TV Centre etc. should be planned internally.,*

REFERENCES:

Christopher M. Norris. (1993). Sports Injuries Diagnosis and Management for Physiotherapists. East Kilbride: Thomson Litho Ltd.

James, A. Gould & George J. Davies. (1985). Physical Physical Therapy. Toronto: C.V. Mosby Company.

Morris B. Million (1984) Sports Injuries and Athletic Problem. New Delhi: Surjeet Publication.

Pande. (1998). Sports Medicine. New delhi: Khel Shitya Kendra

The Encyclopedia of Sports Medicine. (1998). The Olympic Book of Sports Medicine, Australia: Tittel Blackwell Scientific publications.

M.P.Ed (SEMESTER-III)
Physical Fitness and Wellness (PE-905- E)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to

- CO1. know various training methods in sports.
- CO2. improve overall & specific fitness.
- CO3. create database of exercises & training protocols.
- CO4. assess fitness using different techniques.

Unit I – Introduction

- Meaning and Definition of Physical fitness, components of physical Fitness, Principles of Physical Fitness
- Fitness and Conditioning (Aerobic Training, Strength Training & Drug and Athletic Training).
- Definition and Dimensions of wellness, Health as Positive Wellness, maintaining Emotional Wellness, Global Wellness (various Health Issues worldwide and their management).
- Physiological, Health and psychological benefits of Physical activity.
- Making Physical activity a priority.

Unit II – Application of fitness & Wellness

- Nutrition & Wellness
- Body Composition & Weight Management
- Endurance: Cardio respiratory & Muscular
- Flexibility, Fitness & Wellness Relationship
- Stress Management & Behaviour Modification

Unit III – Fitness & Wellness Assessment

- Measurement of Height, weight and body composition.
- Assessment of cardio respiratory fitness and health related fitness.
- Stress assessment and its management technique.
- Preparation & implementation of personal & group exercise plans
- Group exercises plan, Personal Training, Fitness & Wellness Activities for various ages and population

Unit IV – Assessment & Methods of Training

- Resistance Training for Muscular Strength and Endurance; Principles of resistance training, Safety techniques (spotting, proper body alignment, lifting techniques, spatial, awareness and proper breathing techniques).
- Weight training principles and concepts; basic resistance exercise(including free hand exercise, free weight exercise, weight machines, exercise bands and tubing, medicine balls, fit balls)
- Flexibility Training, Relaxation Techniques and Core Training. Safety techniques (stretching protocol; breathing and relaxation techniques).

Unit V – Establishment & Management of Fitness Centre

- Principles of starting a fitness centre-environment, location, policy, offer of programmes, record keeping, and public relation.
- Fitness centre membership and its types.
- Safety aspects in a fitness centre.
- Qualification and qualities for a fitness trainer.

REFERENCE:

- David K. Miller & T. Earl Allen, Fitness, A life time commitment, Surjeet Publication Delhi 1989.
- Dificore Judy, the complete guide to the postnatal fitness, A & C Black Publishers Ltd. 35 Bedford row, London 1998.
- Dr. A. K. Uppal, Physical Fitness, Friends Publication (India), 1992. W. K. Oeger & Sharon A. Hoeger, Fitness and Wellness, Morton Publishing Company, 1990.
- Elizabeth & Ken day, Sports Fitness for Women, B. T. Batsford Ltd, London, 1986.
- Emily R. Foster, Karyn Hartiger & Katherine A. Smith, Fitness Fun, Human Kinetics Publishers 2002.
- Lawrence, Debbie, Exercise to music. A & C black publisher Ltd. 37, Sohe Square, London 1999.
- Robert Malt. 90 day fitness plan, D. K. Publishing, Inc. 95, Madison Avenue, New York 2001.

M.P.Ed (SEMESTER-III)
SPORTS ENGINEERING (PE-906-E)
Total Marks- 100 (70 Theory + 30 Internal)

Unit - I Introduction to sports engineering and Technology

- Meaning of sports engineering, human motion detection and recording, human performance, assessment, equipment and facility designing and sports related instrumentation and measurement.

Unit - II Mechanics of engineering materials

- Concept of internal force, axial force, shear force, bending moment, torsion, energy method to find displacement of structure, strain energy. Biomechanics of daily and common activities –Gait, Posture, Body levers, ergonomics, Mechanical principles in movements such as lifting, walking, running, throwing, jumping, pulling, pushing etc.

Unit- III Sports Dynamics

- Introduction to Dynamics, Kinematics to particles – rectilinear and plane curvilinear motion coordinate system. Kinetics of particles – Newton’s laws of Motion, Work, Energy, Impulse and momentum.

Unit- IV Building and Maintenance:

- Sports Infrastructure- Gymnasium, Pavilion, Swimming Pool, Indoor Stadium, Outdoor Stadium, Play Park, Academic Block, Administrative Block, Research Block, Library, Sports Hostels, etc.
- Requirements: Air ventilation, Day light, Lighting arrangement, Galleries, Store rooms,
- Office, Toilet Blocks (M/F), Drinking Water, Sewage and Waste Water disposal system, Changing Rooms (M/F), Sound System (echo-free), Internal arrangement according to need and nature of activity to be performed, Corridors and Gates for free movement of people, Emergency provisions of lighting, fire and exits, Eco-friendly outer surrounding. Maintenance staff, financial consideration.
- **Building process:-** design phase (including brief documentation), construction phase functional (occupational) life, Re-evaluation, refurbish, demolish.
- **Maintenance policy,** preventive maintenance, corrective maintenance, record and register for maintenance.

Unit – V Facility life cycle costing

- Basics of theoretical analysis of cost, total life cost concepts, maintenance costs, energy cost, capital cost and taxation

Reference

Franz K. F. et. al., Editor, Routledge Handbook of Sports Technology and Engineering (Routledge, 2013)

Steve Hake, Editor, The Engineering of Sport (CRC Press, 1996)

Franz K. F. et. al., Editor The Impact of Technology on Sports II (CRC Press, 2007)

Helge N., Sports Aerodynamics (Springer Science & Business Media, 2009)

Youlin Hong, Editor Routledge Handbook of Ergonomics in Sport and Exercise (Routledge,2013)

Colin White, Projectile Dynamics in Sport: Principles and Applications

Eric C. et al., Editor Sports Facility Operations Management (Routledge, 2010)

M.P.Ed (SEMESTER-III)
Practical Courses
Track and Field Specialization Activity (PE-907-C-1)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. History of Jumping events
2. Motor skills and their development
3. Plyometric and jumping exercises
4. Organization of Athletic events and event presentation
5. Layout of field event sectors
6. World Athletic Rules Regulations and officiating in semester events.

Part B – Practicum:

1. Javelin Throw

- a. Introduction to the implement, measurement and safety measures
- b. Teaching steps of the throwing Javelin
- c. Grip. Hold, Carry, Approach
- d. Technique of Javelin Throw
- e. Release/Throw and Recovery

2. Race Walking

- a. Technique of Race Walking
- b. Identification of faults and their corrections

3. Hammer Throw

- a. Introduction to the implement, measurement and safety measures
- b. Teaching steps of the Throwing Hammer
- c. Grip, Hold, Carry, Rotation
- d. Throwing/Execution
- e. Recovery

4. Stipple Chase

- a. Introduction to Stipple Chase
- b. Events of the race
- c. Technique of Stipple Chase Hurdling

M.P.Ed (SEMESTER-III)
Practical Courses
Football Specialization Activity (PE-907-C-2)

Total Marks :100
External Marks :70
Internal Marks :30

System of play

1. Development of various formations
2. Requirements and functioning of various formations

Psychological Aspects

3. Psychological preparation and its components
4. Pep talk
5. Presence of spectator factor
6. Injury prevention and rehabilitation

M.P.Ed (SEMESTER-III)
Practical Courses
Yoga Specialization Activity (PE-907-C-3)

Total Marks :100
 Theory Marks :70
 Internal Marks:30

Part- A

1. Asanas (Meaning, Definitions, aim and objectives, chareteristics, classification)
2. Differences between Asanas and Physical Exercises.
3. Pranayama
4. Prayer

Part- B

1. Viparitararani
2. Karnapidasana
3. Majari Asana
4. Uttan Mondukasana
5. Simhasana
6. Utkatasana
7. Virasana
8. Samasana
9. Siddhasana
10. ushtrasana
11. Mayurasana
12. Padangustasana
13. Chakrasana
14. Bakasana
15. Kurmasana
16. Hanumanasana
17. Virabhadrasana
18. Shitali Pranayama
19. Sitkari Pranayama
20. Bhramari Pranayama
21. Bhatrika Pranayama
22. Nauli
23. Jalkapalbhati
24. Danda Dhauti
25. Vastra Dhauti

References:

1. "A Text Book on Yoga and Health" – Dr. Sanjib Kumar Bhowmik (Sports Publication, New Delhi)
2. "Asanas" – Swami Kuvalayaananda (Published by Kaivalyadhama, Lonavla).

3. “Pranayama” – Swami Kuvalayaananda (Published by Kaivalyadhama, Lonavla).
4. “Asanas” – Swami Kuvalayaananda (Published by Kaivalyadhama, Lonavla).
5. “Asana Why & How”- O.P. Tiwari (Published by Kaivalyadhama, Lonavla)
6. “Anatomy and Physiology of Yogic Practices” by Dr. M.M. Gore,

M.P.Ed (SEMESTER-III)
Practical Courses
Basketball Specialization Activity (PE-907-C-4)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. Rules & Regulations of 10 – rest
2. Aims & objectives of tactics.
3. Offensive tactics & defensive tactics (individual 7 group)
4. Methods of tactical training (break up drills)
5. Coaching philosophy.
6. Coaching ethics.

Part B – Practicum:

1. Performing tactical skills
 - a. Individual tactics
 - b. Group tactics
 - c. Team tactics
2. Identification of faults & corrective measures.
3. Performing game with different tactics & information.

M.P.Ed (SEMESTER-III)
Practical Courses
Football - Advance Activity (PE-908-C-1)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

13. Dimensions and layout of Football playing area
14. Rules and Regulations of Game
15. Officiating of Football game

Part B – Practicum

13. Fundamental skills /Techniques of Football game
14. Different teaching stages of different skills/techniques
(Stance, execution & follow through)
15. Identification of faults and corrective measures
16. Basic playing ability practices.
17. 5 Nos. Of Teaching and Coaching Lesson plan.

M.P.Ed (SEMESTER-III)
Practical Courses
Track and Field-Advance Activity (PE-908-C-2)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. Proper TRACK Marking (200 Mtr. & 400 Mtr.)
2. Rules and Regulations of Sports
3. Officiating / Judging of the sports

Part B – Practicum

1. Running, Throwing and Jumping events
2. Different teaching stages of different skills/techniques
(Stance, execution & follow through)
3. Identification of faults and corrective measures
4. 5 Nos. Of Teaching and Coaching Lesson plan.

M.P.Ed (SEMESTER-III)
Practical Courses
Handball - Advance Activity (PE-908-C-3)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. Dimensions and layout of Handball playing area
2. Rules and Regulations of Game
3. Officiating of the game

Part B – Practicum

1. Fundamental skills /Techniques of Handball game
2. Different teaching stages of different skills/techniques
(Stance, execution & follow through)
3. Identification of faults and corrective measures
4. Basic playing ability practices.
5. 5 Nos. Of Teaching and Coaching Lesson plan.

Semester – IV

Part A: Theoretical Course						
Paper Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Part A: Core Course						
PE-1001-C	Information & Communication Technology in Physical Education	4	4	30	70	100
PE-1002-C	Sports Psychology	4	4	30	70	100
PE-1003-C	Adapted Physical Education	4	4	30	70	100
Elective Course (Anyone)						
PE-1004-E	Value and Environmental Education	4	4	30	70	100
PE-1005-E	Education Technology in Physical Education					
PE-1006-E	Dissertation					
Part-B: Practical Course						
PE-1007-C	Specialization Activity 1. Track & Field 2. Football 3. Yoga 4. Basketball 5. Volleyball (*Any one)	6	4	30	70	100
PE-1008-C	Advance Games Activity- Boxing/ Taekwondo/ Archery (any One)	6	4	30	70	100
PE-1009-C	Coaching & Officiating Lessons of Specialization Activity -5 Lessons (4 Internal & 1 External)	6	4	30	70	100
PE-1010-C	Teaching & Coaching Lessons of Advance Game Activity - 5 Lessons (4 Internal & 1 External)	6	4	30	70	100
Total		40	32	240	560	800
		160	128	960	2240	3200

M.P.Ed (SEMESTER-IV)
INFORMATION & COMMUNICATION TECHNOLOGY IN PHYSICAL EDUCATION (PE-1001-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to

- CO1. Understand the various applications of computer skills.
 CO2. Give the different barriers in communication and will help students to sort out the gap Communication.
 CO3. Understand the utilities of various MS Office applications in related to Physical Education
 CO4. Understand E-based communication, virtual classes in teaching and learning process

Unit I – Communication & Classroom Interaction Concept,

- Elements, Process & Types of Communication
- Communication Barriers & Facilitators of communication
- Communicative skills of English - Listening, Speaking, Reading & Writing
- Concept & Importance of ICT Need of ICT in Physical Education
- Scope of ICT: Teaching Learning Process, Publication Evaluation, Research and Administration
- Challenges in Integrating ICT in Physical Education

Unit II – Fundamentals of Computers

- Characteristics, Types & Applications of Computers Hardware of Computer: Input, Output & Storage Devices Software of Computer: Concept & Types
- Computer Memory: Concept & Types
- Viruses & its Management
- Concept, Types & Functions of Computer Networks Internet and its Applications
- Web Browsers & Search Engines Legal & Ethical Issues

Unit III – MS Office Applications

- MS Word: Main Features & its Uses in Physical Education
- MS Excel: Main Features & its Applications in Physical Education
- MS Access: Creating a Database, Creating a Table, Queries, Forms & Reports on Tables and its Uses in Physical Education
- MS Power Point: Preparation of Slides with Multimedia Effects
- MS Publisher: Newsletter & Brochure

Unit IV – ICT Integration in Teaching Learning Process:

- Approaches to Integrating ICT in Teaching Learning Process, Project Based Learning (PBL) , Co-Operative Learning , Collaborative Learning , ICT and Constructivism: A Pedagogical Dimension

Unit V – E-Learning & Web Based Learning

- E-Learning, Web Portals/ Online learning, Visual (Virtual) Classroom, E-Library
- Introduction to MOOC'S (Massive open online course) and OER'S (Open Educational Resources)

REFERENCES:

B. Ram, New Age International Publication, Computer Fundamental, Third Edition-2006

Brain under IDG Book. India (p) Ltd Teach Yourself Office 2000, Fourth Edition-2001
Douglas E. Comer, The Internet Book, Purdue University, West Lafayette in 2005
Heidi Steel Low price Edition, Microsoft Office Word 2003- 2004
ITL Education Solution Ltd. Introduction to information Technology, Research and
Development Wing-2006
Pradeep K. Sinha & Priti; Sinha, Foundations computing BPB Publications -2006.

M.P.Ed (SEMESTER-IV)
SPORTS PSYCHOLOGY (PE-1002-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to

- CO1. get acquainted with the meaning, nature and scope of sports Psychology.
- CO2. know & prepare psychological profiles of sportsmen.
- CO3. understand the role of sports psychology in the performance.
- CO4. know various psychological problems and its coping techniques for better sports performance.
- CO5. know the role of leaders, counselors, and social psyche in the performance enhancement.
- CO6. know about Psychological Tests and be able to conduct these tests on subjects.

UNIT I - Introduction

- Definition, Need, Scope and Importance of Sports Psychology.
- Relationship of sports psychology with other sports sciences & Role of sports psychologists.
- Sensation, perception, memory, information processing, decision making, thought process.
- Attention, types of attention and role of attention in sports.
- Meaning and definition of Motor Learning, stages of motor learning and plateau effect.

UNIT II - Motivation

- Meaning and Definition, Types of Motivation,
- Theories of motivation, Measurement of motivation, Techniques of developing motivation, Motivation performance relationship.
- Meaning and Definition, Nature, Causes and types of anxiety, Method of Measuring Anxiety, Management of anxiety.
- Meaning, Definition, Causes, types and management of Stress and Sports Performance.
- Meaning, Definition and types of aggression, management and measurement of aggression and Sports Performance

UNIT III – Goal Setting , PST & Psychometry

- Meaning and Definition of Goal Setting, Types of goals and their effectiveness, principles of goal setting.
- Importance of psychological skill training programme.
- Cognitive behavioral techniques (Imagery, VMBR, Mental Practice/ Rehearsal)
- Relaxation techniques (PMR, Bio-feedback, Hypnosis, etc), Activation Techniques.
- Measurement and assessment limitations in sports and exercise psychology.

UNIT IV – Leadership and Group Dynamics

- Leadership: Meaning, Definition, types of Leadership and Sports Performance,
- Coach- athlete relationship issues.
- Definition and Meaning of Group Cohesion, Group dynamics: Group Size, Groups Composition, Group Cohesion, Group Interaction,
- Role of team cohesion in team sports.

UNIT V – Personality and Socio- psychological Issues in Modern sports

- Definition & meaning and characteristics of personality,
- Measuring Personality Traits, Effects of Personality on Sports Performance.
- Gender inequalities in Sports and role conflict
- Types of spectator and their effect on sports performance.
- Sports burnout and exercise addiction.

Practicals:

- Use of Psychological test apparatus-Depth Perception, Mirror Drawing apparatus, reaction time apparatus
- Steadiness test, use of Finger dexterity board
- Use of various inventory and questionnaires (Motivation/Anxiety/Self esteem/ Emotion etc.)

REFERENCES:

- Authors Guide (2013) National Library of Educational and Psychological Test (NLEPT) Catalogue of Tests, New Delhi: National Council of Educational Research and Training Publication.
- Authors Guide (2013) National Library of Educational and Psychological Test (NLEPT) Catalogue of Test, New Delhi: National Council of Educational Research and Training Publication.
- Jain. (2002), Sports Sociology, Heal Sahety Kendre Publishers.
- Jay Coakley. (2001) Sports in Society – Issues and Controversies in International Education, Mc-Craw Seventh Ed.
- John D Lauther (2000) Psychology of Coaching. Ner Jersy: Prenticce Hall Inc.
- John D. Lauther (1998) Sports Psychology. Englewood, Prentice Hall Inc.
- Miroslaw Vauks & Bryant Cratty (1999). Psychology and the Superior Athlete. London: The Macmillan Co.
- Richard, J. Crisp. (2000). Essential Social Psychology. Sage Publications.
- Robert N. Singer (2001). Motor Learning and Human Performance. New York: The Macmillan Co.
- Robert N. Singer. (1989) The Psychology Domain Movement Behaviour. Philadelphia: Lea and Febiger.
- Thelma Horn. (2002). Advances in Sports Psychology. Human Kinetic.
- Whiting, K, Karman, Hendry L.B & Jones M.G. (1999) Personality and Performance in Physical Education and Sports. London: Hendry Kimpton Publishers.

M.P.Ed (SEMESTER-IV)
Adapted Physical Education (PE-1003-C)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

CO1. understand the meaning, need and importance of Adapted Physical Education

CO2. know the purpose, aims and objectives of Adapted Physical Education

CO3. understand the Test, Measurement and Evaluation in Adapted Physical Education

CO4. develop the Individual Education Program of Adapted Physical Education

CO5. understand the Motor & HRPF development of individual with disability

CO6. understand the role of games and sports in Adapted Physical Education

UNIT-I : Introduction to Adapted Physical Education

- Meaning, Definition, Scope, Aim and Objective of Adapted Physical Education
- The guiding principles of Adapted Physical Education
- The policies for Adapted Physical Education
- Functions of Adapted Physical Education teachers.

UNIT-II : The Adapted Programme in Action

- The Adapted programme for elementary school, high/secondary schools, college and universities
- Sensitization programme
- Latest facilities provided

Unit – III: Humanism and Adapted Physical Education :

- Humanistic theory, Self-actualization theory, Expectancy theory, Attribution theory, Social Learning theory
- Problems confronting disabled person
- Adjustment problems of the disabled and Mainstreaming

UNIT-IV: Classification of Disability

(A) Physical Disabilities

- Causes
- Characteristics
- Functional Limitations

(B) Mental Retardation

- Causes
- Characteristics
- Functional Limitations

(C) Visual Impairment

- Causes

- Characteristics
- Functional Limitations

(D) Hearing Impairment

- Causes
- Characteristics
- Functional Limitations

(E) Behavioral Disorders

- Adjustment problems
- Personality disorder

UNIT-V: Recreation and Rehabilitation program for disabled

- Paralympics Games
- Special Olympics
- Recreation for the Handicapped
- Special Physical Education programme for blind, deaf and mentally retarded children
- Neurological disabilities- Poliomyelitis and Cerebral Palsy.

Rehabilitation

- Aims and Objectives of rehabilitation council of India
- Meaning of functional and occupational rehabilitation
- Importance of Adapted programme in rehabilitation
- Functional rehabilitations
- Psychological rehabilitation- Adjust mental, Environmental and Personality Development.

References:

- Walter C. Crowe, David Auxter and Jean Pyfer, Principles and Methods of Adapted Physical Education and Recreation London : C.V. Mosby Comp.
- Holies F. Fair and John M. Dunn, Special Physical Education Philadelphia: Saunders College Publishing.
- C. Sherrill, Adapted Physical Activity, Recreation and Sport, Bown Pub.
- J.P. Winnick, Adapted Physical Education and Sport Champaign; Human Kinetics.
- H.H.Clark, Development and Adapted Physical Education, Englewood, Prentice Hall 1964.
- D.H.Clark,A.S.Daniels, Adapted Physical Education, New York Harpers & Brothers 1972.
- V.V.Hunt, Recreation for the Handicapped, Prentice Hall inc. 1974

M.P.Ed (SEMESTER-IV)
VALUE AND ENVIRONMENTAL EDUCATION (PE-1004-E)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. inculcate values in to their daily routines
- CO2. judge values and commitment to values.
- CO3. know about environmental studies
- CO4. make sustainable use of natural resources and use products which are environmentally recommended
- CO5. know the status of Sanitation, urban & rural health and will keep themselves and their surroundings clean and healthy
- CO6. know about govt. policies for management of Pollution.

UNIT I – Introduction to Value Education

- Values: Meaning, Definition, Concepts of Values.
- Value Education: Need, Importance and Objectives.
- Moral Values: Need and Theories of Values.
- Classification of Values: Basic Values of Religion, Classification of Values.

UNIT II – Value Systems

- Meaning and Definition, Personal and Communal Values,
- Consistency, Internally consistent, internally inconsistent,
- Judging Value System,
- Commitment, Commitment to values.

Unit- III – Environmental Education

- Definition, Scope, Need and Importance of environmental studies.,
- Concept of environmental education,
- Historical background of environmental education,
- Celebration of various days in relation with environment,
- Plastic recycling & prohibition of plastic bag / cover,
- Role of school in environmental conservation and sustainable development, Pollution free ecosystem.

Unit - IV Rural Sanitation and Urban Health

- Rural Health Problems, Causes of Rural Health Problems, Points to be kept in Mind for improvement of Rural Sanitation,
- Urban Health Problems, Process of Urban Health, Services of Urban Area, Suggested Education Activity, Services on Urban Slum Area,
- Sanitation at Fairs & Festivals, Mass Education.

Unit - V Natural Resources and related environmental issues

- Water resources, food resources and Land resources,
- Definition, effects and control measures of: Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Thermal Pollution
- Management of environment and Govt. policies,
- Role of pollution control board.

REFERENCE:

Miller T.G. Jr., Environmental Science (Wadsworth Publishing Co.)

Odum, E.P. Fundamentals of Ecology (U.S.A.: W.B. Saunders Co.) 1971.

Rao, M.N. & Datta, A.K. Waste Water Treatment (Oxford & IBH Publication Co. Pvt. Ltd.) 1987

Townsend C. and others, Essentials of Ecology (Black well Science)

Heywood, V.H. and Watson V.M., Global biodiversity Assessment (U.K.: Cambridge University Press), 1995.

Jadhav, H. and Bhosale, V.M. Environmental Protection and Laws (Delhi: Himalaya Pub. House), 1995.

Mc Kinney, M.L. and Schoel, R.M. Environmental Science System and Solution (Web enhanced Ed.) 1996.

Miller T.G. Jr., Environmental Science (Wadsworth Publishing Co.)

M.P.Ed (SEMESTER-IV)
EDUCATION TECHNOLOGY IN PHYSICAL EDUCATION AND SPORTS (PE-1005-E)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. know about different technological concepts and types
- CO2. use technology to its fullest potential.
- CO3. use technology for better communication in instructional system.
- CO4. know and use different audio-visual media in physical education
- CO5. know about new technological advancements in educational setting and their uses.

Unit I – Nature and Scope

- Educational technology-concept, Nature and Scope. Forms of educational technology: teaching technology, instructional technology, and behavior technology
- Transactional usage of educational technology: integrated, complementary, supplementary stand-alone (independent); programmed learning stage; media application stage and computer application stage.

Unit II – Systems Approach to Physical Education and Communication

- Systems Approach to Education and its Components: Goal Setting, Task Analysis, Content Analysis, Context Analysis and Evaluation Strategies
- Instructional Strategies and Media for Instruction. Effectiveness of Communication in instructional system; Communication Modes, Barriers and Process of Communication.

Unit III- Instructional Design

- Instructional Design: Concept, Views. Process and stages of Development of Instructional Design. Overview of Models of Instructional Design; Instructional Design for Competency Based Teaching: Models for Development of Self Learning Material.

Unit IV – Audio Visual Media in Physical Education

- Audio-visual media - meaning, importance and various forms Audio/Radio: Broadcast and audio recordings - strengths and Limitations, criteria for selection of instructional units, script writing, pre-production, post-production process and practices, Audio Conferencing and Interactive Radio Conference.
- Video/Educational Television: Telecast and Video recordings Strengths and limitations, Use of Television and CCTV in instruction and Training, Video Conferencing, SITE experiment, countrywide classroom project and Satellite based instructions. Use of animation films for the development of children's imagination.

Unit V – New Horizons of Educational Technology

- Recent innovations in the area of ET interactive video - Hypertext, video-texts, optical fiber technology - laser disk, computer conferencing. etc. Procedure and organization of Teleconferencing/Interactive video-experiences of institutions, schools and universities.

- Recent experiments in the third world countries and pointers for, India with reference to Physical education. Recent trends of Research in Educational Technology and its future with reference to education.

REFERENCE:

Amita Bhardwaj, New Media of Educational Planning". Sarup of Sons, New Delhi-2003
Bhatia and Bhatia. The Principles and Methods of Teaching (New Delhi : Doaba House), 1959.

Communication and Education, D. N. Dasgupta, Pointer Publishers

Education and Communication for development, O. P. Dahama, O. P. Bhatnagar, Oxford Page 68 of 71 IBH Publishing company, New Delhi

Essentials of Educational Technology, Madan Lal, Anmol Publications

K. Sampath, A. Pannirselvam and S. Santhanam. Introduction to Educational Technology (New Delhi: Sterling Publishers Pvt. Ltd.) : 1981.

Kochar, S.K. Methods and Techniques of Teaching (New Delhi, Jalandhar, Sterling Publishers Pvt. Ltd.), 1982

Kozman, Cassidy and Jackson. Methods in Physical Education (W.B. Saunders Company, Philadelphia and London), 1952.

M.P.Ed (SEMESTER-IV)
DISSERTATION (PE-1006-E)
Total Marks- 100 (70 Theory + 30 Internal)

Course outcomes: At the end of the course student will be able to-

- CO1. develop Research attitude among the students
- CO2. formulate the Research problem and carry out the Research
- CO3. develop and administer the tools for data collection
- CO4. organize and present the research work

- A candidate shall have dissertation for M.P.Ed. – IV Semester and must submit his/her Synopsis and get it approved by the Head of Department on the recommendation of D.R.C. (Departmental Research Committee).
- A candidate selecting dissertation must submit his/her dissertation not less than one week before the beginning of the IV Semester Examination.
- The candidate has to face the Viva-Voce conducted by DRC.

M.P.Ed (SEMESTER-IV)
Practical Courses
Track and Field Specialization Activity (PE-1007-C-1)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. History of Throwing events
2. Mechanics of Throwing, Jumping and Running
3. World Athletics Rules Regulations and Officiating in semester practicum events.

Part B – Practicum:

1. High Jump

- a. Measurement and technical rules
- b. Approach
- c. Scissor Technique
- d. Straddle Technique
- e. Fosbury Flop Technique
- f. Landing and Leaving the mat

2. Hurdles

- a. Introduction to the Hurdles with all measurements
- b. Hurdling Drills
- c. Running over the hurdles

3. Combined Events

- a. Decathlon
- b. Heptathlon

4. Pole Vault

- a. Introduction to Pole Vault
- b. Measurements and Technical rules of Pole Vault
- c. Technique of Pole Vault

M.P.Ed (SEMESTER-IV)
Practical Courses
Football Specialization Activity (PE-1007-C-2)

Total Marks :100
External Marks :70
Internal Marks :30

Competition

1. Preparation including build up competition, with specific task
2. Team preparation – Physical & Mental

Special features of training in women

3. Anatomical & Physiological differences
4. Psychological differences

Video reading analysis of Training Sessions and Match Performances

Gathering video information –

5. To understand the own mistake
6. To motivate perform better
7. Development of Grass Root Football

M.P.Ed (SEMESTER-IV)
Practical Courses
Yoga Specialization Activity (PE-1007-C-3)

Total Marks :100
 External Marks :70
 Internal Marks :30

Part – A

1. Yogic Diet (Concept of Ahara in Indian perspective, concept of Mitahara)
2. Awareness of Yoga Therapy (Applications, Indications, Contra-indications and limitations)
3. Yogic Management of Health Problems (Back ace, Obesity, Diabetes, Stress)

Part – B

1. Shirshasana
2. Natarajsana
3. Garudasana
4. Padma Bakasana
5. Poorna Matsyendrasana
6. Eka Pada Sirasana
7. Kapotasana
8. Kukkutasana
9. Uttan Kurmasana
10. Vatayansana
11. Bhumasana
12. Padma Mayurasana
13. Poorna Bhujangasana
14. Poorna Dhanurasana
15. Vrischikasana
16. Yogic Practices for the Eyes (Palming, Sideways Viewing, Front and Sideways Viewing, Up and down viewing, Rotational Viewing and Preliminary Nasikagra Dristi)
17. Trataka
18. Yoga Nidra
19. Meditation (Demonstrated ability to perform meditation; knowledge of the environment for meditation)

References:

1. “A Text Book on Yoga and Health” – Dr. Sanjib Kumar Bhowmik (Sports Publication, New Delhi).
2. “Asana Pranayama Mudra Bandha”- Swami Satyananda Saraswati (Yoga Publication Trust, Munger, Bihar).
3. “Asanas” – Swami Kuvalayaananda (Published by Kaivalyadhama, Lonavla).
4. “Pranayama” – Swami Kuvalayaananda (Published by Kaivalyadhama, Lonavla)

M.P.Ed (SEMESTER-IV)
Practical Courses
Basketball Specialization Activity (PE-1007-C-4)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

1. Official duties & powers (floor & table officials)
2. Official signs & signals
3. Mechanism of officiating skill & technique
4. 2 – men and 3 – men official techniques

Part B – Practicum:

1. Perform 2 – men official techniques in game situation.
2. Perform 3 – men official techniques in game situation.
3. Perform table official duties in game situation.

M.P.Ed (SEMESTER-IV)
Practical Courses
Boxing Advance Activity (PE-1008-C-1)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

- Dimensions and layout of Boxing playing area
- Rules and Regulations of Game
- Officiating of the game

Part B – Practicum

- Fundamental skills /Techniques of Boxing game
- Different teaching stages of different skills/techniques
- (Stance, execution)
- Identification of faults and corrective measures
- Basic playing ability practices.
- 5 Nos. Of Teaching and Coaching Lesson plan.

M.P.Ed (SEMESTER-IV)
Practical Courses
Taekwondo - Advance Activity (PE-1008-C-2)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

- Dimensions and layout of Taekwondo playing area
- Rules and Regulations of Game
- Officiating of the game

Part B – Practicum

- Fundamental skills /Techniques of Taekwondo game
- Different teaching stages of different skills/techniques
- (Stance, execution)
- Identification of faults and corrective measures
- Basic playing ability practices.
- 5 Nos. Of Teaching and Coaching Lesson plan.

M.P.Ed (SEMESTER-IV)
Practical Courses
Archery - Advance Activity (PE-1008-C-3)

Total Marks :100
External Marks :70
Internal Marks :30

Part A – Theory:

- Dimensions and layout of Archery playing area
- Rules and Regulations of Game
- Officiating of the game

Part B – Practicum

- Fundamental skills /Techniques of Archery game
- Different teaching stages of different skills/techniques
- (Stance, execution)
- Identification of faults and corrective measures
- Basic playing ability practices.
- 5 Nos. Of Teaching and Coaching Lesson plan.



TRIPURA UNIVERSITY

(A CENTRAL UNIVERSITY)

Suryamaninagar-799022, Tripura

**SYLLABUS OF M.A.
IN
LINGUISTICS AND TRIBAL LANGUAGES**

**DEPARTMENT OF LINGUISTICS & TRIBAL LANGUAGES
FACULTY OF ARTS AND COMMERCE
TRIPURA UNIVERSITY
SURYAMANINAGAR
TRIPURA-799022**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The goal of the M.A. programme is to enable students to have a fundamental understanding of the basic nature, branches and history of language and to promote linguistic inquiry. It also aims to enable the students to understand and use methods of logical analysis in analyzing data from a wide variety of languages and dialects. The students who complete M.A. programme are expected to accomplish the following objectives:	
PEO1	Grasp the complexity of language as a communication system shaped by cognitive, biological, cultural, and social factors.
PEO2	Understand the concepts and theories of linguistic structure, and patterns of language use.
PEO3	Understand the processes of language change and variation, the role of language in reflecting and constructing social identities, and the distinctive properties of human language.
PEO4	Are able to collect, organize and analyze linguistic data from diverse languages, to form hypotheses about language structure/use and to test those hypotheses against new data.
PEO5	Are ready for significant scholarly participation in the field of linguistics.
PEO6	Lexicographers, translators, research associate of language documentation and research, Language analyst, psycholinguist, engineers in NLP, Forensic linguist and Accent trainer.
PEO7	Writing and editing jobs at Mass media, professional and technical communications, Machine Learning Engineer, Computational Linguist and Data Scientist.
PEO8	Broadcaster, News Reader, Interpreter, Language editors, Copy writer and Content writer.
PEO9	Language editing and processing in Digital Humanities.
PEO10	Higher Studies and Research at Indian and Foreign Universities.

PROGRAMME OUTCOMES (POs)

On successful completion of the M.A. programme	
PO1	Students will gain an advanced knowledge of the core areas of linguistics, such as phonetics, phonology, morphology, syntax, semantics and sociolinguistics; applied linguistics, such as translation, lexicography and language teaching etc.
PO2	Grasp the complexity of language as a communication system shaped by cognitive, biological, cultural, and social factors.
PO3	Understand the concepts and theories of linguistic structure, and patterns of language use.
PO4	Understand the processes of language change and variation, the role of language in reflecting and constructing social identities, and the distinctive properties of human language.
PO5	Students can apply their linguistic knowledge to enhance their writing activities and also to improve their understanding on psycho-socio skills in inter and intra lingual communicative contexts.
PO6	Integrate relevant knowledge to establish a foundation for advanced researches in indigenous languages and people.
PO7	Students can employ their linguistic knowledge and skills in teaching, training and linguistics researches at further studies.
PO8	Understand the technical vocabulary and theoretical tools of the field, necessary to read published linguistic research.
PO9	Develop awareness of the nature of language and its role in human society.
PO10	Apply knowledge and understanding of linguistic diversity and variability within and across societies.

CURRICULUM STRUCTURE

M.A. in LINGUISTICS AND TRIBAL LANGUAGES

Total Core (C) Credits:68, Total Elective (E) Credits:12, Total Credits: 80

FIRST (1st) SEMESTER: 500 Marks (5 Core Courses = 20 Credits)								
Sl No	Course Code	Name of Course	Credit Distribution			Total credit	Marks	Remarks
			L	T	P			
1	LTL 701C	Introduction to Linguistics	4	0	0	4	100	Core Course
2	LTL 702C	Phonetics and Phonology	4	0	0	4	100	Core Course
3	LTL 703C	Morphology	4	0	0	4	100	Core Course
4	LTL 704C	Syntax I	4	0	0	4	100	Core Course
5	LTL 705C	Languages of North East India	4	0	0	4	100	Core Course
SUB TOTAL			20	0	0	20	500	
SECOND (2nd) SEMESTER: Marks: 600 (CC = 16 Credits; EC = 4 Credits)								
6	LTL 801C	Semantics	4	0	0	4	100	Core Course
7	LTL 802C	Sociolinguistics	4	0	0	4	100	Core Course
8	LTL 803C	Historical Linguistics	4	0	0	4	100	Core Course
9	LTL 804C	Translation	4	0	0	4	100	Core Course
10	LTL 805E	Language and Society	4	0	0	4	100	Elective Course
SUB TOTAL			20	0	0	20	500	
THIRD (3rd) SEMESTER: 500 Marks (CC = 16 Credits; EC = 4 Credits)								
12	LTL 901C	Generative Phonology	4	0	0	4	100	Core Course
13	LTL 902C	Syntax II	4	0	0	4	100	Core Course
14	LTL 903C	Lexicography	4	0	0	4	100	Core Course
15	LTL 904C	Psycholinguistics	4	0	0	4	100	Core Course
13	LTL 905E	Analysis of Endangered Languages	4	0	0	4	100	Elective Course
SUB TOTAL			20	0	0	20	500	
FOURTH (4th) SEMESTER: 500 Marks (CC = 16 Credits; EC=4 Credits)								

14	LTL 1001C	Language Typology and Linguistic Universals	4	0	0	4	100	Core Course
15	LTL 1002C	Structure of Tibeto-Burman Languages	4	0	0	4	100	Core Course
16	LTL 1003C	Field Linguistics	4	0	0	4	100	Core Course
17	LTL 1004C	Dissertation	4	0	0	4	100	Core Course
18	LTL 1005E	A Foundation Course in Phonetics	4	0	0	4	100	Elective Course
SUB TOTAL			20	0	0	20	500	
AGGREGATE (Entire Duration of M.A.)			80	0	0	80	2000	

*L-Lecture hrs/week; T-Tutorial hrs/week; P-Project/Practical/Lab/All other non-classroom academic activities, etc. hrs/week; CC- Core Credit Points; EC- Elective Credit Points

MARKS DISTRIBUTION				Total Marks
Paper	Internal Marks		External Marks	
Papers (all semesters)	10 (assignment)	20 (class tests, paper presentation, etc.)	70 (semester Examination)	100 (30-Internal + 70- Semester exam)
Dissertation / Project Report (IV Semester)	30 Dissertation Presentation		70 Dissertation/Project Record	100 (30-presentation + 70 Dissertation/Project Record)

LEARNING OUTCOMES

M.A 1st Semester

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL701C	Introduction to Linguistics	4	0	0	4	100

At the end of the course student will be able to:

1. Understand general concepts of linguistics
2. Gain understanding of different levels of language structure
3. To be acquainted with different approaches to define language
4. Gain knowledge of history of linguistics
5. Learn the relationship between linguistics and other disciplines

Course contents:

Language and Communication

Definition and origin of language; features of language; language and communication; human and non-human communication; language, mind and society; written and spoken language; writing systems; language and dialect; branches of linguistics; scope of linguistics; linguistics as a science

Study of Language

Approaches to the study of language: prescriptive and descriptive approaches, synchronic and diachronic approaches, syntagmatic and paradigmatic relations; language, langue and parole, competence and performance, substance and form

History of Linguistics

History of linguistics - pre-structuralist period: old Babylonian, Greek, Indian, Hebrew, Arabic, later European - structuralist period: European and American structuralism - poststructuralist period: Chomskyan and post-Chomskyan approaches

Linguistics and other Disciplines

Linguistics and related disciplines- anthropology, computer science, education, literature, philosophy, political science, psychology, sociology, neuro-science

Recommended Books:

Abbi, Anvita, 1996. *Languages of Tribal and Indigenous Peoples of India: The Ethnic space*, Motilal Banarsidass Publishers, New Delhi.

Aarts, B., and McMahon, A., (ed.), 2006. *The Handbook of English Linguistics*, Blackwell Publishing Ltd., USA.

Asher, R. (ed.), 1994. *Encyclopedia of Language and Linguistics*, Elsevier-Pargamon.

Bloomfield. L., 1933. *Language*, New York, Henry Holt. (Indian Edition, Delhi: Motilal).

Crystal, D., 2008. *A Dictionary of Linguistics and Phonetics*, Blackwell Publishing Ltd., USA.

Fasold, R. & J. Connor-Linton, 2006. *An introduction to language and linguistics*, Cambridge: Cambridge University Press.

Fromkin, V., and R. Rodman, 1974. *An Introduction to Language*. New York: Holt, Rinehart and Winston, (2nd Edition).

Hockett, C.F. 2006. *A course in Modern Linguistics*, Surjeet Publication, New Delhi.

Lyons, J., 1968. *Introduction to Theoretical Linguistics*, Cambridge (UK): Cambridge University Press.

Miri, Mrinal, (ed.), 2003. *Linguistics Situation in North-East India*, Concept Publishing Company: New Delhi.

Mishra, AK, Melissa Wahlang & Ch. Sarajubala (eds), 2013. *Studies in Linguistics of North-Eastern Languages*, New Delhi: Laklshi Publishers & Distributors.

Col. Ved Prakash, 2006. *Encyclopaedia of North-East India*, Atlantic: New Delhi.

Radford, A., Atkinson, M., Britain, D., and Spencer, 2009. A., *Linguistics: An Introduction*, Cambridge University Press, New York.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL702C	Phonetics and Phonology	4	0	0	4	100

At the end of the course student will be able to:

1. Comprehend the central concepts in phonetics and phonology
2. Understand how sounds are produced, how they are transmitted, and how they are perceived (Phonetics)
3. Recognise the sounds of the IPA chart and the parameters along which sounds can vary
4. Describe sounds using appropriate terminology and symbolisation
5. Know the structure of the syllable and suprasegmental features
6. Establish phonological categories on the basis of contrast
7. Identify phonological process and formulate a rule

Course contents:

Anatomy and Physiology of Speech Production

Approaches to phonetics: articulatory, acoustic and auditory phonetics; speech organs and their function; airstream mechanisms, phonation, oral-nasal process; articulators and basic terms related to articulation

Classification of Speech Sounds

Vowels: articulatory classification and description; cardinal vowel system; semi-vowels; consonants: articulatory classification and description; complex articulations; transcription: IPA sounds and symbols; broad and narrow transcription

Prosody and Suprasegmental Features

Syllables and syllable division; syllable structure; maximal onset principle (MOP), sonority hierarchy; accent, stress, rhythm, pitch, tone, intonation

Phonemic Organization and Phonological Approach

Phone, phoneme, allophone; principles of phonemic analysis; distinctive features; approaches to phonology: structuralist phonology, generative phonology, autosegmental phonology; phonological alternations, processes and rules.

Recommended Books:

1. Abercrombie, D. 1967. *Elements of General Phonetics*. Edinburgh: Edinburgh University.
2. Catford, J.C. 1988. *A Practical Introduction to Phonetics*. Oxford: Oxford University Press.
3. Chomsky, N. & Halle, M. 1986. *The Sound Pattern of English*, New York: Harper and Row.
4. Clark, J. & Yallop, C. 1990. *An Introduction to Phonetics and Phonology*. Oxford, Basil Blackwell.
5. Hyman, Larry M. 1975. *Phonology: Theory and analysis*. N.Y.: Holt Rinehart and Winston.
6. Katamba, F. 1989. *An Introduction to Phonology*. Longman Group UK Limited.
7. Ladefoged, P. 2011. *A Course in Phonetics*. Keith Johnson University of California, Berkeley.
8. Ladefoged, P. 2001. *Vowels and consonants: An Introduction to the Sounds of the Languages of the World*. Oxford: Blackwell.
9. Ladefoged, P & Maddieson, I. 1996. *The Sounds of the World's Languages*. Oxford: Blackwell.
10. Lieberman, P. & Blumstein, S. 1988. *Speech Physiology, Speech Perception and Acoustic Phonetics*. Cambridge: Cambridge University Press.
11. Ogden, R. 2009. *An Introduction to English Phonetics*. Edinburgh University Press.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL703C	Morphology	4	0	0	4	100

At the end of the course student will be able to:

1. Gain knowledge of the internal structure of words
2. Analyse the meaningful unit(s) of words
3. Understand morphological theories
4. Understand the word structure of their own language
5. Compare word structures among TB languages
6. Apply theoretical concepts to other language
7. Develop the performance and solve problems

Course contents:

Morphemic analysis

Morphemes, morphs, allomorphs; Classification of morphemes: free, bound, root, stem, affixes; Morphological process: word formation rules; Morphemes (Nida's Principle)

Morphophonemics

The concept of morphophoneme, relation between phoneme and morpheme, Internal and external sandhi; Item and Arrangement, Item and Process and Word and Paradigm

Morphological constructions

Inflection and derivation; Affixation and Compounding, types of compounds; Reduplication; Language classification: genetical and typological

Word forms and words

Open and closed word; grammatical categories- tense, aspect, mood, case relations, person, number and gender; pronominalization, classifier

Recommended Books:

- Adam, V. 1973. *An Introduction to Modern English word Formation*. Longman.
- Anderson, J. M. 1971. *The Grammar of Case*. Cambridge: CUP.
- Aronoff, Mark. 1976. *Word Formation in Generative Grammar*. Cambridge, Mass: MIT Press.
- Aronoff, M, and Kirsten Fudeman. 2010. *What is Morphology*. Oxford:Blackwell.
- Bauer, Laure. 1983. *English Word Formation*. Cambridge, University Press.
- Bauer, Laure. 1988. *Introducing Linguistic Morphology*. Edinburgh: Edinburgh University Press.
- Bybee, J. 1985. *Morphology: A Study of the Relation between Meaning and Form*. Amsterdam: John Benjamins.
- Corbett, G. 1990. *Gender*. Cambridge: CUP.
- Dressler, Wolfgang. 1985. *Morphology*. Ann Arbor: Karoma Press.
- Hammond, M. and Noonan, M. (eds). 1988. *Theoretical Morphology: Approaches in Modern Linguistics*. Orlando: Academic Press.
- Hockett, Charles F. 1958. *A Course in Modern Linguistics*. New York: Macmillan.
- Jensen, J. 1990. *Morphology*. Amsterdam: John Benjamins.
- Matthews, P. 1972. *Inflectional Morphology*. Cambridge: CUP.
- Matthews, P. 1974. *Morphology*. Cambridge: CUP.
- Nida Eugena, 1949. *Morphology: The Descriptive Analysis of Words*. Ann Arbor: University of Michigan.
- Kattamba, F. 1993. *Morphology*. London: St. Martin's Prss.
- Plank, F. 1979. *Ergativity*. New York: Academic Press.
- Sloat, C. and Taylor, S. 1978. *The Structure of English Words*. Eugene, Oregon: Pacific Language Associates.
- Spencer, A. (1991). *Morphological Theory*. Oxford: Blackwell.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL704C	Syntax I	4	0	0	4	100

At the end of the course student will be able to:

1. Understand the basic concepts involved in analysis of clause structures
2. Understand syntagmatic and paradigmatic relations in language
3. Provide immediate constituent analysis of clauses
4. Understand the basic concepts of Transformational Generative linguistics
5. Understand the basic concepts of functional and cognitive approaches to clause structure

Course contents:

Basic Concepts

Sentence types – simplex and complex; sentence types– active and passive; sentence types– transitivity; sentence types– declarative, exclamative, imperative, interrogative; ordination of sentences– coordination and subordination, parts of speech; grammatical relations; case; thematic roles

Pre-Chomskyan Syntax

Syntax in early grammatical traditions – western and eastern schools; historical-comparative method to Saussure; Structuralist syntax – syntagmatic and paradigmatic relations; American Structuralist syntax – immediate constituent analysis

Chomskyan Syntax

Brief history of the Chomskyan paradigm; Generative Grammar; Universal Grammar; kernel sentences; deep structure and surface structure; transformations and generations; movement; Logical Form and Phonological Form

Post-Chomskyan Syntax

Cognitive Linguistic theories – Cognitive Grammar, Construction Grammar, Radical Construction Grammar, Word Grammar; Systemic Functional Grammar; Role and Reference Grammar; Simpler Syntax; construction; figure and ground; image schema; metaphor

Recommended Books:

Akmajian, Adrian, Richard A. Demers, Ann K. Farmer and Robert M. Harnish. 2010. *Linguistics: An Introduction to Language and Communication*. 6th Edition. Cambridge: MIT Press. (Chapter 5)

Baker, Mark C. 2003. Syntax. *The Handbook of Linguistics*, ed. by Mark Aronoff and Janie Rees-Miller, pp 265-294. Oxford: Blackwell Publishers.

Bloomfield, Leonard. 1973 [1933]. *Language*. London: George Allen and Unwin Ltd. (Chapters 11 and 12).

Croft, William. 2007. Construction grammar. *Oxford Handbook of Cognitive Linguistics*, ed. by Dirk Geeraerts and Hubert Cuyckens, pp 463-508. Oxford: OUP.

Culicover, Peter W. and Ray Jackendoff. 2006. The simpler syntax hypothesis. *Trends in*

Cognitive Science, 10.9: 413-418.

Givon, Talmy. 2001. *Syntax: An Introduction*, Vol. 1. Amsterdam: John Benjamins Publishing Company.

Halliday, M.A.K. A brief sketch of systemic grammar. *On Language and Linguistics: M.A.K. Halliday*, ed. by Jonathan Webster, 180-184. New York: Continnum.

Hockett, Charles F. 1958. *A Course in Modern Linguistics*. New Delhi: Oxford and IBH Publishing Co. (Chapter 17)

Langacker, Ronald. 2007. Cognitive grammar. *Oxford Handbook of Cognitive Linguistics*, ed. by Dirk Geeraerts and Hubert Cuyckens, pp 421-462. Oxford: OUP.

Robert D. Van Valin. *An Overview of Role and Reference Grammar*.
www.linguistics.buffalo.edu/people/faculty/vanvalin/vanvalin. Online. Accessed on 10.10.2016.

Rowe, Bruce M. and Diane P. Levine. *A Concise Introduction to Linguistics*. 4th Edition. London and New York: Routledge. (Chapter 5)

Yule, George. 2010. *The Study of Language*. Cambridge: CUP. (Chapter 5)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL705C	Languages of North-East India	4	0	0	4	100

At the end of the course student will be able to:

1. The students will learn various language families of India specifically the language families of North-East India
2. Gain knowledge on the linguistic profiles and linguistic situation in North-East India
3. Understand, evaluate and critically assess current models and theories of language contact, and issues of endangered languages
4. Critically assess and evaluate research on a specific language contact scenario
5. Describe issues related to measuring and defining bilingualism
6. Better understanding of the origin and role of orthography (that is, writing systems)
7. Research linguistic issues of interest in the region's languages

Course contents:

Language families of India and North East India

Sino-Tibetan Family, Austro-Asiatic Family, Indo-Aryan Family, Dravidian Family, Tai-Kadai Family, Andamanese Family

Linguistic Profiles of North-East India

Languages of Assam, Arunachal Pradesh, Sikkim, Tripura, Manipur, Meghalaya, Mizoram and Nagaland, North-East languages in the Indian Census reports

Linguistic Ecology of North-East India

Endangered languages of the North East, language contact situations, language shift, bilingualism, writing systems of North East languages

Characteristics of Language Families

Phonetic processes and phonological systems, tonal patterns, word order, morpho-syntax, areal features

Recommended Books:

1. Benedict, Paul. K. 1972. *Sino-Tibetan: A Conspectus*. Cambridge University Press.
2. Baruah, P.N. Dutta. 1997. *Languages of the North East*. CIIL: Mysore.
3. Burling, Robbins. 2003. The Tibeto-Burman Languages of Northeastern India in Graham Thurgood and Rady J. LaPolla. (eds.). *The Sino-Tibetan Languages*. London: Routledge. Cambridge
4. Grierson, G.A. 1904. *Linguistic Survey of India* (Vol. 3, Part 3). Calcutta: Government Publication.
5. Grierson, G.A. 1995. *Languages of North Eastern India: A Survey* (Vol. 1). Delhi: Gyana Publishing House.
6. Hyslop, G., Morey, S., and Post, Mark, W. (eds.). 2013. *North East Indian Linguistics: Vol 5*. Cambridge University Press, New Delhi, India.
7. Mishra AK, Wahlang Melissa & Sarjubala Ch. (eds.). 2013. *Studies in Linguistics of North Eastern Languages*. New Delhi: Lakshmi Publishers & Distributors.
8. Morey, Stephen and Post, Mark W. 2008. *North East Indian Linguistics*. New Delhi: CUP.
9. War, J et al., (eds.). 2014. *Tibeto-Burman Linguistics of North East India*. EBH Publishers: Guwahati.

M.A. 2nd Semester

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL801C	Semantics	4	0	0	4	100

At the end of the course student will be able to:

1. Establish the understanding of fundamental principles of semantics
2. Gain the knowledge of how meaning works in language
3. Understand various levels of meanings ranging from smaller to the larger unit
4. Earn understanding on theoretical semantics and language in use
5. Apply theoretical concepts to other language
6. Develop the performance and solve problems

Course contents:

Basic Concepts

Definition, scope and importance of semantics; meaning, aspects of meaning; connotation,

denotation, lexical, grammatical and social meaning

Sense and Reference

Sense relations- polysemy, homophony, synonymy, antonymy, anomaly, hyponymy; topic and focus; ambiguity, entailment, presupposition and paraphrase; sentences; utterances; propositions

Semantic theories

Componential theory, truth conditional theory, generative theory and contextual theory of meaning; logical and field semantics; different types of logic and its application

Pragmatics

Pragmatics and its theories (Austin, Searle, Grice); participant roles; speech acts; Gricean Maxims, metaphor, idiom; deixis.

Recommended Books:

- Chomsky, N. 1972. *Studies on Semantics in Generative Grammar*. The Hague: Mouton.
- Chierchia, Gennaro and Sally McConnell-Ginet. 1990. *Meaning and Grammar: An Introduction to Semantics*. Cambridge, Mass: MIT Press.
- Fodor, Janet D. 1977. *Semantics: Theories of Meaning in Generative Grammar*. New York: Thomas Y. Crowell.
- Frawley, William. 1992. *Linguistic Semantics*. Hillsdale, N.J.: Erlbaum.
- Hurford, James D. and Brendan, Heasley 1983: *Semantics. A Course Book*. London: Cambridge University Press.
- Jackendoff, Ray. 1972. *Semantic Interpretation in Generative Grammar*. Cambridge, Mass: MIT Press.
- Keith, Allan. 2007. *Natural Language Semantics*. Oxford: Blackwell.
- Kempson, Rush M. 1977. *Semantic Theory*. London: Cambridge University Press.
- Leech, Geoffrey N. 1974. *Semantics*. Pelican Books (Chptrs. 1, 2, 6, 11, 13 & 14).
_____.1981. *Semantics*. London: Penguin.
_____.1983. *Principles of Pragmatics*. London: Longman (Chptrs. 4 & 5).
- Levinson, Stephen C. 1983. *Pragmatics*. Cambridge: Cambridge University Press.
- Lyons, John. 1995. *Linguistics Semantics*. Cambridge University Press.
_____.1977. *Semantic Theory*. Cambridge: Cambridge University Press. (Chptrs. 1 & 2).
- Miller, J. E. 1985. *Semantics and Syntax*. Cambridge: CUP.
- Palmer, F. R. 1996. *Semantics*. London: Cambridge University Press.
- Saeed, John I 1969. *Speech Acts*. London: Cambridge University Press.
_____. 1997. *Semantics*. Oxford: Basil Blackwell.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL802C	Sociolinguistics	4	0	0	4	100

At the end of the course student will be able to:

1. Demonstrate an understanding of sociolinguistic concepts
2. Understand the relationships between language, social and cultural contexts and how these relationships signalled through language
3. Establish the understanding of sociolinguistic theory and concepts for explaining how language varies in social contexts
4. Critically examine the discourse of language maintenance, language planning, language standardization and modernization
5. Identify different sociolinguistic processes and their role in contact-induced language change
6. Describe the relationship between language, identity, power and gender at the individual and societal level.
7. Conduct original data-based research on a sociolinguistic topic of their choice

Course contents:

Language and Society:

Socio-linguistics and sociology of language; speakers and communities; speech community; languages, dialects, registers, isoglosses, diffusion and wave theory

Social and Cultural variation

Socio-linguistic variables; patterns of variation; regional, social and stylistics; language repertoire; Sapir and Whorf – linguistic categories and cultures

Language Change and Language Contact

Study of language change in progress; Labov's and Trudgill's linguistics variations; bilingualism; multilingualism; diglossia; code switching and code mixing; pidgin; creoles; post-creole continuum

Linguistic Dimensions of Society and Applied Issues

Issues of language maintenance and shift; borrowing, interference, convergence and divergence; language planning; language standardization and modernization; language: identity, power and gender

Recommended Books:

1. Appel, R. and Muysken, P. 1987. Language Contact and Bilingualism. London Edward Arnold.
2. Bayer, Jennifer. 1990. Language and social identity. In: Multilingualism in India. Clevedon: Multilingual Matters Ltd: 101-111.
3. Dua, H. R. 2001. Science Policy Education and Language Planning. Mysore: Yashoda Publications.
4. Fasold, P.P. (ed.) 1972. Language and Social Context. Harmondsworth: Penguin.

5. Fasold, R. 1999, The Sociolinguistics of Language London: Basil Blackwell.
6. Haugen, E. 1950. Problems of Bilingualism. *Lingua* 2:271-290.
7. Holm, John. 1988. Pidgins and Creoles. Vols I & II. Cambridge: Cambridge University Press.
8. Hudson, R.A. 1980. Sociolinguistics. Cambridge: CUP.
9. Hymes. D. 1974: Foundations in Sociolinguistics, An Ethnographic Approach. Philadelphia University of Pennsylvania Press.
10. Pattanayak, D. P. 1981. Multilingualism and Mother Tongue Education. Delhi: Oxford University Press.
11. Romaine, S. 1989. Bilingualism. London: Basil Blackwell.
12. Sebba, M. 1997. Contact Languages, London: Macmillan.
13. Wardhaugh, R. 1992. An Introduction to Sociolinguistics, Oxford. Blackwell.
24. Williams, G. 1992. Sociolinguistics. London: Rutledge.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL803C	Historical Linguistics	4	0	0	4	100

At the end of the course student will be able to:

1. Understand the basic concepts of diachronic linguistics
2. Understand the comparative method of reconstruction
3. Understand the internal reconstruction
4. Analyze sound change, morphological change, syntactic change, and semantic change

Course contents:

Basic Concepts

History of historical linguistics; language change - phonological, morphological, syntactic, semantic; motivations for language change - external and internal; attitude towards language change, linguistic classification and reconstruction; family tree model and wave theory; linguistic prehistory; language family and subgrouping; language contact and borrowing; birth and death of languages; methods of analysis - comparative, internal reconstruction, and quantitative; lexicostatistics and glottochronology - Swadesh's formulation and list; cognate

Sound Change

Phonetic and phonemic changes; mergers and splits, chain shifts, lenition, fortition, assimilation, dissimilation, epenthesis - prothesis, anaptyxis, excrescence, and paragoge, metathesis, prosodic change, Neogrammarian hypothesis - regularity principle and regularity of language change; milestones in sound change analysis - Grimm's law and Verner's law; sporadic changes

Morphosyntactic Change

Word formation process – affixal derivation, zero derivation, reanalysis, back-formation, compounding, taboo replacement, taboo deformation, folk etymology, grammaticalization, degrammaticalization, borrowing and claque, morpheme boundary shift; etymology; syntactic alignment and change - reanalysis, extension, borrowing, and grammaticalization

Semantic Change

Meaning change – externally motivated, generalization and specialization, metaphor, metonymy, reanalysis; analyzing semantic change

Recommended Books:

- Akmajian, Adrian, Richard A. Demers, Ann K. Farmer and Robert M. Harnish. 2010. *Linguistics: An Introduction to Language and Communication*. 6th Edition. Cambridge: MIT Press. (Chapters 7 and 8)
- Bybee, Joan and Paul Hopper. 2001. *Frequency and the Emergence of Linguistic Structure*. Amsterdam and Philadelphia: John Benjamin Publishing Company.
- Campbell, Lyle. 1998. *Historical Linguistics: An Introduction*. 3rd edition. Massachusetts: MIT Press.
- Campbell, Lyle, and Mauricio J. Mixco. 2007. *A glossary of Historical Linguistics*. Salt Lake City: The University of Utah Press.
- Fox, Anthony. 1995. *Linguistic Reconstruction: An Introduction to Theory and Method*. Oxford: Oxford University Press.
- Fromkin, Victoria, Robert Rodman and Nina Hyams. 2009. *An Introduction to Language*. Boston: Wadsworth. (Chapter 11)
- Hale, Mark. 2007. *Historical Linguistics: Theory and Method*. Blackwell Textbooks in Linguistics. Malden and Oxford: Blackwell.
- Hock, H & Joseph, B. (2009). *Language History, Language Change & Language Relationship: An Introduction to Historical and Comparative Linguistics*. 2nd Edition. New York: Mouton de Gruyter.
- Jeffers, Robert J., and Ilse Lehiste. 1979. *Principles and Methods for Historical Linguistics*. Cambridge: MIT Press.
- Lehmann, Winfred P. 1992. *Historical Linguistics*. 3rd edition. London and New York: Routledge.
- Matisoff, James A. 2003. *Handbook of Proto-Tibeto-Burman: System and Philosophy of Sino-Tibetan Reconstruction*. Berkeley and London: University of California Press.
- Matisoff, James A, Stephen P. Baron, and John B. Lowe. 1996. *Languages and Dialects of Tibeto-Burman*. Berkeley: Center for Southeast Asia Studies.
- Trask, R. L. 1996. *Historical Linguistics*. London, New York, Sydney, and Auckland: Arnold.
- Trask, R. L. 2000. *The Dictionary of Historical and Comparative Linguistics*. Chicago and London: Fitzroy Dearborn Publishers.
- Traugott, Elizabeth Closs, and Bernd Heine, eds. 1991. *Approaches to Grammaticalization*. Volumes 1 and 2. Amsterdam and Philadelphia: John Benjamin Publishing Company.
- Yule, George. 2010. *The Study of Language*. 4th Edition. Cambridge: CUP. (Chapters 17,18,19).

Course	Name of the Course	Credit	Total	Marks
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Code		Distribution			Credit	
		L	T	P		
LTL804C	Translation	4	0	0	4	100

At the end of the course student will be able to:

1. Gain the knowledge of different theoretical aspects and types of translation
2. Understand significant levels of linguistics in Translation ranging from the smaller to the larger unit
3. Sort out various issues related in different domains
4. Apply theoretical concepts to different fields of translation
5. Develop the performance and handle the practical problems

Course contents:

Translation and Linguistic theory

Definition, objective and application of translation; theories of translation: Universalist, Relativist, Catford and Nida.

Types of translation

Total translation, partial translation, text-oriented vs. reader-oriented, literal vs. free translation, transcreation, word to word translation.

Translation and applied linguistics

Place of translation and language teaching, translation and dictionary making; translation and language modernization; machine translation.

Problems of translation

Problems of translating text; cultural incompatibility; problems of translating proper names and place names, and scientific terms; dialectal translation, contextual and collocational items.

Recommended Books:

Bassnett-McGuire, Susan. 1980. *Translation Studies*. London: Methuen and Co.

Brower, R.A. (Ed). 1959. *On Translation*. Cambridge, Mass: Harvard University Press.

Catford, J.C. 1965. *A Linguistic theory of Translation*. London: Oxford University Press.

Fawcett, Peter. 2003. *Translation and Language: Linguistic Theories Explained*. UK: St. Jerome Publishing.

Jeremy, Munday. 2001. *Introducing Translation Studies*, London: Oxford University Press.

Klinger, Susanne. 2015. *Translation and Linguistic Hybridity*. New York: Routledge.

Newmark, Peter. 1981. *Approaches to Translation*. Oxford: Pergamon Press.

..... 1988. *A Textbook of Translation*. New York, London: Prentice Hall.

Nida, Eugene. 1964. *Towards A Science of Translation*. Lei den: Brill.

Nair, Sreedevi, K. 1996. *Aspects of Translation*. New Delhi: Creative Books.

Tucer, C.R. 1969: *The Theory and Practice of Translation*. Lei den: Brill.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL805E	Language and Society	4	0	0	4	100

At the end of the course student will be able to:

1. Understand the basic concepts of sociolinguistics
2. Understand the relationship between language and social strata
3. Understand the relationship between language and thought
4. Understand the sociolinguistics of the Indian languages

Course contents:

Basic Concepts

Analysis of languages; speech varieties - language, dialect, and idiolect; birth and death of languages; sociolinguistic issues

Language in Society

Bidirectional relation of language and society; linguistic representation of social structures- age, caste, class, gender, and power; social groups and sociolinguistic variables; taboos and euphemisms

Social Dimensions of Language

Social variation of language - standard, prestige, and regional; multilingualism; code switching and mixing; linguistic identity; language shift; reactions to language change; language planning

Language and Society in India

Sociolinguistic issues in India; languages and language families of India; Indian English; counting of languages; language education in India; Indian languages and the Constitution of India

Recommended Books:

Coupland, Nikolas and Adam Jaworski. *Sociolinguistics: A Reader*. New York: Macmillan Education.

Kachru, Braj B., Yamuna Kachru and S. N. Sridhar. *Language in Southasia*. Cambridge: Cambridge University Press.

Meyerhoff, Miriam. 2006. *Introducing Sociolinguistics*. New York: Routledge. (All Chapters)

Wardhaugh, Ronald. 2010. *An Introduction to Sociolinguistics*. (6th Edn). Oxford: Blackwell Publishing Limited. (All Chapters)

M.A. 3rd Semester

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL901C	Generative Phonology	4	0	0	4	100

At the end of the course student will be able to:

1. Establish the understanding of the universal nature of phonological structure and the phonologies of individual languages
2. Develop a basic understanding of the fundamental concepts of generative phonology
3. Familiarized with sounds that are defined in terms of a fixed set of universal features
4. Enhance the knowledge of how phonological rules are formalized in terms of those features
5. The ability to apply generative model to the analysis of novel data

Course contents:

Introduction

Natural classes; distinctive features; major class features; laryngeal features; secondary and complex articulation; prosodic features

Feature Geometry

Distinctive features; articulator theory; feature tree; characterizing phonological rules; spreading, delinking, insertion and deletion; spreading of terminal features; consonant-vowel interaction

Cyclic Phonology

Derived environment rules; strict cycle; lexical phonology; elsewhere condition; structure preservations; multistratal rules; word level

Prosodic Phonology

The syllable; quantitative approach to syllable; moraic theory; compensatory lengthening; autosegmental phonology: tone, nasality, vowel harmony; CV tie

Recommended Books:

1. Anderson, J. 1979. The Organization of Phonology. New York: Academic Press.
2. Clements, G.N. and Keyser, S.J. 1983. CV-Phonology. Cambridge. Mass: MIT Press.
3. Durand, J. 1990. Generative and Non-linear Phonology. London: Longman.
4. Giegerich, H. J. 1994. Metrical phonology. In asdf Volume 5:2478–2483.
5. Goldsmith, J. 1990. Autosegmental and Metrical Phonology. Oxford: Basil Blackwell.
6. Goldsmith, J (ed)1995. The Handbook of Phonological Theory. Cambridge: Blackwell.
7. Goldsmith, J (ed)1999. Phonological Theory: The Essential Readings. Cambridge: Blackwell.
8. Hockett, C. F. 1955. Manual of Phonology. Baltimore: Waverley Press.
9. Hooper, J. B. 1976. An Introduction to Natural Generative Phonology. New York: Academic

Press.

10. Jensen, John T. 2004. Principles of Generative Phonology: An Introduction. Amsterdam: John Benjamins Publishing Company.

11. Kenstowicz, M. 1994. Phonology in Generative Grammar. Cambridge: Blackwell.

12. Kenstowicz, Michael, and Charles Kisseberth. 1979. Generative phonology. San Diego: Academic

13. Mohanan, K.P. 1986. The Theory of Lexical Phonology. Dordrecht: Reidel.

14. Nespor, Marina and Irene Vogel. 1986. Prosodic Phonology (Studies in Generative Grammar, 28). Dordrecht: Foris.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL902C	Syntax II	4	0	0	4	100

At the end of the course student will be able to:

1. Understand the theoretical issues involved in syntactic theories
2. Understand the differences among generative, functional, and cognitive approaches to syntactic analysis
3. Understand the relationship between syntactic theories and language variation
4. Understand the relationship between syntactic theories and language change
5. Understand the relationship between syntactic theories and language acquisition

Course contents:

Preliminaries

Contemporary theories in syntactic analysis; syntactic structures and syntactic relations; qualitative and quantitative approaches to syntax; synchronic and diachronic approaches to syntax

Chomskyan Syntax

Aspects model; Government and Binding theory; Minimalist Program; analysis within the Chomskyan paradigm; explanation and evidence; language acquisition; diachronic development of syntactic structures

Functionalist Syntax

Sentence structure and information structure; communicative aspect of syntax; Greenbergian approach; Givon's approach; Halliday's approach; Role and Reference Grammar; analysis within the functionalist paradigm; explanation and evidence; language acquisition; diachronic development of syntactic structures; corpus

Cognitive Linguistic Syntax

Sentence structure and cognitive structure; conceptual aspects of syntax; Cognitive Grammar; Construction Grammar; Radical Construction Grammar; analysis within the cognitive linguistic paradigm; explanation and evidence; language acquisition; diachronic development of syntactic structures; corpus

Recommended Books:

Akmajian, Adrian, Richard A. Demers, Ann K. Farmer and Robert M. Harnish. 2010. *Linguistics: An Introduction to Language and Communication*. 6th Edition. Cambridge: MIT Press. (Chapter 5)

Baker, Mark C. 2003. Syntax. *The Handbook of Linguistics*, ed. by Mark Aronoff and Janie Rees-Miller, pp 265-294. Oxford: Blackwell Publishers.

Bloomfield, Leonard. 1973 [1933]. *Language*. London: George Allen and Unwin Ltd. (Chapters 11 and 12)

Croft, William. 2007. Construction grammar. *Oxford Handbook of Cognitive Linguistics*, ed. by Dirk Geeraerts and Hubert Cuyckens, pp 463-508. Oxford: OUP.

Culicover, Peter W. and Ray Jackendoff. 2006. The simpler syntax hypothesis. *Trends in Cognitive Science*, 10.9: 413-418.

Givon, Talmy. 2001. *Syntax: An Introduction*, Vol. 1. Amsterdam: John Benjamins Publishing Company.

Halliday, M.A.K. A brief sketch of systemic grammar. *On Language and Linguistics: M.A.K. Halliday*, ed. by Jonathan Webster, 180-184. New York: Continnum.

Hockett, Charles F. 1958. A Course in Modern Linguistics. New Delhi: Oxford and IBH Publishing Co. (Chapter 17)

Langacker, Ronald. 2007. Cognitive grammar. *Oxford Handbook of Cognitive Linguistics*, ed. by Dirk Geeraerts and Hubert Cuyckens, pp 421-462. Oxford: OUP.

Radford, Andrew, Martin Atkinson, David Britain, Harald Clashen and Andrew Spencer. 2009. *Linguistics: An Introduction*. 2nd Edition. Cambridge: CUP. (Part III)

Robert D. Van Valin. *An Overview of Role and Reference Grammar*.
www.linguistics.buffalo.edu/people/faculty/vanvalin/vanvalin. Online. Accessed on 10.10.2016.

Rowe, Bruce M. and Diane P. Levine. *A Concise Introduction to Linguistics*. 4th Edition. London and New York: Routledge. (Chapter 5)

Yule, George. 2010. *The Study of Language*. Cambridge: CUP. (Chapter 5)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL903C	Lexicography	4	0	0	4	100

At the end of the course student will be able to:

1. Establish the understanding of fundamental principles in lexicography
2. Gain the knowledge of writing and editing dictionaries
3. Come up with the expertise by learning various internal attributes of different types of dictionaries which are applicable to other languages
4. Sort out specific problems which are involved in compiling dictionaries

Course contents:

Linguistic perspective

Lexicology and lexicography; lexicography and linguistics; lexicon and grammar; lexical units– form and function, lexeme and word

Lexemes and lexical meaning

Simple and composite; nature of combinations - set and free; set combinations, compounds, multiword, lexical units, proverbs and idioms; variations- dialectal variations, standard and non-standard; meaning-denotative and connotative; contextual meaning - polysemy, homonymy, synonymy, antonymy, hyponymy

Types of Dictionaries and Dictionary making

Criteria for dictionary classification, types of dictionaries; Synchronic vs. diachronic/historical, restricted/special vs. non-restricted/general, mono-lingual, bi-lingual and multi-lingual, thesaurus and encyclopedia; selection of entry for dictionary, arrangement of entries- alphabetical labeling and grammatical description, notation and format - purpose and scope, reader's guide, guide to pronunciation, abbreviations, use of punctuations and symbols

Specific Problems

Data collection; selection and arrangement of entries; preparation of dictionaries of an unwritten language; spelling and pronunciation; phonetic transcription; interpretation of cultural specific meaning

Recommended Books:

Akhmanova, O. (ed). 1972. *Lexicology: Theory and Method*. Moscow.
 Annaimalai, E. 1978. *The Nature of Lexicography*, CIIL, Jamia Milia, New Delhi.
 Dash, Niladri Sekhar. 2007. The art of Lexicography. In Vesna Muhvic-Dimanovski and Lelija Socanac (eds). *Encyclopedia of Life Support Systems*. Oxford: EOLSS Publishers. (P. 225-276).
 Gimson, A.C. 1973. *Phonology and the Lexicography in R I. Mc David and A.R. Dukert*.
 Jackson, Howard. 2002eb. *Lexicography: An Introduction*. New York: Routledge.
 Katre, S.M. 1965. *Lexicography*. Annamalai Nagar. Annamalai University.
 Kurath, M. 1961. *The Semantic Patterning of Words*. Washington: Georgetown University.
 Landau, S.I. 1989. *Dictionaries: The art and craft of Lexicography*. Cambridge.
 Lipka, L. 1990. *An Outline of English Lexicology*. Tübingen: Max Niemeyer.
 Sebeok, T. A. (Ed). 1963. *Current Trends In Linguistics, Vol. I*. The Hague: Mouton.
 Singh, R. A. 1983. *Lexicology and Lexicography*. Mysore: CIIL.
 Zgusta, L. 1971. *Manual of Lexicography*. The Hague: Mouton.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL904C	Psycholinguistics	4	0	0	4	100

At the end of the course student will be able to:

1. Understand the basic concepts of psycholinguistics and neurolinguistics
2. Understand the basic concepts of speech production
3. Understand the basic concepts of speech perception
4. Understand the basic concepts of first and second language acquisition
5. Understand the basic concepts of language disorders

Course contents:

Language and Brain

Neurolinguistics, Language areas in brain – Broca’s area, Wernicke’s area, the localization view

Child Language Acquisition

Acquisition schedule – cooing and babbling, one-word stage, two-word stage, telegraphic speech, acquisition processes, early speech production and perception, sentence production, critical period hypothesis

Second Language Acquisition

First, second, and foreign languages, age-differences and socio-psychological factors in acquisition, language transfer, interlanguage, second language loss

Language Disorders

Aphasia – Broca’s aphasia, Wernicke’s aphasia, conduction aphasia, disturbances in language production and comprehension, dyslexia, agrammatism

Recommended Books:

Akmajian, Adrian, Richard A. Demers, Ann K. Farmer and Robert M. Harnish. 2010. *Linguistics: An Introduction to Language and Communication*. 6th Edition. Cambridge: MIT Press.

Baker, Mark C. 2003. Syntax. *The Handbook of Linguistics*, ed. by Mark Aronoff and Janie Rees-Miller, pp 265-294. Oxford: Blackwell Publishers.

Caplan, D. 1987. *Neurolinguistics and Linguistic Aphasiology: An Introduction*. Cambridge and New York: CUP.

Rowe, Bruce M. and Diane P. Levine. *A Concise Introduction to Linguistics*. 4th Edition. London and New York: Routledge.

Yule, George. 2010. *The Study of Language*. Cambridge: CUP.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL905E	Analysis of Endangered Languages	4	0	0	4	100

At the end of the course student will be able to:

1. Gain the understanding of the current status of the language existence
2. Develop to determine safeguards of languages which are in danger
3. Analyse endangered languages with the skills of linguistic levels
4. Earn the concept of revitalisation of death languages
5. Understand documentation processes

Course contents:

Basic Concepts

Concept of endangered languages; steps for safeguarding endangered languages; documentation

Phonology

Phonemics- segmental and suprasegmental; description and distribution of vowels; description and distribution of consonants

Morphology

Concept of morpheme, morph and allomorphs; root, stem and base; affixation and compounding; inflection and derivation; case marking

Syntax

Words vs. phrases; Sentence and its different types; clauses and its different types; relative clause structure; passive constructions

Reading list:

Austin, P.L. & Sallabank, J. (eds.). *The Cambridge Handbook of Endangered Languages*. Cambridge: CUP.

Crystal, D. 2000. *Language Death*. Cambridge: CUP.

Dalby, Andrew. 2002. *Language in Danger*. London: Penguin.

Daniel, N. et al. 2000. *Vanishing Voices: The Extinction of the World's Languages*. New York: OUP.

Dorain N. 1989 (Ed.). *Investigating Obsolescence: Studies in Language Contraction and Death*. Cambridge: CUP.

Dwyer, A.M. 2009. Tools and techniques for endangered-language assessment and revitalization. In *Vitality and Viability of Minority Languages*. October 23-24, 2009. New York: Trace Foundation Lecture Series Proceedings.

Gippert, J., Himmelmann N.P. and Mosel, U. (eds.). 2006. *Essentials of Language Documentation*. Berlin & New York: Mouton de Gruyter.

Harrison D. 2007. *When Languages Die: the Extinction of Human Knowledge*. Oxford: OUP.

Hinton, L. 2003. Language revitalization. *Annual Review of Applied Linguistics*. Vol. 23: 44-57.

Kroeger, P. R. 2015. *Analyzing Grammar: An Introduction*. Cambridge: CUP.

Lenore et al. 1998 (Ed.). *Endangered Languages: Language Loss and Community Response*. Cambridge: CUP.

Lieber, Rochelle, 2009. *Introducing Morphology*. Cambridge: Cambridge University Press.

McMahon, A. 2002. *An Introduction to English Phonology*. Edinburgh: Edinburgh University Press.

Miller, Jim. 2002. *An Introduction to English Syntax*. Edinburgh: Edinburgh University Press.

Radford, A & et al, 2009. *Linguistics: An Introduction*. Cambridge: Cambridge University Press.

Spolsky, B. 2004. *Language Policy*. Cambridge: Cambridge University Press.

Yule, George. 2010. *The Study of Language*. Cambridge: Cambridge University Press.

Journals

Language Documentation & Conservation (<http://nflrc.hawaii.edu/ldc/>) (Edited by Vera Ferreira and Peter Bouda).

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL1001C	Language Typology and Linguistic Universals	4	0	0	4	100

At the end of the course student will be able to:

1. Develop a basic understanding of synchronic linguistic analysis of the world's languages
2. Understand the types of languages around the world
3. Understand the problem of cross linguistic identification
4. Understand the implications of cross linguistic universals and variations

Course contents:

Basic Concepts

Language typology – theories and methods; Chomskyan paradigm; Greenbergian paradigm; Functionalist paradigm; Cognitive Linguistic paradigm; human cognition, material cultural, and language; language typology and historical linguistics; linguistic area; linguistic universals; dimensions of linguistic variation

Language Typology

Phonological typology; phonetic inventory and phonemic inventories; word order typology; basic word order; variation in basic word order; fixed word order and free word order; clause ordination; subordination and coordination strategies; semantic typology; verb framed vs. satellite framed languages; event encoding properties

Linguistic Universals

Sound universals; basic vowel and consonant inventories; morphosyntactic universals; common paths of grammaticalization; semantic universals

Languages of India

Typology of Indian languages; India as a linguistic area; examples from Indian languages for linguistic universals

Recommended Books:

- Bybee, Joan and Paul Hopper. 2001. *Frequency and the Emergence of Linguistic Structure*. Amsterdam and Philadelphia: John Benjamin Publishing Company.
- Caffarel, Alice, J.R. Martin, and Christian M.I.M. Matthiessen. 2004. *Language Typology: A Functional Perspective*. Amsterdam and Philadelphia: John Benjamin Publishing Company.
- Debnath, Rupak. 2014. *Kokborok: Language Origin and Development*. Khumulwng: Tripura Tribal Areas District Council.
- Greenberg, Joseph. 1974. *Language Typology: A Historical and Analytical Overview*.
- Hock, H & Joseph, B. (2009). *Language History, Language Change & Language Relationship: An Introduction to Historical and Comparative Linguistics*. 2nd Edition. New York: Mouton de Gruyter.
- Jeffers, Robert J., and Ilse Lehiste. 1979. *Principles and Methods for Historical Linguistics*. Cambridge: MIT Press.
- Krishnamurthi, Bh. 2003. *The Dravidian languages*. Cambridge: Cambridge University Press.

Masica, Colin P. 1993. *The Indo-Aryan Languages*. Cambridge: Cambridge University Press.

Matisoff, James A. 1999. In Defense of Kamarupan. *Linguistics of the Tibeto-Burman Area*, Vol. 22.2, 173-182.

Matisoff, James A. 2003. *Handbook of Proto-Tibeto-Burman: System and Philosophy of Sino-Tibetan Reconstruction*. Berkeley and London: University of California Press.

Moravcsik, Edith A. 2013. *Introducing Language Typology*. Cambridge: Cambridge University Press. (All Chapters)

Matisoff, James A, Stephen P. Baron, and John B. Lowe. 1996. *Languages and Dialects of Tibeto-Burman*. Berkeley: Center for Southeast Asia Studies.

Ramat, Paolo. 1987. *Linguistic Typology*. Berlin: Mouton de Gruyter.

Shopen, Timothy (ed.). 2007. *Language Typology and Syntactic Description*. Vol. 1: Clause Structure. Cambridge: Cambridge University Press.

Shopen, Timothy (ed.). 2007. *Language Typology and Syntactic Description*. Vol. 2: Complex Constructions. Cambridge: Cambridge University Press.

Shopen, Timothy (ed.). 2007. *Language Typology and Syntactic Description*. Vol. 3: Grammatical Categories and the Lexicon. Cambridge: Cambridge University Press.

Song, Jae Jung (ed). 2011. *The Oxford Handbook of Linguistic Typology*. Oxford: Oxford University Press.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL1002C	Structure of Tibeto-Burman Language	4	0	0	4	100

At the end of the course student will be able to:

1. Gain knowledge about the features and structure of Tibeto-Burman languages
2. Establish comparative and contrastive analysis in Tibeto-Burman languages
3. Analyze the phonological and morpho-syntactic structure of the languages
4. Strengthen their ability to conduct original data-based research on any topic of their choice
5. Enable to specialise in Tibeto-Burman languages of North-East India

Course contents:

Phonology

Sound systems: vowel systems and consonant systems; phonotactics; syllable structure; suprasegmentals; phonological processes; tonal typology

Morphology

Inflectional and derivational morphology; nouns; verbs; adjectives; word formation: affixation, agglutination, compounding, morphological alterations, reduplication, expressives, quotative constructions; person, number, gender, numerals, classifiers

Syntax

Case marking; agreement patterns; transitivity; grammaticalization; nominalization;

relativization; clause structure, subordination, complementation, clause chains; concatenation; tense and aspect; causatives; evidentiality; negation

Comparative Study

Bodo-Garo-Koch, Kuki-Chin and Naga languages; comparison between Tibeto-Burman languages in Northeast India

Recommended Books:

1. Aikhenvald, Alexandra Y. and R.M.W. Dixon. (eds.). 2006. *Serial Verb Constructions: A Cross-Linguistic Typology*. Oxford: Oxford University Press.
2. Benedict, P.K. 1972. *Sino-Tibetan: A Conspectus*. New York: Cambridge University Press.
3. Bradley, David. (ed.) 1979. *Tibeto-Burman languages of Himalayas*, Canberra: Australian National University.
4. DeLancey, Scott. 1990. 'Sino-Tibetan Languages', in Bernard Comrie (ed.) *The World's Major Languages*, London: Croom Helm.
5. Dixon, R.M.W. 1994. *Ergativity*. Cambridge: Cambridge University Press.
6. Thurgood, Graham and Randy J. LaPolla. (eds.). 2003. *The Sino-Tibetan Languages*. London and New York: Routledge.
7. Matisoff, J.A. 2003. *Handbook of Proto-Tibeto-Burman: System and Philosophy of Sino-Tibetan Reconstruction*. Berkeley: University of California Press.
8. Namkung, Ju, 1996. *Phonological Inventories of Tibeto-Burman Languages*. Sino-Tibetan Etymological Dictionary and Thesaurus Project, Center for Southeast Asia Studies, University of California.
9. Weidert, Alfons. 1987. *Tibeto-Burman Tonology: A Comparative Analysis*. John Benjamins Publishing.
10. North East Indian Linguistics, Volume 1-5.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL1003C	Field Linguistics	4	0	0	4	100

At the end of the course student will be able to:

1. Establish the understanding of fundamental principles of field work
2. Prepare for conducting linguistic field work
3. Gain the knowledge of different tools used for obtaining linguistic data
4. Analyse, manage and back up of data gathered from field work
5. Gain the knowledge of research ethics

Course contents:

Concepts of Field Linguistics

Concepts and objectives of Field Linguistics; bilingual vs. monolingual fieldwork; selection of language; selection of area; selection of informants; participant observation

Questionnaire and Equipment

Concept and preparation of questionnaire; basic word list; other questionnaire related to words (body parts; flora and fauna, celestial bodies etc.); audio and video recorder, data management, data back-up (making CDs, typing, digitizing data)

Data Collection and Analysis

Use of IPA and training; Data elicitation; collection of narrations, folk tales, folk songs, and other indigenous knowledge based information; data analysis, discussion and interpretation

Research Ethics and Bibliography

Plagiarism, copyright issues, preparation of bibliography; references

Recommended Books:

Abbi, Anvita. 2001. *A manual of linguistic fieldwork and Structures of Indian Languages*. Munich: Lincom Europa.

Bowern, Claire. 2008. *Linguistic fieldwork*. New York: Palgrave Macmillan.

Briggs, Charles L. 1986. *Learning How to Ask: A Sociolinguistic Appraisal of the Role of the Interview in Social Science Research*. Cambridge: Cambridge University Press.

Burling, Robbins. 2000. *Learning a Field Language*. Prospect Heights, Illinois: Waveland Press.

Chelliah, S. L. & De Reuse, W.J. 2011. *Handbook of Descriptive Linguistic Fieldwork*. New York: Spinger.

Crowley, Terry & Nick Thieberger. 2007. *Field Linguistics: A Beginner's Guide*. (Oxford: Oxford University Press.

Day, R.A., 1992. *How to Write and Publish a Scientific Paper*. Cambridge: CUP.

Fink, A., 2009. *Conducting Research Literature Reviews: From the Internet to Paper*. Sage Publications.

Fishman, J, A. (ed) 1999. *Handbook of Language and Ethnic Identity*. Oxford, Oxford University Press.

Garg, B.L., Karadia, R., Agarwal, F. & Agarwal, U.K., 2002. *An Introduction to Research Methodology*. RBSA Publishers.

Grierson, G. A. 1903-28. *Linguistic Survey of India, Vol. 1-14*. Delhi: Motilal Banarasidas.

Kothari, C.R., 1990. *Research Methodology: Methods and Techniques*. New Age International.

Newman, Paul & Martha, Ratliff. (ed.) 2001. *Linguistic Fieldwork*. Cambridge: Cambridge University Press.

Narasimha, Rao, K. V. V. L. & Jennifer Bayer. 2000. *Research Methodology in Linguistics*. Mysore, CIIL.

Vaux, B. & Cooper, J. 1999. *Introduction to Linguistic Field Methods*. Munich: Lincom Europa.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
LTL1004C	Term Paper	4	0	0	4	100

At the end of the course student will be able to:

1. Elicit data from a language or dialect
2. Prepare for conducting linguistic field work

3. Work on different aspects of a language or the same aspect of different languages
4. Come up with expertise knowledge to work on language

Course contents:

This course aims at providing training to students to elicit data from a Language or Dialect, which is preferably under analyzed. Every student will be assigned with different aspects of a language or the same aspect of different languages. The respective guide (after allotment of guide) will encourage the students to come up with significant analyses.

Students shall submit 02 (two) copies of term papers under the following heads which may be suitably modified:

- Introduction**
- Review of Literature**
- Data analysis**
- Discussion and Conclusion**
- References**
- Appendices (if necessary)**

LTL1005E	A Foundation Course in Phonetics	4	0	0	4	100
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At the end of the course student will be able to:

1. Comprehend the central concepts in phonetics
2. Understand how sounds are produced, how they are transmitted, and how they are perceived
3. Recognise the sounds of the IPA chart and the parameters along which sounds can vary
4. Describe sounds using appropriate terminology and symbolisation
5. Establish phonological categories on the basis of contrast
6. Provide structural descriptions of prosodic features using appropriate phonological notation
7. Produce simple phonetic descriptions and broad phonetic transcriptions of speech

Course contents:

Introduction

Basic concepts and terminologies; anatomy & physiology of speech production: respiratory system, laryngeal system, articulatory system; acoustic phonetics; auditory phonetics

Classification of Speech Sounds

Vowels: monophthongs, diphthongs, cardinal vowels; consonants: place and manner of articulations

Prosodic Features

Syllable; length; stress; tone; intonation

Transcription: The phonetic chart (IPA); transcription: phonetic and phonemic

transcription; transcription practice

Recommended Books:

1. Abercrombie, D. 1967. *Elements of General Phonetics*. Edinburgh: Edinburgh University.
2. Catford, J.C. 1988. *A Practical Introduction to Phonetics*. Oxford: Oxford University Press.
3. Chomsky, N. & Halle, M., 1968. *The Sound Pattern of English*, New York: Harper and Row.
4. Clark, J. & Yallop, C. 1990. *An Introduction to Phonetics and Phonology*. Oxford, Basil Blackwell.
5. Hyman, Larry M. 1975. *Phonology: Theory and analysis*. N.Y.: Holt Rinehart and Winston.
6. Katamba, F. 1989. *An Introduction to Phonology*. Longman Group UK Limited.
7. Ladefoged, P., 2011. *A Course in Phonetics*. Keith Johnson University of California, Berkeley.
8. Ladefoged, P. 2001. *Vowels and consonants: An Introduction to the Sounds of the Languages of the World*. Oxford: Blackwell.
9. Ladefoged, P & Maddieson, I. 1996. *The Sounds of the World's Languages*. Oxford: Blackwell.
10. Lieberman, P. & Blumstein, S. 1988. *Speech Physiology, Speech Perception and Acoustic Phonetics*. Cambridge: Cambridge University Press.
11. Ogden, R. 2009. *An Introduction to English Phonetics*. Edinburgh University Press.
12. Roach, P. 1995. *English Phonetics and Phonology: A Practical Course*. Cambridge: Cambridge University Press.

TRIPURA UNIVERSITY **(A Central University)**

MASTER OF PHARMACY (M.Pharm.)
IN
PHARMACEUTICAL CHEMISTRY



CURRICULUM STRUCTURE

Tripura University (A Central University)
Suryamaninagar-799022

भैषज विज्ञान विभाग
DEPARTMENT OF PHARMACY
त्रिपुरा विश्वविद्यालय
TRIPURA UNIVERSITY



(केन्द्रीय विश्वविद्यालय / A Central University)
सूर्यमणिनगर, अगरतला / Suryamaninagar, Agartala
त्रिपुरा(प.)/Tripura (W.), पिन/PIN – 799022, भारत/INDIA

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वेबसाइट / Website : www.tripurauniv.in

INFORMATION

The Department of Pharmacy, Tripura University (A Central University), Suryamaninagar-799022, has adopted the M.Pharm syllabus as per the guidelines of **Pharmacy Council of India (PCI), New Delhi** vide Gazette notification named **“The Master of Pharmacy (M.Pharm) course Regulation-2014”** published in the Gazette of India dated **11th December 2014**.

The PCI syllabus for M.Pharm in Pharmaceutical Chemistry has been approved by the 5th BPGS, 9th BFS and 22nd AC meeting. The Department of Pharmacy is therefore permitted to carry out all the academic works as per the rules, regulations, syllabus and examinations contained in the enclosed curriculum structure as notified by the university vide notification No. TU/REG/G-Admin/05/ 2015 (Vol-IV) dated 25th June 2020.

New subject codes have been given for the course code which has not been given by PCI. Pages which are not relevant to our program have been omitted from the PCI syllabus. The formats for the M.Pharm thesis has been attached in MS word file. Students are instructed not to change any design, pattern, style, and font size while writing the thesis to maintain the uniformity.

PROGRAMME EDUCATIONAL OBJECTIVES

The Department of Pharmacy, Tripura University (A Central University), Suryamaninagar was established in the year 2011 with the goal of imparting postgraduate education and research training in pharmaceutical sciences for the first time in the state of Tripura. The M.Pharm program of the department has been affiliated with Pharmacy Council of India (PCI), New Delhi and AICTE, New Delhi.

The primary objective of the Department of Pharmacy is to develop programs relevant to current global standards to meet the challenges of pharmaceutical industry. The Department of Pharmacy also endeavors for excellence in drug discovery research projects to develop novel therapeutics for contemporary health problems. The department offers Master of Pharmacy (M. Pharm., a four-semester full time program) in Pharmaceutical Chemistry and Ph.D degrees in various disciplines of pharmaceutical sciences.

These programs amalgamate advanced theoretical knowledge with independent research training in the field of drug discovery and pharmaceutical chemistry under the supervision of experienced faculty members. Courses in our curriculum emphasize on promoting discovery of newer therapeutic molecules with better efficacy and safety profile. The candidates receive basic and advance knowledge in the areas of pharmaceutical chemistry, phytopharmaceuticals, nanopharmaceuticals, modern analytical techniques and structure-based drug design research. Therefore, our program enables our students to strive for higher professional achievements in pharmaceutical industry, entrepreneurship as well as academic sector.

Vision

To establish the Department of Pharmacy as a model institute of pharmaceutical research and education in the country to meet the global

challenges of the industry and thereby developing pharmacy professionals with highest professional acumen and achievements.

Mission

- ✓ To establish the department as a center of excellence for research and development in the field of pharmaceutical sciences
- ✓ To impart quality education in pharmacy through teaching learning processes.
- ✓ To carry out pharmaceutical industry oriented interdisciplinary biomedical research.
- ✓ To establish international collaborations for global exchange of the knowledge.

PROGRAM OUTCOMES

- Pharmaceutical Chemistry will inculcate the habit of critical thinking in the minds of the M.Pharm students to engage themselves in developing new drugs for the healthcare and pharmaceutical industries.
- Students will learn about the skills required to do the quality check and quality assurance in the drug compounds and finished formulations.
- Students will learn the advanced and updated researches in the field of drug discovery and drug design.
- Candidates will be trained to discover new drugs from the elements of the organic and natural compounds into their medicinal uses.
- The M.Pharm students can acquire better career in the healthcare and pharmaceutical industry after completing the course.

CURRICULUM STRUCTURE

M. Pharm in Pharmaceutical Chemistry

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPC101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPC1012T	Advanced Organic Chemistry -I	4	4	4	100
MPC103T	Advanced Medicinal chemistry	4	4	4	100
MPC104T	Chemistry of Natural Products	4	4	4	100
MPC105P	Pharmaceutical Chemistry Practical I	12	6	12	150
MPC106S	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Semester II

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
MPC201T	Advanced Spectral Analysis	4	4	4	100
MPC202T	Advanced Organic Chemistry -II	4	4	4	100
MPC203T	Computer Aided Drug Design	4	4	4	100
MPC204T	Pharmaceutical Process Chemistry	4	4	4	100
MPC205P	Pharmaceutical Chemistry Practical II	12	6	12	150
MPC206S	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Semester III

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
MRM301T	Research Methodology and Biostatistics*	4	4		100
MPC302J	Journal club	1	1		25
MPC303D	Discussion/ Presentation (Proposal Presentation)	2	2		50
MPC304R	Research Work	28	14		350
Total		35	21		525

Semester IV

Course Code	Course	Credit Hours	Credit Points	Hrs/Wk	Marks
MPC401J	Journal Club	1	1		25
MPC402R	Research Work and Colloquium	31	16		400
MPC403D	Discussion/Final Presentation	3	3		75
MPC404C	Co-curricular Activities		2		50
Total		35	20		550

COURSE OUTCOMES

M.Pharm 1st Semester	
Subject Code & Subject	Outcomes
MPC101T. Modern Pharmaceutical Analytical Techniques	CO: After completion of course student is able to know about chemicals and excipients. The analysis of various drugs in single and combination dosage forms. Theoretical and practical skills of the instruments.
MPC1012T. Advanced Organic Chemistry -I	CO: Upon completion of course, the student shall be to understand The principles and applications of retrosynthesis The mechanism and applications of various named reactions The concept of disconnection to develop synthetic routes for small target molecule The various catalysts used in organic reactions The chemistry of heterocyclic compounds
MPC103T. Advanced Medicinal Chemistry	CO: At completion of this course it is expected that students will be able to understand Different stages of drug discovery Role of medicinal chemistry in drug research Different techniques for drug discovery

	<p>Various strategies to design and develop new drug like molecules for biological targets</p> <p>Peptidomimetics</p>
<p>MPC104T.</p> <p>Chemistry of Natural Products</p>	<p>CO: At completion of this course it is expected that students will be able to understand-</p> <p>Different types of natural compounds and their chemistry and medicinal importance</p> <p>The importance of natural compounds as lead molecules for new drug discovery</p> <p>The concept of rDNA technology tool for new drug discovery</p> <p>General methods of structural elucidation of compounds of natural origin</p> <p>Isolation, purification and characterization of simple chemical constituents from natural source</p>
<p>MPC105P</p> <p>Pharmaceutical Chemistry Practical - I</p>	<p>CO: Upon completion of course, the student shall understand-</p> <p>Analysis of Pharmacopoeial compounds and their formulations by UV Vis spectrophotometer, RNA & DNA estimation</p> <p>Simultaneous estimation of multi component containing formulations by UV spectrophotometry</p> <p>Experiments based on Column chromatography</p> <p>Experiments based on HPLC</p> <p>Experiments based on Gas Chromatography</p>

M.Pharm 2nd Semester	
Subject Code & Subject	Outcomes
MPC201T Advanced Spectral Analysis	CO: At completion of this course it is expected that students will be able to understand- Interpretation of the NMR, Mass and IR spectra of various organic compounds. Theoretical and practical skills of the hyphenated instruments. Identification of organic compounds.
MPC202T Advanced Organic Chemistry -II	CO: Upon completion of course, the student shall able to understand The principles and applications of green chemistry The concept of peptide chemistry. The various catalysts used in organic reactions The concept of stereochemistry and asymmetric synthesis.
MPC203T Computer Aided Drug Design	CO: At completion of this course it is expected that students will be able to understand Role of CADD in drug discovery Different CADD techniques and their applications Various strategies to design and develop new drug like molecules. Working with molecular modeling softwares to design new drug molecules The in silico virtual screening protocols
MPC204T	CO: At completion of this course it is expected that students will be able to understand

<p>Pharmaceutical Process Chemistry</p>	<p>The strategies of scale up process of APIs and intermediates.</p> <p>The various unit operations and various reactions in process chemistry.</p> <p>To impart knowledge on the development and optimization of a synthetic route/s and the pilot plant procedure for the manufacture of Active Pharmaceutical Ingredients (APIs) and new chemical entities (NCEs) for the drug development phase.</p>
<p>MPC205T</p> <p>Pharmaceutical Chemistry Practical II</p>	<p>CO: At completion of this course it is expected that students will be able to understand.</p> <p>Synthesis of organic compounds by adapting different approaches involving (3 experiments)</p> <p>Oxidation.</p> <p>Reduction/hydrogenation.</p> <p>Nitration.</p> <p>Comparative study of synthesis of APIs/intermediates by different synthetic routes</p> <p>Assignments on regulatory requirements in API</p> <p>Comparison of absorption spectra by UV and Woodward – Fieser rule.</p> <p>Interpretation of organic compounds by FT-IR.</p> <p>Interpretation of organic compounds by NMR.</p> <p>Interpretation of organic compounds by MS.</p> <p>Determination of purity by DSC in pharmaceuticals.</p> <p>Identification of organic compounds using FT-IR, NMR, CNMR and Mass spectra.</p> <p>To carry out the preparation of following organic compounds.</p>

M.Pharm 3rd Semester

MRM 301T Research Methodology and Biostatistics	CO: At completion of this course it is expected that students will be able to understand To develop new scientific tools, concepts and theories to solve and understand scientific and nonscientific problems. To find solutions to scientific, nonscientific and social problems and, To overcome or solve the problems occurring in our everyday life of a research student.
MPC302J Journal Club	CO: A journal club has following outcomes: It will teach and develop critical appraisal skills, increase exposure to rapidly evolving pharmaceutical literature. They provide a unique opportunity to promote interest in research while learning from experts about knowledge gaps and future research questions. Assessing critical appraisal skills for reading and writing a scientific paper and providing an interactive and social opportunity for peer-to-peer learning. Improving small group participation, presentation, and communication skills
MPC303D Discussion /Presentation (Proposal Presentation)	

MPC304R Research Work	
M.Pharm 4th semester	
MPC401J Journal Club	<p>CO: A journal club has following outcomes:</p> <p>It will teach and develop critical appraisal skills, increase exposure to rapidly evolving pharmaceutical literature.</p> <p>They facilitate better knowledge and literature awareness through group discussion with peers.</p> <p>They provide a unique opportunity to promote interest in research while learning from experts about knowledge gaps and future research questions.</p> <p>Assessing critical appraisal skills for reading and writing a scientific paper and providing an interactive and social opportunity for peer-to-peer learning.</p> <p>Improving small group participation, presentation, and communication skills</p>
MPC402R Research Work and Colloquium	
MPC403D Discussion/Final Presentation	

TRIPURA UNIVERSITY

MASTER OF TECHNOLOGY (M.TECH)

IN

COMPUTER SCIENCE AND ENGINEERING



CURRICULUM STRUCTURE

FIRST & THIRD SEMESTER: JULY-DECEMBER
SECOND & FOURTH SEMESTER: JANUARY-JUNE

Tripura University (A Central University)
Suryamaninagar, Agartala, Tripura West-799022

Program Outcomes (PO)

The Program outcomes (PO) of M.Tech (CSE) are given below:

PO1: Knowledge about Technology: Students will have an understanding of the basic foundations of computing.

PO2: Problem Analysis Ability: Students will have an ability to adapt existing models, techniques, algorithms, etc. for efficiently solving problems.

PO3: Technology and Society: Students will have an ability to design, develop and evaluate new computer based systems for novel applications which meet the desired needs of real world.

PO4: Modern Technology: Students will have an ability to undertake original research at the computer vision & its related areas.

PO5: Problem Solving: Students will have an ability to independently carry out research /investigation and development work to solve practical problems.

PO6: Professional Ethics: Students will have an understanding of professional and ethical responsibility.

PO7: Society and IOT: Students will have an understanding of the impact of Internet of Things (IoT) related solutions in an economic, societal and environment context.

PO8: Technical Skill Development: Students will have an ability to apply mathematical foundations and algorithmic principles for modeling and simulation of engineering problems.

PO9: Communication Skill Development: Students will have an ability to write and present a substantial technical report/document.

PO10: Lifelong Learning: Students s will have an ability to learn independently and engage in lifelong learning.

**SYLLABUS FOR M.TECH IN COMPUTER SCIENCE AND
ENGINEERING (CSE)**

M.Tech(CSE) Semester: I								
Theoretical Courses	Subject Code	Subject Name	Marks	L	T	P	C	Core / Optional/ Elective
Paper-I	CSE 901C TH	Design & Analysis of Algorithms	100	04	0	0	04	C
Paper-II	CSE 902C TH	Wireless Communication & Mobile Computing	100	04	0	0	04	C
Paper-III	CSE 903C TH	Image Processing	100	04	0	0	04	C
Paper-IV	CSE 904C TH	Probability and Random Process	100	04	0	0	04	C (Offered by Department of Statistics)
Paper-V		Computer Skills 3	100	04	0	0	04	(As per University Norms) Compulsory Foundation
Sessional Courses	Subject Code	Subject Name	Marks	L	T	P	C	Core / Optional/ Elective
Sessional 1	CSE 905C PR	Image Processing Lab	100	0	0	04	02	C
Sessional 2	CSE 906C PR	Mobile Computing Lab	100	0	0	04	02	C
Total			700	20	0	08	24	

Note.: C –Core, E- Elective, P – Practical, L- Lectures, T- Tutorial

M.Tech(CSE) Semester: II								
Theoretical Courses	Subject Code	Subject Name	Marks	L	T	P	C	Core/Optional/Elective
Paper-VI	CSE 101E TH	Elective Papers:	100	04	0	0	04	E (Offered by Deptt. of CSE)
	CSE 1001 E1	Pattern Recognition						
	CSE 1001 E2	Software Engineering						
Paper-VII	CSE 1002C TH	Theory of Computation	100	04	0	0	04	C
Paper-VIII	CSE 1003C TH	Network Security & Cryptography	100	04	0	0	04	C
Paper-IX	CSE 1004E TH	Elective Papers:	100	04	0	0	04	E (Offered by Deptt. of CSE)
	CSE 1004 E1	Distributed Computing						
	CSE 1004 E2	Introduction of Quantum Computing						
Sessional Courses	Subject Code	Subject Name	Marks	L	T	P	C	Core / Optional/ Elective
Sessional 1	CSE 1005C PR	Term Paper Leading to Thesis	100	0	0	04	02	C
Sessional 2	CSE 1006C PR	Design project	100	0	0	04	02	C
Total			600	16	0	08	20	

Note.: C –Core, E- Elective, P – Practical, L- Lectures, T- Tutorial

M.Tech(CSE) Semester: III							
Thesis Identification, Literature Survey and Plan of Work (Thesis: Phase-I)							
Subject Code	Subject Name	Marks	L	T	P	C	Core / Optional/ Elective
CSE 1101C PR/CSE 1101E PR	Thesis Report Interim	100	0	0	04	04	Core (Open Elective for other Departments)
CSE 1102C PR/CSE 1102E PR	Thesis Seminar Interim (Presentation & VIVAVOCE)	200	0	0	04	04	Core (Open Elective for other Departments)
CSE 1103C PR	Technical Communication	100	0	0	04	02	C
CSE 1104C PR	Workshop and Seminars	100	0	0	02	02	C
CSE1105E TH	Elective Papers:	100	04			04	E
CSE 1105 E1	Business Ethics						E (Offered by Deptt. of MBA)
CSE 1105 E2	Fuzzy Set Theory						E (Offered by Deptt. of Mathematics)
CSE 1105 E3	Financial Management						E (Offered by Deptt. of Commerce)
CSE 1105 E4	Modern Control Systems						E (Offered by Deptt. of Electrical Engineering)
CSE 1105 E5	Big Data and Data Science						E (Offered by Deptt. of CSE)
CSE 1105 E6	IOT Applications and Communication Protocols						E (Offered by Deptt.of CSE)
CSE 1105 E7	Object Detection under Adverse Weather Conditions in Computer Vision						E (Offered by Deptt. of CSE)
CSE 1105 E8	Fluid Mechanics						E
Total		600	04	0	14	16	

Note.: C –Core, E- Elective, P – Practical, L- Lectures, T- Tutorial

M.Tech(CSE) Semester: IV							
Thesis Implementation (Thesis: Phase-II)							
Subject Code	Subject Name	Marks	L	T	P	C	Core / Optional / Elective
CSE 1201C PR/CSE 1201E PR	Thesis Report Final	200	0	0	08	08	Core (Open Elective for other Departments)
CSE 1202C PR/CSE 1202E PR	Thesis Seminar Final (Presentation &VIVA VOCE)	200	0	0	08	08	Core (Open Elective for other Departments)
CSE 1203C PR	Workshop and Seminars	100	0	0	02	02	C
CSE 1204E TH	Open Elective Paper	100	04			04	Open Elective*
Total		600	04	0	18	22	

* Open Elective: As offered by other departments of Tripura University in respective semester under CBCS

Note.: C –Core, E- Elective, P – Practical, L- Lectures, T- Tutorial

Total Credits: 82

SYLLABUS FOR M.TECH IN COMPUTER SCIENCE AND ENGINEERING

First Semester (Total Marks: 700, Total Credit: 24)

Theoretical Courses

Paper-I

CSE 901C TH: Design & Analysis of Algorithms

Credit:4

Course Outcomes (CO):

- i. Understand different complexity measures to analyze the complexity/performance of different algorithms.
- ii. Understand advanced techniques such as greedy algorithms, dynamic programming and know the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems.
- iii. Understand and conduct mathematical proofs for computation and algorithms.

Syllabus:

Introduction: What is Algorithm? Algorithm and its specification. Time Complexity: Asymptotic Notation, Standard Notation and Common Functions, Asymptotic Analysis(Best, Worst, Average Case). Different cases of Time Complexity of Binary Search and Linear Search, Bubble Sort, Quick Sort, Merge Sort, Tournament Sort, Bucket Sort or Radix Sort, Insertion Sort, Selection Sort.

Greedy Algorithm: Activity Selection Problem, Elements of the Greedy Policy, Hoffman Coding, Task Scheduling Problem, Coin Changing Problem/Algorithm, Prim's Algorithm And Kruskal's Algorithm And Comparisons. Knapsack Problem. Scheduling with Minimizing Time in the System.

Shortest Path Algorithm: Dijkstra Algorithm,

Divide and Conquer Method: Multiplying large integers. Strassen Matrix Multiplication. **Dynamic Programming:** Elements of Dynamic Programming, Making Change, Knapsack Problem, Shortest Path (Floyd Algorithm), Matrix Chained Multiplication, Assembly Line Scheduling.

Exploring Graphs: Introduction,

Traversing Trees: Pre order, Post order Numbering. DFS, BFS, Acyclic Graphs. **Backtracking:** Knapsack Problem, Eight Queen's Problem

Branch and Bound: Assignment Problem.

Graph Algorithms:Single Source Shortest Path: Bellman Ford Algorithm, Dijkstra Algorithm.

All Pairs Shortest Path: Short Path of Floyd Warshall Algorithm, Johnson's Algorithm. **Computational Complexity:** Introduction to NP completeness, The Classes P and NP, Polynomial Reduction, NP Cook's Therom Complete Problems NP-completeness; Redurndancy. Approximation algorithms; Randomized algorithms; Linear programming; Special topics: Geometric algorithms (range searching, convex hulls, segment intersections, closest pairs), Numerical algorithms (integer, matrix and polynomial multiplication, FFT, extended Euclid's algorithm, modular exponentiation, primality testing, cryptographic computations),

References:

1. T. Cormen, C. Leiserson, R. Rivest, and C. Stein. Introduction to Algorithms (2nd edition). MIT Press/ McGraw-Hill

2. Michael T. Goodrich and Roberto Tamassia. Algorithm Design: Foundations, Analysis, and Internet Examples. John Wiley & Sons
3. J. Kleinberg and É. Tardos. Algorithm Design. Addison-Wesley, 2005
4. Hovwitt and Sahani, “ Fundamental of Algorithm.

Paper-II

CSE 902C TH: Wireless Communication & Mobile Computing

Credit:4

Course Outcomes (CO):

- i. Learn the basics of wireless communications.
- ii. Demonstrate fundamentals of different generations of cellular network architectures.
- iii. Apply TCP/IP of mobile and wireless network
- iv. Examine the security, energy efficiency, mobility etc. as well as their special features.

Syllabus:

Wireless Communication – Wired and wireless, Mobility of users and equipments, Overview of Electromagnetic Spectrum. Overview of Satellite Networks. Concepts of Spread Spectrum, CDMA System. Concepts of Cellular Network and related technologies like GSM, 3G network architecture and operations, 4G LTE network architecture and operations, Different architectural entities of 5G network and their operations, Migration from LTE to 5G.

Mobile Computing – Characteristics, Infrastructure vs Infrastructureless Networks, Wireless LANs - Data link layer protocols, TCP protocols. Routing Protocols in Mobile Adhoc Network (MANET), Overview of Bluetooth Technology. Overview of Sensor Networks. Concepts of Mobile IP, Wireless Application Protocols and others. Overall security requirements and considerations in wireless and mobile computing systems. Concepts of fault tolerance.

References:

1. V.K.Garg & J.E.Wilks: Wireless and Personal Communication Systems: Fundamentals and Applications, IEEE Press and Prentice Hall, 1996.
2. T.S.Rappaport, B.D.Woerner and J.H. Reed: Wireless Personal Communications: The Evolution of PCS, Dkyener Academic, 1996.
3. G.I. Stuber: Principles of Mobile Communication, Kluener Academic, 1996.
4. U.Black: Mobile and Wireless Networks, Prentice Hall PTR, 1996.
5. Charles Parkins – Mobile Adhoc Networks
6. Wireless Communication- W. Stallings
7. Mobile Communication – J. Schiller
8. Introduction to Wireless and Mobile Systems – Dharma Prakash Agarwal and Qing-An Zeng
9. Mobile Computing – Raj Kamal
10. Research Papers of International Journals, Proceedings of Conferences and other online resources.

Paper-III

CSE 903 TH: Image Processing

Credit:4

Course Outcomes (CO):

- i. Understand the basic theory and algorithms/ techniques that are widely used in digital image processing.
- ii. Understand image analysis algorithms.
- iii. Understand current applications of Image Processing.
- iv. Develop hands-on experience in using computers to process images.

Syllabus:

Introduction, image definition and its representation, neighbourhood. Orthogonal transformations like DFT,DCT, Wavelet.

Enhancement: contrast enhancement, smoothing and sharpening, filtering and restoration

Segmentation: pixel classification, global/local gray level thresholding, region growing, split/merge techniques, edge detection operators, Hough transform. Image feature/primitive extraction, component labelling, medial axis transform, skeletonization/thinning, shape properties, textural features – moments, gray level co-occurrence matrix, structural features, Fourier descriptor, polygonal approximation. Compression: coding, quantization, spatial and transform domain-based compression. Color image processing: color model, enhancement, and segmentation.

Mathematical morphology: basic concepts, erosion, dilation, opening, closing. Advanced applications like biomedical image processing, digital watermarking, etc

References:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, Addison-Wesley, California, 1993.
2. Rosenfeld and A. C. Kak, Digital Picture Processing, Vol. 1 & 2, 2nd ed. Academic Press, Inc. 1982.
3. Chanda and D. Dutta Mazumdar, Digital Image Processing and Analysis, Prentice Hall of India, NewDelhi, 2000.

Paper-IV

CSE 904C TH: Probability and Random Processes

Credit:4

Course Outcomes (CO):

- i. Understand concepts of probability, conditional probability and independence.
- ii. Understand the axiomatic formulation of modern Probability and the concept of random processes and determine covariance and spectral density of stationary random processes.
- iii. Understand and apply the concepts of filtering and prediction of a random process.

Syllabus:

1. **Sample space and events**, Probability axioms, conditional probability, independence of events, Bayes' rule. [3 lectures]
2. **Random variables** -discrete and continuous. Expectations, Moments, Tchebyshev's inequality, Characteristic function. Functions of one random variable. [6 lectures]
3. **Discrete distributions:** Binomial, Poisson, and continuous distributions: uniform, normal, exponential, gamma, Weibull etc. [7 lectures]

4. **Stochastic convergence** and limit theorems. [4 lectures]
5. **Mean Square Estimation**– linear regression. [3 lectures]
6. **General concepts** of stochastic processes, Markov chains, Markov processes [5 lectures]
7. **Power spectrum**, spectral representation, basic spectral estimation, [3 lectures]
8. **Entropy** [2 lectures]
9. **Random walks**, shot noise, deterministic signals in noise, [3 lectures]
10. **Queuing theory** (M/M/1 and M/M/C). [4 lectures]

References:

1. Probability, Random Variables and Stochastic Processes – fourth Edition” by A. Papoulis and S. U.Pillai, McGraw Hill Education (India) Pvt. Ltd., New Delhi.
2. Probability & Statistics with Reliability, Queuing and Computer Science Applications. Kishore S.Trivedi. Eastern Economy Edition, PHI.
3. Stochastic Processes. J. Medhi. 3rd Edition, New Age. International, 2009.
4. *Fundamentals of Mathematical Statistics: A Modern Approach*. S. C.Gupta (Prof.), Dr. V. K. Kapoor. Edition,Publisher, Sultan Chand, 2000.

Paper V

Computer Skill-III

Credit:4

Course Outcomes (CO):

- i. Understand the various insights and fundamentals of programming languages (python/ C/ C++/ Java).
- ii. To implement and solve various real world research problems using programming languages.
- iii. Develop problem-solving skills: Think logically, computationally, and creatively to solve problems.
- iv. To Identify and analyze a problem, design a solution algorithm as a systematic way of processing the necessary information to produce the required output, and implement the solution as a computer program.
- v. Gain a broad exposure to topics in computing and its related disciplines.

Syllabus:

Python/ JAVA programming Language

Prescribed by the University centrally.

Sessional Courses

Sessional 1

CSE 905 PR: Image Processing Lab

Credit:2

Course Outcomes (CO):

- i. Develop hands-on experience in using computers to process images and solve various real world problems.
- ii. Develop skills using programming languages for realization and implementation of image processing problems.

Syllabus:

Understanding about different types of Digital images; Conversion between image data types; Basics of image display; Arithmetic Operations; Histogram Analysis; Neighborhood Processing; Image Geometry; The Fourier Transform of an image; Image Segmentation, Edge Detection; Morphological Operation; Color Image Processing; Image Compression; Wavelet Analysis

References Book:

1. "Digital Image Processing using Matlab", Rafael C. Gonzalez, Richard E. Woods, Steven Eddins.
2. "Mastering in Matlab", Duane C. Hanselman. Pearson Education.

Sessional 2

CSE 906 PR: Mobile Computing Lab

Credit:2

Course Outcomes (CO):

- i. Learn the implementation of CDMA.
- ii. Understand the frequency of the distribution in cellular network.
- iii. Implement different routing protocols of ad-hoc network in different simulation tools.
- iv. Pursue their research work in the field of Mobile Computing.

Syllabus:

Implementation of Code Division Multiple Access (CDMA); Write a program to divide a given area into equal hexagon and divide the given frequency range into the cells to create clusters; Study of Network Simulation tools; Implementation of AODV, DSR, OLSR and other routing protocols in simulation tool and their study; Implementation of wireless sensor network in simulation tool; Study assignment on: Bluetooth and Wireless Application Protocol (WAP).

References:

1. Mobile Communication – J. Schiller.
2. Mobile Computing – Raj Kamal.
3. Research Papers of International Journals, Proceedings of Conferences and other online resources.

Second Semester (Total Marks: 600, Total Credit:20)

Theoretical Courses

Paper-V

CSE 101E TH: Elective Papers

Credit:4

CSE 101E1: Pattern Recognition

Course Outcomes (CO):

- i. Understand the basics and fundamentals of statistical techniques commonly used in pattern recognition problem.
- ii. Understand the concepts of machine learning and deep learning techniques and various real world problems that can be handled by learning algorithms/ techniques.
- iii. Compare and contrast different pattern recognition algorithms.
- iv. Apply the concepts of machine learning and deep learning algorithms in real life problems.
- v. Understand the concepts of decision making and modelling as a problem solving approach.

Syllabus:

Introduction to pattern recognition and learning (supervised, unsupervised), training and test sets, feature selection.

Supervised learning and classification: Discriminant functions and decision boundaries Linear discriminant functions, relaxation procedure, non-separable behaviour Minimum distance classifier. Bayesian decision theory. Maximum likelihood classification. Parameter estimation, sufficient statistics, component analysis and discriminants (PCA, Fisher's) Nonparametric techniques. Density estimation, Parzen window, K-NN estimation, Decision Tree, SVM.

Unsupervised learning and clustering: Data description and clustering –similarity measures, criterion for clustering, Methods of clustering – partitional: KMean, KMode, KMedian, FCN, hierarchical, graph theoretic, density based, Cluster validity

Feature extraction and feature selection: Problems of dimensionality- Feature extraction --PCA-Feature selection –KarhunenLoeve, stochastic approximation, kernel approximation, divergence measures

References:

1. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification and Scene Analysis, 2nd ed., Wiley, New York, 2000.
2. J. T. Tou and R. C. Gonzalez, Pattern Recognition Principles, Addison-Wesley, London, 1974.

CSE 101 E2: Software Engineering

Introduction and Brief Overview - Software process, modeling and analysis, software architecture, software design. **Software Modeling, Analysis, Testing** - Analysis modeling and best practices, traditional practice diagrams such as DFDs and ERDs etc, **Traditional Testing techniques** – white box and black box testing. **Object-Oriented Software Engineering - Concept of OO Software** – Design and Analysis, Overview of various UML diagrams and UML analysis modeling, analysis case studies, analysis tools, analysis patterns, OO software testing. **Case study with complete examples Software Architecture** -

Architectural styles, architectural patterns, analysis of architectures, formal descriptions of software architectures, architectural description languages and tools, scalability and interoperability issues, web application architectures, case studies. **Software Design** - Design best practices, design patterns, extreme programming, refactoring, design case studies, component technology, object oriented frameworks, distributed objects, object request brokers, case studies. Web Engineering, Clean room Engineering and other recent topics.

References:

1. G. Booch, J. Rumbaugh, and I. Jacobson, I. The Unified Modeling Language User Guide. Addison-Wesley, 1999
2. E. Gamma, R. Helm, R. Johnson, and J. Vlissides. Design Patterns: Elements of Reusable Object-Oriented Software. Addison-Wesley, 1995
3. M. Shaw and D. Garlan. Software Architecture: Perspectives on an Emerging Discipline. Prentice-Hall, 1996
4. L. Bass, P. Clements, and R. Kazman. Software Architecture in Practice, Addison-Wesley, 1998
5. J. Rumbaugh, I. Jacobson, and G.Booch. The Unified Modeling Language Reference Manual. Addison Wesley Longman, 1999.
6. Jacobson, G. Booch, and J. Rumbaugh, and I. Jacobson. The Unified Software Development Process. Addison Wesley Longman, 1999.
7. J. Rumbaugh, M. Blaha, W. Premerlani, F. Eddy, and W. Lorensen. Object-oriented Modeling and Design. PHI, EEE, 1997.
8. G. Booch. Object-Oriented Analysis and Design with Applications. Second Edition. Benjamin Cummings, 1994.
9. Jim Conallen. Building Web Applications with UML. Addison-Wesley, 2000.
10. K. Beck. Extreme Programming Explained. Pearson Education Asia, 2000.
11. Software engineering – design, reliability and management – Schuman Mar.
12. Software engineering – Pressman.

Paper-VII

CSE 1002C TH: Theory of Computation

Credit:4

Course Outcomes (CO):

- i. Understand the requirements and applications of each phase of compiler and various compilation techniques needed to obtain high performance on modern computer architectures.
- ii. Understand different optimization techniques and difference between them.
- iii. Understand formal language theory and its application to computer science.
- iv. Apply mathematical preliminaries to develop the basic components of language design.
- v. Design simple computational machines using the concepts of language theory Correlate computability with formal computational machines.

Syllabus:

Optimization and decision problems, Reductions, Turing Machine as an acceptor and as an enumerator—**Techniques of Turing Machine construction** – parallel tracks and storage in control, subroutine Turing Machine, Church-Turing thesis, **Variants of Turing Machine** –multitape, **nondeterministic**—their equivalences with other models. Properties of recursively enumerable and recursive sets. Relations between unrestricted grammars and Turing Machines. **Linear Bounded Automata** —relation with Context Sensitive

Languages Enumeration of Turing Machines, existence of undecidable problems, Undecidable problems involving Turing Machines and CFG's. Universal Turing Machine as a model of general-purpose computer, **Post Correspondence Problem** – Applications, valid and invalid computations of Turing Machines. Time and Space complexity of Turing Machines, NP- completeness.

References:

1. John C. Martin: Introduction to languages and the theory of computation, 2nd Ed., McGraw Hill.
2. D.P. Bovet & P. Gescenzi: Introduction to Theory of Complexity, PH.
3. Rozenberg & Salomaa: Handbook of Formal languages, Vol. I&II.

Introduction: Introduction to language theory, tokens. Alphabets, definition of grammar Production rules, sentences, sentential forms, language definitions, derivations. **Regular languages:** Pumping Lemma of regular sets, Minimization of finite automata. Chomsky Hierarchy of languages. **Finite Automata:** Finite automaton, Deterministic, Non-Deterministic and equivalence. Transition diagrams, epsilon transitions, Equivalence of regular expressions and FA. Moore and Mealy machines. **Context Free Language:**

Relations between classes of languages, Context Free Grammar, Derivation trees, ambiguity simplification, Normal forms, applications. **Lexical Analysis:** Interface with input, parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, error reporting, and implementation. Regular definition, Transition diagrams, LEX. **Syntax analysis:** context free grammars, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, Bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC. **Pushdown Automata:** Pushdown automata, definitions, context free languages, construction of PDA for simple CFLs, Linear bounded automata. **Turing machines:** Turing machines, Introduction to computability, Universal Turing Machines, Types of Turing Machines, Techniques for construction of Turing machines, Halting problem. Assembler, Loader, Linker: basic concept; absolute and Relocatable, assemblers and macroprocessors Linkers- concept and design; loaders, different types. Editors and debuggers. Interpreters. Compilers: - Various phases; lexical analyzers- design. Parsing top down (L.L. (1) and recursive descent), bottom- up, (Shift – reduce concept to L.R. (1) symbol tables, error handling. Syntax – directed Translation – attributes and intermediate codes. Optimization concepts and machine code. Generation Use of LEX and YACC.

Reference Books:

1. John C. Martin: Introduction to languages and the theory of computation, 2nd Ed., McGraw Hill.
2. D.P. Bovet & P. Gescenzi: Introduction to Theory of Complexity, PH.
3. Rozenberg & Salomaa: Handbook of Formal languages, Vol. I&II.

Paper-VIII

CSE 1003C TH: Network Security & Cryptography

Credit:4

Course Outcomes (CO):

- i. Will be able to understand different threats and vulnerabilities of network and their countermeasures.
- ii. Describe the services and processes used in network security.
- iii. Use a variety of techniques for cryptography.
- iv. Conduct research in the burgeoning fields of cryptography and network security.

Syllabus:

Network Security: Basic Security Concepts, Threats, Vulnerabilities, Different types of attacks, Digital Signatures, and Certification Authorities, Kerberos Key Exchange, Encryption on the World Wide Web, E-Mail Security, Operating System Security, LAN Security, Virtual Private Networks, Firewalls, Intrusion Detection, Crisis Management.

Suggested Text:

1. John E. Canavan, "Fundamentals of Network Security", Artech House, 2001.
2. William Stallings, "Cryptography and Network Security: Principles and Practice", Prentice Hall, 2006.

References:

1. Matt Bishop and Sathyanarayana S.Venkatramanayya, "Introduction to Computer Security", Pearson Education, 2005.
2. Matt Bishop, "Computer Security: Art and Science", Pearson Education, 2003.
3. Nitesh Dhanjani and Justin Clarke, "Network Security Tools", O'Reilly, 2005.

Cryptography: Basics of stream cipher and block cipher, Methods of breaking cipher, Encryption Techniques such as, DES, IDEA, CAST, RC4, Diffie Hellman, RSA, Hashing techniques such as, MD5, SHA, Extended Euclidean Algorithm, Congruence, Chinese Remainder Theorem, Euler's Theorem, Primitive elements and conjugates in finite fields, Quadratic Reciprocity Law, Jacobi and Legendre's symbols, Gaussian Integers, Carmichael Numbers and strong pseudoprimes, Addition Chain Problems, Factorization schemes of Solovay-Strassen, Miller-Rabin, Pollard, Factor bases and Continued Fraction methods, Classical Cyphers and one time pad, Massey O'Mara, El Gamal Schemes, Mental Poker, Access Control, Elliptic curve Cryptosystems and Factorization-Lenstra's Algorithm, Golay Code, MDS Codes, Krawtchouk Polynomials, Designs and codes-intersection numbers of t-designs.

References:

1. Bruce Schneier: Applied Cryptography, Second Edition: Protocols, Algorithms, Wiley
2. Neal Koblitz: A Course in Number Theory and Cryptography, Springer.
3. Irtlnsnf& Rosen: Second Course in Number Theory, Springer.
4. Evangels Kramakis: Primality & Cryptography, John Wiley.
5. Mc Williams & Sloanne: Theory of Error Correcting Codes, Vol. I & II, Elsevier.
6. Steven Roman: Coding and Information Theory, Springer.
7. Atul Kahate: Cryptography and Network Security, Mc Graw Hill
8. Bernard Menezes: Network Security and Cryptography, Cengage Learning

Paper-IX

CSE 1004E TH: Elective Papers

Credit:4

CSE 1004 E1: Distributed Computing

Course Outcomes (CO):

- i. List and summarize the distributed computing principles, as well as the complications and difficulties that these principles entail.
- ii. Understand the concepts of distributed computing, synchronous and asynchronous processes.
- iii. Utilize the idea of shared data and files.
- iv. Use a web-based distributed system.

- v. Recognize how important distributed system security is.

Syllabus:

Introduction: Definitions, Motivations, Consequences, Examples, Advantages and Disadvantages, Design Challenges/Issues, System models, NOS, Middleware, Shared Memory Systems, Message Passing Systems, **Concept of time:** Physical Clock, Clock Drift, Skew, Clock Synchronization Algorithms, Network Time Protocol, Logical clocks, Vector Clocks, Causal ordering, Global State **Distributed Mutual Exclusion Algorithms:** Central-server algorithm, Ring-based algorithm, Lamport's algorithm, Ricart and Agrawala's algorithm, Maekawa's voting-based algorithm, Suzuki-Kasami's Broadcast algorithm, Raymond's tree-based algorithm, **Leader Election Algorithms and their complexity analysis:** LCR, HS, Chang Roberts, Peterson leader election algorithm, Bully Algorithm. **Guarded Commands** - Atomicity-Fairness Central and Distributed Schedulers. **Correctness Criteria** - proving safety and liveness properties. Client Server Computing. **Fault Tolerant Systems**-Fault Classification. **Distributed Consensus**-Byzantine Generals problem-Atomic Broadcast.

References:

1. George Coulouris: Distributed Systems: Concepts and Design, Pearson.
2. N.A.Lynch: Distributed Algorithms, Morgan Kaufmann Publishing Inc., CA,1996.
3. Tel: Introduction to Distributed Algorithms.
4. A.S. Tanenbaum: Distributed Operating Systems. Prentice Hall, N.J.,1995.

CSE 1004 E2: Introduction of Quantum

Computing Mathematical foundations and quantum mechanical principles

[8 lectures]

1. Finite dimensional inner product spaces, Hermitian and unitary operators, projection operators, commutators
2. Hilbert space as state space, Schrodinger equation and time evolution, measurement, Heisenberg uncertainty relation, Dirac notation, density operators, quantum entanglement

Qubits, quantum gates and quantum circuits [20 lectures]

1. Concept of qubit, representation of qubit in Bloch Sphere, Multi qubit quantum state representation
2. Single, Two and Multi-qubit quantum gates, Matrix representation of gates, universal gates for quantum computing.
3. Quantum Circuit, Reversible Computation using quantum circuits, quantum parallelism, quantum circuit representation, quantum computing language (QCL) for quantum process description, Quantum Circuit description languages
4. Quantum Adder Circuits, Quantum Fourier transform Circuit, Quantum Multiplier, Quantum Shift register.
5. Quantum Physical Machine Description, Quantum Circuit Cost.
6. Synthesis techniques for quantum circuit

Quantum algorithms [12 lectures]

1. Elements of quantum automata and quantum complexity theory.
2. Deutsch's algorithm, Deutsch-Jozsa Algorithm and the Bernstein-Vazirani Algorithm, Simon's

- algorithm
3. Quantum Fourier transform, Shor's Algorithm and its applications.
 4. Grover's algorithm for searching and its applications.

References:

1. Quantum Computation and Quantum Information by Michael Nielsen and Isaac Chuang, Cambridge Univ. Press.
2. P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press

Good lecture notes:

1. John Preskill's lecture notes-<http://www.theory.caltech.edu/people/preskill/ph229/>
2. David Mermin's lecture notes-<http://people.ccmr.cornell.edu/mermin/qcomp/CS483.html>

Sessional Courses

Sessional 1

CSE 1005C PR: Term Paper Leading to Thesis

Credit:2

Course Outcomes (CO):

- i. Understand the various advanced topics in computer science and engineering for real-world applications.
- ii. Synthesize and integrate material from primary and secondary sources with their own ideas in research papers.

Sessional 2

CSE 1006C PR: Design Project

Credit:2

Course Outcomes (CO):

- i. Solve certain real world practical problems in the domain of computer science and engineering and other interdisciplinary research areas.

Third Semester (Total Marks: 600, Total Credit: 16)

Thesis Identification, Literature Survey and Plan of Work (Thesis: Phase-I)

CSE 1101C PR: Thesis Report Interim

Credit:4

Course Outcomes (CO):

- i. Conduct independent research in some advanced topics of Computer Science and Engineering and interdisciplinary research areas.
- ii. Produce a thesis of publishable quality.

CSE 1102C PR: Thesis Seminar Interim (Presentation & Viva-Voce)

Credit:4

Course Outcomes (CO):

- i. Effectively present and defend research orally with value added applications.

CSE 1103C PR: Technical Communication

Credit:2

Course Outcomes (CO):

- i. Understand the various blocks of the writing process and apply them to technical writing tasks.
- ii. Understand basic sources and methods of research and documentation on topics in computer science and engineering.
- iii. Understand the ethics (Plagiarism) related to writing and publishing research works in well renowned Journals/ Conferences/ Books.

CSE 1104C PR: Workshop and Seminars

Credit:2

Course Outcomes (CO):

- i. Understand advanced topics and various scope of research in the domain of computer science and engineering.
- ii. Meet various well renowned researchers and experts in the domain of computer science and engineering.

CSE 1105 E TH: Elective Papers

Credit:4

CSE 1105 E1: Business Ethics
(Offered by Deptt. Of MBA)

CSE 1105 E2: Fuzzy Set Theory
(Offered by Deptt. Of Mathematics)

CSE 1105 E3: Financial Management
(Offered by Deptt. Of Commerce)

CSE 1105 E4: Modern Control System
(Offered by Deptt. Of Electrical Engineering)

CSE 1105 E5: Big Data and Data Science

Course Outcomes (CO):

- i. Understand the key issues and basic building blocks of big data and its management.
- ii. Understand the basic concepts of enabling techniques and scalable algorithms in the field of big data analytics.
- iii. Understanding the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modelling, and statistics.
- iv. Apply algorithms to build machine intelligence.

Syllabus:

Data Science History; Pioneers; and Modern Trends, Taxonomy, The Curse of Big Data, New Types of Metrics, Three Classes of Metrics, Relationship among Metrics, 5V of Data Science **6L**

Introduction to Big data Platform, Traits of Big data, Challenges of Conventional Systems, Evolution Of Analytic Scalability, Analytic Processes and Tools, Analysis vs. Reporting **6L**

Modern Data Analytic Tools, Data Structure, Overview of R language, Data Types, Accessing Data, Cleaning Data **6L**

Basic Statistical Concepts: Sampling Distributions; Re-Sampling; Statistical Inference; Prediction Error, Hash Joins, Model-Free Confidence Intervals, K-means Clustering, Independent Sample Tests, Basic Association Analysis, Association Rule Speedup **8L**

Linear regression part 1, Linear regression part 2, Logistic regression, Naïve Bayes, Decision trees part 1, Decision trees part 2, Correlation and R-Squared for Big Data, Monte Carlo Simulations **6L**

Introduction to Hadoop/MapReduce, The MapReduce paradigm & Hadoop and HDFS overview, When to Use MapReduce, What MapReduce Can't Do, Comparison between SQL and NoSQL DBs, Overview on BigTable; Hive and Pig, Visualization tools **8L**

CSE 1105 E6: IOT Applications and Communication Protocols

Course Outcomes (CO):

- i. Basic introduction of all the elements of IoT-Mechanical, Electronics/sensor platform, Wireless and wireline protocols, Mobile to Electronics integration, Mobile to enterprise integration.
- ii. Open source/commercial electronics platform for IoT-Raspberry Pi, Arduino , ArmMbedLPC.
- iii. Open source /commercial enterprise cloud platform for IoT-Ayla, iO Bridge, Libellium, Axeda, Cisco fog cloud.

Syllabus:

Introduction and Applications: smart transportation, smart cities, smart living, smart energy, smart health, and smart learning.

Basic function and architecture of a sensor — sensor body, sensor mechanism, sensor calibration, sensor maintenance, cost and pricing structure, legacy and modern sensor network.

Development of sensor electronics — IoT vs legacy, and open source vs traditional PCB design style

Development of sensor communication protocols, Protocols: Modbus, relay, Zigbee, Zwave, X10, Bluetooth, ANT, etc.

Business driver for sensor deployment — FDA/EPA regulation, fraud/tempering detection, supervision, quality control and process management

Different kind of calibration Techniques: manual, automation, infield, primary and secondary calibration — and their implication in IoT

Powering options for sensors: battery, solar, Witricity, Mobile and PoE

Zigbee and Zwave — advantage of low power mesh networking. Long distance Zigbee. Introduction to different Zigbee chips.

Bluetooth/BLE: Low power vs high power, speed of detection, class of BLE. Introduction of Bluetooth vendors & their review. Wireless protocols such as Piconet and packet structure for BLE and Zigbee

Other long distance RF communication link. LOS vs NLOS links, Capacity and throughput calculation

Application issues in wireless protocols: power consumption, reliability, PER, QoS, LOS. PCB vs FPGA vs ASIC design. Prototyping electronics vs Production electronics. QA certificate for IoT-CE/CSA/UL/IEC/RoHS/IP65.

Basic introduction of multi-layer PCB design and its workflow

Electronics reliability-basic concept of FIT and early mortality rate

Environmental and reliability testing-basic concepts

Basic Open source platforms: Arduino, Raspberry Pi, Beaglebone

Introduction to Mobile app platform for IoT: Protocol stack of Mobile app for IoT, Mobile to server integration, iBeacon in iOS, Windows Azure, Linkify Mobile platform for IoT, Axeda, Xively

Database implementation for IoT : Cloud based IoT platforms, SQL vs NoSQL, Open sourced vs. Licensed Database, Available M2M cloud platform, AxedaXively, Omega NovoTech, Ayla Libellium, CISCO M2M platform, AT&T M2M platform, Google M2M platform.

Recent trends in home automation, IOT-locks, Energy optimization in home

References:

1. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, Wiley-Blackwell.
2. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li.
3. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by Nicos Komninos.
4. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony Townsend

CSE 1105 E7: Object Detection under Adverse Weather Conditions in Computer Vision

Chapter-1: Introduction to Object Detection, **Chapter-2:** Challenges of adverse weathers in outdoor scenarios, **Chapter-3:** Particle behaviours in different bad weather, **Chapter-4:** scattering & absorption, **Chapter-5:** Image acquisition in presence of different particles, **Chapter-6:** Objects under thermal sensors for detection task, **Chapter-7:** Statistical feature analysis of different weather condition, **Chapter-8:** Background of Image degradation due to atmospheric/ weather conditions, **Chapter-9:** Object detection using visual sensor in degraded condition, **Chapter-10:** visibility enhancement of outdoor scenes in degraded conditions, **Chapter-11:** Influence of visibility enhancement for high level computational task in degraded outdoor scenes.

CSE 1105 E8 Fluid Mechanics

Fourth Semester ((Total Marks: 600, Total Credit: 22))

Thesis Implementation (Thesis: Phase-II)

CSE 1201C PR: Thesis Report Final

Credit:8

Course Outcomes (CO):

- i. Conduct independent research in some advanced topics of Computer Science and Engineering and interdisciplinary research areas.
- ii. Produce a thesis of publishable quality.

CSE 1202C PR: Thesis Seminar Final (Presentation & Viva-Voce)

Credit:8

Course Outcomes (CO):

- i. Effectively present and defend research orally with value added applications.

CSE 1203C PR: Workshop and Seminars

Credit:2

CSE 1204E TH: Elective Papers

Credit:4

M.Tech.
in
Electrical Engineering
Tripura University
(A Central university)
Tripura, India

syllabus

(Course Structure (Electrical Engineering))

1st Semester: 700

Theoretical Courses	Subject Code	Subject Name	Marks	L	T	P	C	Core/Optional Elective
Paper-I	MEE -901 C	Modern Power System Operation and Control	100 *(70+30)	04	0	0	04	C
Paper-II	MEE -902 C	Modern Control Systems	100 *(70+30)	04	0	0	04	C
Paper-III	MEE - 903C	Nonconventional Energy Sources and Power Generation	100 *(70+30)	03	0	0	03	C
Paper-IV	MEE -904 E	<u>Elective Papers :</u>	100 *(70+30)	03	0	0	03	E
	MEE -904 E1	DSP and Communication Networking						E
	MEE -904 E2	Image Processing						E (Offered by Department of CSE)
	MEE -904 E3	Probability and Random Processes						
	MEE -904 E4	Introduction of Quantum Computing						E
	MEE -904 E5	Fuzzy Set Theory						E (Offered by Department of Mathematics)
	MEE -904 E5	Advance Mathematics						E
Compulsory Foundation Course	Computer Skill III	JAVA Software	100 *(70+30)	04	0	0	04	CFC (offered by IT or CSE)
Sessional Courses	Subject Code	Subject Name	Marks					
Sessional 1	MEE 905P	Power system Simulation Lab	100 *(70+30)	0	0	04	02	C
Sessional 2	MEE 906P	Control and Measurement Lab	100 *(70+30)	0	0	04	02	C
Total			700	18	0	08	22	

*70 (Theory) + 30 (Internal Assessment)

2nd Semester: 600

Theoretical Courses	Subject Code	Subject Name	Marks	L	T	P	C	Core/ Elective
Paper-V	MEE- 1001 C	Power Electronics Converters	100 *(70+30)	04	0	0	04	C
Paper-VI	MEE- 1002 C	Power System Protection and Switchgear	100 *(70+30)	04	0	0	04	C
Paper-VII	MEE- 1003 E	Elective Papers :	100 *(70+30)	03	0	0	03	E
	MEE- 1003 E 1	Optical Information Processing						E
	MEE- 1003 E 2	Advance Electrical Drives						E
	MEE- 1003 E3	Smart Grid						E
	MEE -1003 E4	Fuzzy Logic and Application						E (offered by Department of Mathematics)
	MEE -1003 E4	Network Security and Cryptography						E (Offered by Department of CSE)
Paper-VIII	MEE 1004 E	Elective Papers	100 *(70+30)	03			03	E
	MEE -1004 E 1	EMI/EMC						E
	MEE- 1004 E 2	Power Electronics Application in Power System						E (Offered by Department of CSE)
	MEE- 1004 E 3	VLSI						E
Sessional Courses	Subject Code	Subject Name	Marks					
Sessional 1	MEE -1005- P	Power Electronics Lab	100 *(70+30)	0	0	04	02	
Sessional 2	MEE -1006 -P	Design Project&Term Paper Leading to Thesis	100 *(70+30)	0	0	04	02	
Total			600	14	0	08	18	

*70 (Theory) + 30 (Internal Assessment)

3rd Semester: 500 Marks

Thesis Identification, Literature Survey and Plan of Work (Thesis: Phase-I)

Subject Code	Subject name	Marks	L	T	P	C	Core/ Elective
EE -1101 C	Thesis Report Interim	100	0	0	04	04	C
EE -1102 C	Thesis Seminar Interim (Presentation & VIVA-VOCE)	200	0	0	04	04	C
EE -1103 C	Technical Communication	100	0	0	04	02	C
EE -1104 C	Workshop and Seminars	100 *(70+30)	0	0	02	02	C
EE -1005 E	Elective Papers	100 *(70+30)	04	0	0	04	E
EE -1005 E1	Artificial Neural Network						E
EE -1005 E2	Fundamental of Business managements						E (offered by MBA Department)
EE -1005 E3	Wireless Communication and Mobile Computing						E (offered by CSE Department)
EE -1005 E4	Special Electrical Machine						E
EE-1005 E5	Advance Electromagnetic & Antenna Theory						E (offered by ECE Department)
Total		600	04	0	10	16	

4th Semester: 400 Marks

Thesis Implementation (Thesis: Phase-II)

Subject Code	Subject name	Marks	L	T	P	C	Core/ Elective
MEE -1201	Thesis Report Final	200	0	0	08	04	C
MEE -1202	Thesis Seminar Final (Presentation & VIVA- VOCE)	200	0	0	08	04	C
MEE -1203	Workshop and Seminars	100 *(70+30)	0	0	02	01	C
MEE -1204 E	Elective Papers	100 *(70+30)	03	0	0	03	E
MEE -1204 E1	Advance Electronics						E (offered by Physics Department)
EE -1204 E2	Bioinformatics Sequence Analysis						E (offered by Molecular Biology & Bioinformatics Department)
EE-1204 E3	Sensor and System						E
Total		600	03	0	16	12	13

Total Credits: 68 Total Marks 2500

Program Outcomes

A post graduate in Electrical Engineering will be able to: -

1. Engineering knowledge:

Apply the knowledge of mathematics, science, electrical engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis:

Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems:

Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage:

Demonstrate their technical ability to design and analyze Electrical Engineering circuits, computer based programs through Logic Controller, PSCAD, ETAP, MATLAB, Lab-VIEW, Open LCA, Arduino and IOT.

6. Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

7. Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

8. Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

9. Self learning and entrepreneurship:

Graduate will be able to participate and succeed in campus placements and competitive examinations like Public sector, GATE etc. An understanding of the industry needs through direct exposure with the industries under the Entrepreneurship Development Cell.

10. Higher education and research:

An ability to take interest in higher education, research avenues through various trainings and research laboratory exposure.

Syllabus

1st Semester

MEE 901: Modern Power Systems Operation and Control

100 Marks

Learning Outcome:

On successful completion of the course students will be able to:

- Know the optimal power flow condition in power system.
- Understand Load frequency Control and Automatic Generation Control and distributed generation.
- Understand the load flow in power system operation.
- Analyze Key Issues in Power System Stability problem and Stability Problems faced by modern Power Systems
- Understand the voltage stability and reliability of the power system under power system operation and control

Syllabus: Operation and control of modern power systems, Power system deregulation; Load flow and stability studies; optimal power flow, distributed generation, magneto hydrodynamic generation, power system reliability, voltage stability.

Books:

1. J.DuncanGlover, M.S.Sharma, T.J.Overbye, " Power System Analysis & Design", Cengage Learning
2. D.P.Kothari, I.J. Nagrath, " Modern Power System Analysis", Mc Graw Hill, 2016
3. T.K. Nagsarkar, M.S. Sukhija, " Power System Analysis", Oxford 2013

MEE 902: Modern Control Systems

100 Marks

Learning Outcomes:

After successful completion of the course, student will be able to:

- Understand mathematical models of linear discrete-time control systems using transfer functions and state-space models
- Analyze steady state behaviors of discrete time control systems.
- Understand sampled system , Shannon's sampling theorem, Final and Initial value theorem
- Understand the role of Z transform, inverse z transform, and discrete equations, sampler, Holding device
- Student can able to analyze the stability of any discrete data control system
- Analyzes the considered MIMO discrete time system.(State space Model, Controllability , observability)
- Design state feedback controller of considered discrete time control system
- Design compensator and discrete controller for considered system

Syllabus: Sampled data control systems, sampling process, ideal sampler, Shannon's sampling theorem, sampling time selection, zero order hold (ZOH).The z-transform, inverse Z-Transform pulse transfer function of ZOH, system stability, z-plane stability, polar plot analysis, stability analysis using root locus diagrams, Z-plane steady state error analysis, State-space models of discrete time systems, Controllability and Observability, Eigen value assignment by state feedback , Kalman filtering, Lyapunov stability analysis, compensator design.

Books:

1. B.C. Kuo, *Digital Control System, Oxford* 2014
2. K.M.Moudgalya, *Digital Control, Wiley India* 2015
3. Gopal, *Digital control and State Variable Methods , Mc Graw Hill, 2014*

MEE 903: Non-Conventional Energy Sources and Power Generation

100 marks

Learning Outcomes

The Students will be able to:

- Calculate the amount of solar radiation and to understand the basic concept of solar cell.
- Understand the basic theory of electric power generation from wind energy.
- Know about the methodology and various components used in converting wind energy into electrical energy.
- Understand geothermal energy and its mechanism of production of energy.
- Understand how power is generated from tidal energy, wave energy and ocean thermal energy.

Syllabus: Solar Radiation, availability, measurement and estimation, Solar Thermal Conversion Devices and Storage, Applications. Wind resources and its characterization, stand alone, grid connected applications of WECS, wind farms, wind turbine, electrical generators and converters, Wind energy in India. Tidal Energy, Geothermal Energy, Solar Photovoltaic conversion, Ocean Energy Conversion, Wind Energy Conversion, Biomass Energy Conversion.

Books:

1. D.P. Kothari, K.C. Singal, Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies" PHI learning Private Limited, 2016.
2. Rakosh Das Begamudre, "Energy Conversion Systems" New Age International (P) Limited, 2014.

MEE-904 E Digital Signal Processing

Learning Outcomes

The Students will be able to:

- Demonstrate the analytical representation of discrete time signals.
- Apply techniques in time and frequency domain to the analysis and design of discrete time systems.
- Analyze discrete time systems in both time and frequency domain.
- Design and analysis of the frequency response of discrete-time signals and systems.
- Design, Analyze and Implement Digital IIR and FIR filters.

Syllabus: Short introduction- Discrete time systems & signals, z-transform, difference equation, filter design by transformation-impulse and step invariant, bi-linear z-transform, matched z-transform, discrete Fourier transform, state variable model. FIR filter design, frequency windowing technique, Chebyshev and Butterworth criterion. Filter performance and design in presence of noise, FIR filters banks-sub band decomposition. Inverse filtering, Deconvolution, signal reconstruction, time frequency analysis- STFT, WT, DSP hardware-design methodologies, popular architectures and overview of programming application notes. Filter implementation: topology, scaling, co-efficient quantization error, signal quantization, sensitivity analysis.

Books:

1. Li Tan, "Digital Signal Processing", Elsevier, 2011.
2. A.V. Oppenheim and Schaffer, "Discrete Time Signal Processing", Prentice Hall, 1989.

MEE 904 E3 : Probability and Random Processes

Learning Outcomes:

After successful completion of the course students will be able to:

- Understand the concepts of random variables, probability distributions and independence of random variables.
- Understand the meaning of probability and probabilistic experiment
- Familiarize with the all approaches to probability theory and particularly, the axiomatic approach.
- Understanding the meaning of conditional probability.
- Distinguish between independent and uncorrelated random variables.
- Distinguish between discrete and continuous random variables and be able to represent them using probability mass, probability density, and cumulative distribution function.
- Identify important types of distributions such as exponential, Binomial, Poisson, Normal, and use them as suitable models in basic science and engineering problems.
- Understand the concept of statistical hypothesis and able to solve such type of real life problems.

Syllabus: Sample space and events, Probability axioms, conditional probability, independence of events, Bayes' rule.

1. Random variables - discrete and continuous. Expectations, Moments, Tchebyshev's inequality, Characteristic function. Functions of one random variable.
2. Discrete distributions: Binomial, Poisson, and continuous distributions: uniform, normal, exponential, gamma, Weibull etc.
3. Stochastic convergence and limit theorems.
4. Mean Square Estimation - linear regression.
5. General concepts of stochastic processes, Markov chains, Markov processes
6. Power spectrum, spectral representation, basic spectral estimation,
7. Entropy
8. Random walks, shot noise, deterministic signals in noise,
9. Queuing theory (M/M/1 and M/M/C).

Books:

1. *Probability, Random Variables and Stochastic Processes - fourth Edition* by A. Papoulis and S. U. Pillai, McGraw Hill Education (India) Pvt. Ltd., New Delhi.
2. *Probability & Statistics with Reliability, Queuing and Computer Science Applications*. Kishore S. Trivedi. Eastern Economy Edition, PHI.
3. *Stochastic Processes*. J. Medhi. 3rd Edition, New Age. International, 2009.
4. *Fundamentals of Mathematical Statistics: A Modern Approach*. S. C. Gupta (Prof.), Dr. V. K. Kapoor. Edition, 10. Publisher, Sultan Chand, 2000.

MEE 904 E4: Introduction of Quantum Computing:

Learning Outcomes:

After successful completion of the course students will be able to:

- **Speed:** Quantum Computers will deliver enormous speed for specific problems. Researchers are working to build algorithms. To find out and solve the problems suitable for quantum speed-ups.
- **Computation:** The speed of quantum computers will improve many of our technologies. Especially, that need immense computation power. Like Machine Learning, 5G (and even faster internet speeds), bullet trains (and many other transport methods), and many more.
- **Big Data:** Quantum computing is important in the current age of Big Data. As we need efficient computers to process the huge amount of data we are producing daily.
- **Power Reduction:** Despite being computational, Quantum computers can reduce power consumption. From 100 to 1000 times they use Quantum tunneling.

Syllabus:

Mathematical foundations and quantum mechanical principles [8 lectures]

- a. Finite dimensional inner product spaces, Hermitian and unitary operators, projection operators, commutators
- b. Hilbert space as state space, Schrodinger equation and time evolution, measurement, Heisenberg uncertainty relation, Dirac notation, density operators, quantum entanglement

Qubits, quantum gates and quantum circuits [20 lectures]

- c. Concept of qubit, representation of qubit in Bloch Sphere, Multi qubit quantum state representation

- d. Single, Two and Multi-qubit quantum gates, Matrix representation of gates, universal gates for quantum computing
- e. Quantum Circuit, Reversible Computation using quantum circuits, quantum parallelism, quantum circuit representation, quantum computing language (QCL) for quantum process description, Quantum Circuit description languages
- f. Quantum Adder Circuits, Quantum Fourier transform Circuit, Quantum Multiplier, Quantum Shift register.
- g. Quantum Physical Machine Description, Quantum Circuit Cost.
- h. Synthesis techniques for quantum circuit

Quantum algorithms [12 lectures]

- i. Elements of quantum automata and quantum complexity theory.
- j. Deutsch's algorithm, Deutsch-Jozsa Algorithm and the Bernstein-Vazirani Algorithm, Simon's algorithm
- k. Quantum Fourier transform, Shor's Algorithm and its applications.
- l. Grover's algorithm for searching and its applications.

Books:

1. *Quantum Computation and Quantum Information* by Michael Nielsen and Isaac Chuang, Cambridge Univ. Press.
2. P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press

Good lecture notes:

John Preskill's lecture notes-<http://www.theory.caltech.edu/people/preskill/ph229/>

David Mermin's lecture notes-<http://people.ccmr.cornell.edu/mermin/qcomp/CS483.html>

MEE 905P

Power System Simulation Lab

100 Marks

Learning Outcomes

On successful completion of The Students will be able to:

- Students can do the experiments on Ferranti effect, solar power system, wind farm system, Hydro-electric power plant etc. with the MATLAB simulink.
- $[Y]_{\text{bus}}$ formation , Load analysis , fault analysis , etc can also be done by this MATLAB simulink .

MEE 906P

Control and Measurement Lab

100 Marks

Learning Outcomes

On successful completion of The Students will be able to:

- Learn the basics of a digital control system
- Understand sampling process and aliasing problem
- Learn how to convert from continuous-time to discrete-time system and use of discrete-time transfer function

- Measurement of level in a tank using capacitive type level probe
- Characterize the LVDT
- Characterize the strain gauge sensor

2nd Semester

MEE 1001: Power Electronics Converters

100 marks

Learning Outcomes

On successful completion of The Students will be able to:

- Understand Theoretical knowledge on modern day semiconductor devices, their characteristics and control.
- Understand theoretical knowledge on modern day semiconductor devices, their characteristics and control.
- Understand operation and analysis of DC-DC, AC-DC and DC-AC converters and their designing.
- Identify the critical areas in application levels and select suitable power converters to control such applications

Syllabus: AC-DC Converters, DC-AC converters, buck, boost, buck-boost, cuk, fly back configuration, resonant converters, PWM inverters; active filters.

Book:

1. Mohan, Undeland, Riobbins, "Power Electronics". Wiley, 2014

MEE 1002: Power System Protection and Switchgear

100 Marks

Learning Outcomes

On successful completion of The Students will be able to:

- Describe the protection schemes used for protection of generator, motor and transformer.
- Differentiate between different types of relays including distance, directional and differential relays.
- Explain the working principle of static relays.

- Knowledge of various types of existing
- Explain the design and constructional details of circuit breakers.
- Explain different types of numerical protection and microprocessor based digital protection.

Syllabus: Protection of generators: under frequency, loss of excitation, loss of prime mover, rotor earth fault, pole slipping, over speed, unbalanced loading; Protection of Transformer: generalized differential protection, protection due to switching surge, Earth fault, over current, over fluxing protection; overcurrent, directional, differential and distance protection, current transformer & potential transformer, Power swing conditions, Static Relays: current, voltage and impedance relays, Motor protection relay, Computer and microprocessor applications in protection schemes, Numerical relays, Advanced topics in Circuit Breaker.

Book:

1. Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chothani "Protection and Switchgear", Oxford University press, 2013.
2. Badri Ram, D.N. Vishwakarma "Power System Protection and Switchgear", McGraw Hill Education (India) Private Limited, 2014.

MEE 1003E : Smart Grid

100 Marks

Learning Outcomes

On successful completion of The Students will be able to:

- The definitive solution for managing the grids of the future.
- Energy savings through reducing consumption.
- Better customer service and more accurate bills.
- Fraud detection and technical losses.
- Reduced balancing cost.
- Levelling of the demand curve (Peak reduction)

Syllabus: The Smart Grid, Smart Grid Communication and Measurement Technology-Monitoring, PMU, Smart Meters, GIS and Google Mapping Tools, Multiagent Systems (MAS) Technology, Components of Smart Grid, Smart Grid Benefits and Challenges, Performance Analysis Tools for Smart Grid Design, Stability Analysis Tools for Smart Grid, Information Security for the Smart Grid.

Text Books:

- (i) Smart Grid: Fundamentals of Design and Analysis; James Momoh; Edition: 2015; Publisher: Wiley India Pvt Ltd
- (ii) The Advanced Smart Grid: Edge Power Driving Sustainability; John Cooper; Edition: 2011; Publisher: Artech House Publishers
- (iii) The Smart Grid; Clark W Gellings; Edition: 2009; Publisher: T&F
- (iv) Smart Grid Technology and Applications; Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, Nick Jenkins; Edition: 2015; Publisher: Wiley India Pvt Ltd
- (v) Smart Grids- Engineering and Management; Jean-Claude Sabonnadiere; Edition: 2011; Publisher: Wiley

EMI/EMC -1004 E 1: EMI/EMC (Electromagnetic Interference /Electromagnetic Coupling)

Learning Outcomes:

After successful completion of the course students will be able to:

- Understand EMC regulation and methods of eliminating interferences
- Explain about the Methods of grounding of cable shield

- Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.

Syllabus:

Module-A:

Introduction To EMC - Concepts of EMC, EMC units.

EMC requirements for electronic systems - World regulatory bodies- FCC, CISPR etc. Class-A devices, class-B devices.

Regulations of the bodies on EMC issues. 3 lectures

Module-B:

Different Mitigation Techniques for preventing EMI.

Grounding: Fundamental grounding concepts, Floating ground, Single-point & Multi-point ground, advantages & disadvantages of different grounding processes.

4 lectures

Module-C:

Shielding: Basic concepts of shielding, Different types of shielding, Shielding effectiveness(S.E), S.E of a conducting barrier to a normal incident plane wave, multiple reflection within a shield, mechanism of attenuation provided by shield, shielding against magnetic field & Electric field, S.E for Electronic & Magnetic material, Skin-depth, S.E for far-field sources, shield seams.

8 lectures

Module-D:

Non-ideal behavior of different electronic components.

Ferrites.

EMI/EMC materials and components.

3 lectures

Module-E:

Characteristics of antennas, fields due to short electric dipole & small magnetic pole, near field & Far-field sources & their characteristics 4 Lectures

Module-F:

EMC measurement set, Power losses in cable, calculation of signal source output for a mismatched load. 3 lectures

Module-G:

Measuring & Test systems, Test facilities, measurements of radiated emission in open test range & in Anechoic chamber, Conducted emission testing by Line Impedance Stabilization network (LISN).

4 lectures

Module-H:

EMP & ESD

4 lectures

Module-I:

PCB wire line with skin depth, grounding multi-point & single point, SMT & through hole.
3 lectures

Total 37 lectures

May be added:

*Transient suppression systems	2 lectures
*Case studies	3 lectures
* EMI filters	3 lectures
*Gaskets	1 lecture
*Sources of conducted & radiated noise. Nature & treatment	3 lectures
*Coupling	1 lecture

MEE- 1004 E 2 :Power Electronics Applications in Power Systems **100 marks**

Learning Outcomes

On successful completion of The Students will be able to:

- Understand the classification of FACTS controllers depending upon different parameters.
- Learn the benefits of using FACTS controllers.
- Understand the basic principle some FACTS device such as SVC, STATCOM, TCSC, SSSC and UPFC.

Syllabus: Steady state and dynamic problems in AC systems, Flexible AC transmission systems (FACTS). series and shunt compensation, Static Var compensators (SVC), Thyristor Controlled series compensators (TCSC), Static phase shifters (SPS), Static compensator (STATCOM), Static synchronous series compensator (SSSC) and Unified power flow controller (UPFC), Modelling and Analysis of FACTS controllers. Control strategies to improve system stability.; Power Quality problems in distribution systems, harmonics, harmonics creating loads, modeling, harmonic propagation, Series and parallel resonances, harmonic power flow, Mitigation of harmonics, filters, passive filters, Active filters, shunt, series hybrid filters, voltage sags & swells, voltage flicker, Mitigation of power quality problems using power electronic conditioners.

Book:

1. K.R. Padiyar "*FACTS Controllers in Power Transmission and Distribution*", New Age International Publishers, 2007.

MEE- 1004 E 3: VLSI 100 Marks

Learning Outcomes:

After successful completion of the course, student will be able to:

- Explain the basic theory of crystal growth, wafer fabrication and IC fabrication technology.
- Explain the different VLSI design styles, overview of ICs and fabrication steps of MOS, CMOS and BJT.
- Design and analyse the output characteristics of different MOS inverters.
- Design combinational and sequential circuit.

Syllabus: Introduction to VLSI Design, Design Styles and parameters, popular technologies. Logic implementation with nMOS, CMOS. DCVS and PLAs. Pass vs. transistor logic, transit time, clocking, scaling, PLA minimization and folding, SIMPLIFY, ESPRESSO. Testability Issues. Physical Design algorithms: Partitioning, Floor planning and placement, Routing, compaction, gate arrays, FPGAs, MCMs. Data structures for layout desing -MAGIC. Design Rule checking, Expert systems, symbolic layout, complexity of layout algorithms.

MEE -1005- P

Power Electronics Lab

100 Marks

After successful completion of the course, student will be able to:

- Understand the basics of Power Electronics
- Learn the details of power semiconductor switches (Construction, Characteristics and operation). Understand the working of various types of converters.
- Learn how to analyse the converters and design the components of them, under various load types.
Learn about the control of various converters.

MEE -1006 -P Design Project & Term Paper Leading to Thesis

100 Marks

Learning Outcomes:

After successful completion of the course, student will be able to:

- Identify the project of their expertise domain and interest.
- Explain the recent trend of research and its recent developments through literature survey
- Make an in-depth study of a specific topic within suitable engineering design and specifications.

3rd Semester

MEE 1105 E4: Special Electrical Machines

100 Marks

Learning Outcomes:

After successful completion of the course, student will be able to:

- Develop various types of models used for synchronous machines like, hydro, steam turbine, governors & excitation systems.
- Understand the construction, connections, principle of operation of three-phase & single phase induction motor.
- Understand equivalent circuits representation of three phase & single phase induction motor. Understand calculation of the performance characteristics (current/speed and torque/speed) of the three-phase & single phase induction motor.
- Understand the starting and speed control methods of three-phase induction motor.
- Understand the construction, connections, principle of operation of single-phase induction and special purpose motors.
- Perform tests on synchronous and induction machines.

Syllabus: Linear motors: Basic principle of operation and types, End effects & transverse edge effects, Field analysis & Propulsion force, equivalent circuit. Induction generators: self excitation requirements,

steady state analysis, voltage regulation, different methods of voltage control, application to mini and micro hydel systems. Doubly fed induction machines: control via static converter, power flow, voltage/frequency control (generation mode), application to grid connected wind and mini/micro hydel systems. Brushless DC Machines: construction operation, performance, control and applications. Switched reluctance motor (SRM): Construction, importance of stator & rotor arc angles, position sensor & indirect rotor position sensing, torque expression, steady state and dynamic performance. Permanent magnet, Hysteresis & reluctance motors, Recent developments in electrical machines.

MEE 1105 E5: Advanced Electromagnetic & Antenna Theory

100 Marks

Learning Outcomes:

After successful completion of the course, student will be able to:

- Recall electromagnetic plane waves. Apply principles of electromagnetic to explain antenna radiation. Explain various antenna parameters.
- Explain antenna as a point source. Design antenna patterns for different cases.
- Explain dipole antennas. Establish mathematical equations for various parameters of thin linear antenna.
- Explain loop, slot, patch and horn antennas. Derive expressions for the parameters of loop and slot antennas.

Syllabus:

Electromagnetics:

Vector analysis, The static electric field, Energy, potential and capacitance, The static electric field in dielectrics, The steady electric current, The steady magnetic field, Time varying fields and Maxwell's equations, Electromagnetic waves.

Microwave & Wireless antenna Theory:

Printed Antennas : Microstrip Antennas: Basic configuration and advantages; Radiation mechanism; Analysis and CAD; Basic characteristics; Feeding techniques; Broad banding techniques; Phased arrays; Printed antennas for mobile and portable wireless equipment; Reconfigurable antennas, wearable antenna, antennas for RFID systems.

Dielectric Resonator Antennas (DRA): Dielectric Resonators, modes, radiation mechanisms, feeding mechanisms, characteristics, design and applications; materials for DRA, integration with active devices, challenges in RFIC designs.

Ultra wideband (UWB) Antennas: Monopole antennas, UWB Slot antennas, Loop antennas, Tapered slot antennas, Impulse Radiating antennas, Conical antennas, Frequency independent antennas, basic principles and characteristics, Radiation mechanisms.

Antennas for special applications: Antennas for on-board systems, antennas for medical applications, antennas for radiometry and remote sensing.

Antenna Measurements: Basic principles, antenna radiation measurements using anechoic chamber and compact range techniques, measurements of antenna patterns, gain, and efficiency, measurement circularly polarized antennas.

Text Books

1. *Elements of Electromagnetics; Mathew N.O. Sadiku, Oxford University Press, 5th Edition(2010)*
2. *Electromagnetic Waves & Radiating Systems, EC Jordan & K.G. Balmain; Pearson Education, 2nd Edition (2009)*
3. *Microstrip Antenna Design Handbook- Ramesh Garg; Artech House (2001)*
4. *Antenna (for all application), John D. Kraus and Ronald J. Marhefka; Tata- MacGraw Hill, 3rd Edition*

5. *Antenna & Wave Propagation*, K.D Prasad; Satya Prakashan, New Delhi, 3rd Edition

6. *Antenna Theory: Analysis & Design*, Constantine A. Balanis; Willey, 3rd Edition

MEE 1101C Thesis Report Interim 100 Marks

Course outcomes:

- Understand that how to write thesis with good readability
- Learn to write section wise.
- Understand the skills needed while writing a thesis
- Ensure the quality of thesis report

MEE 1102C Thesis Seminar Interim(Presentation & Viva Voce) 200 Marks

- Synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
- Identify from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
- Demonstrate the findings of their technical solution in a written report.
- Present the work in International/ National conference or reputed journals.

MEE 1103C Technical Communication 100

Course outcomes:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title
- Ensure the good quality of paper at very first-time submission

MEE 1104C Workshop and Seminars 100Marks

Course outcomes:

- Follow discussions, oral arguments, and presentations, noting main points or evidence and tracking threads through different comments
- Prepare appropriately to participate effectively and offer substantive replies to others' arguments, comments, and questions, while remaining sensitive to the original speaker and the classroom audience
- Speak and debate with an appreciation for complex social and technical sensibilities
- Offer compelling, articulate oral arguments, showing an understanding of the unique demands of oral presentation as opposed to writing

4th Semester

MEE 1204 E3 Sensors and Systems

100 Marks

Learning Outcomes:

After successful completion of the course, student will be able to:

- Classify and explain with example of sensors, transducers and actuators.
- Predict the expected performances of various sensors
- Locate different type of sensors used in real life
- understand of sensor interfacing with microcontroller
- Explain working Principles of different types of sensors.

Syllabus: Sensor characteristics; R, L and C sensors: Hall Effect sensors; piezoelectric sensors; Micro-sensors. Sensors for displacement, pressure, temperature, flow etc Optical sensors, chemical and bio-sensors, Sensor applications in non-destructive testing, Interfacing sensors with microprocessors and micro controllers.

Texts/References

1. Jon S. Wilson, *Sensor Technology Handbook*, ELSEVIER

2. Subhas Chandra Mukhopadhyay, Aimé Lay-Ekuakille, and Anton Fuchs, *New Developments and Applications in Sensing Technology*, Springer.

MEE 1201C

Thesis Report Final

200 Marks

Course outcomes:

- Understand that how to write thesis with good readability
- Learn to write section wise.
- Understand the skills needed while writing a thesis
- Ensure the quality of thesis report

MEE 1202C

Thesis Seminar Final(Presentation and Viva Voce)

200Marks

Course Outcome:

- Synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
- Identify from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
- Demonstrate the findings of their technical solution in a written report.
- Present the work in International/ National conference or reputed journals.

MEE 1203C

Workshop and Seminars

100Marks

Course outcomes:

- Follow discussions, oral arguments, and presentations, noting main points or evidence and tracking threads through different comments

- Prepare appropriately to participate effectively and offer substantive replies to others' arguments, comments, and questions, while remaining sensitive to the original speaker and the classroom audience
- Speak and debate with an appreciation for complex social and technical sensibilities
- Offer compelling, articulate oral arguments, showing an understanding of the unique demands of oral presentation as opposed to writing



TRIPURA UNIVERSITY

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Department of Material Science and Engineering

XX

The Department of Material Science and Engineering is one of the new teaching and research departments of Tripura University (A Central University), started its journey in 2016, included under the XII Five Years Plan sanctioned by UGC. This department offers four-semester ‘M. Tech’ programme in ‘Material Science and Engineering’. This unique stream in engineering helps students to gain technical knowledge of various kinds of materials like metals, semiconductors, ceramics, polymers and composites through material characterization and its structure – property relationships. This unique stream in engineering helps students to gain technical knowledge on various kinds of materials for engineering applications in critical industrial sectors, energy and electronics.

List of programmes offered by the Department

- I. M.Tech: Material Science and Engineering**
- II. Ph.D.: Material Science and Engineering**

I. M.Tech: Material Science and Engineering

Programme Specific Objectives:

PSO-1	Develop core competency in fundamental understanding of materials and their properties.
PSO-2	Analyze, design and evaluate materials for engineering applications.
PSO-3	Solving engineering problems using the domain knowledge of materials.
PSO-4	Ability to work individually or in a group and under supervision for research and development activities with high professional and ethical standards.

Programme Outcomes:

PSO-1	Identify different materials and their properties for engineering applications.
PSO-2	Carryout a systematic research work on materials and analyze the results.
PSO-3	Write substantial scientific/technical reports and present the same.
PSO-4	Develop knowledge in the science of materials for the benefit of the society

M.Tech. (Material Science and Engineering) – Course Structure

1 ST SEMESTER						
		L	T	P	Credits	Marks
Theory Papers	Name					
MS 903C	Techniques of Materials Characterization	4	0	0	4	100
MS 908C	Fundamentals of Materials Science and Engineering	4	0	0	4	100
MS 909C	Materials Processing Technology	4	0	0	4	100
MS 910E	Surface Engineering (Will be offered as an elective to other departments)	4	0	0	4	100
Elective from other department	Elective from other departments (Student will have to choose elective offered by other departments)	-	-	-	4	100
Sessional Papers	Name					
MS911P	Materials Characterization Laboratory (List of experiments)			8	4	100
MS 912P	Mini Project-01 (Submission of Report/Presentation and Viva Voce)	0	2	0	2	100
Subtotal					26	700
2 ND SEMESTER						
		L	T	P	Credits	Marks
Theory Papers	Name					
MS 1001C	Electronic and Opto-electronic Materials	4	0	0	4	100
MS 1002C	Science and Technology of Ceramics	4	0	0	4	100
MS 1003E	Nanomaterials	2	0	0	2	100
MS 1008E	Advanced Engineering Materials	2	0	0	2	100

CFC	Compulsory Computer Foundation Course (Skill-3) (Will be offered by Department of IT or CSC)	4	0	0	4	100
Sessional Papers	Name				Credits	Marks
MS 1009P	Materials Processing Laboratory	0	0	8	4	100
MS 1010P	Mini Project-02 (Submission of Report/Presentation and Viva Voce)	0	2	0	2	100
Subtotal					22	700
3RD SEMESTER						
		L	T	P	Credits	Marks
Paper	Name					
MS 1101	Progress Report on Thesis				10	100
MS 1102	Seminar Presentation and Viva-Voce				6	50
Subtotal					16	150
4TH SEMESTER						
		L	T	P	Credits	Marks
Paper	Name					
MS 1201	Project Thesis Report				10	150
MS 1202	Project Presentation and Viva-Voce				6	100
Subtotal					16	150

	Total Credits	Total Marks
M.Tech. Material Science and Engineering	26+22+16+16 = 80 Credits	700+700+150+150 = 1700

Detailed Course Syllabus

1st Semester

		L	T	P	Credits	Marks
Theory Papers	Name					
MS 903C	Techniques of Materials Characterization	4	0	0	4	100

Course Objectives:

1. To develop an in-depth understanding of the various techniques/instruments used for different characterization of materials

Course Outcomes:

1. Knowledge about the principles of the different instruments used for materials characterization, Analysis of experimental results and interpretation of results

Module	Paper/Course content	Time (Hours)
1	Importance of different characterization techniques of materials, Classification of characterization techniques for materials depending upon the dimensions of the materials: macro, micro and nano-characterization; Microscopy techniques: Optical microscopy, Necessity to introduce electron microscope for materials characterization, Electron microscopy: Scanning electron microscopy and Transmission electron microscopy: working principles, data analysis and interpretation of results, advantages and limitations. Scanning probe microscopy: Scanning tunneling microscopy and Atomic force microscopy: analysis of data and interpretation of results.	20
2	X-ray: generation of x-rays, basic science, Braggs law, X-ray diffraction techniques for amorphous, single crystal and polycrystalline materials: analysis of data and interpretation of results.	6
3	Spectroscopy: Atomic absorption spectroscopy, UV-Vis-NIR spectroscopy, Energy dispersive X-ray spectroscopy, Infrared spectroscopy, Raman spectroscopy, Photoluminescence spectroscopy, X ray fluorescence spectroscopy and X-ray photoelectron spectroscopy: working principles, analysis of data and interpretation of results.	16
4	Electrical characterization: two-probe and four-probe methods; Magnetic characterization: magnetic measurements: VSM, Hall measurements; Thermal characterization: DTA, DSC, TGA, Mechanical testing and NDT.	6

Reference books:

1. L. Yang, Materials Characterization, Wiley-VCH, 2nd Edition, 2015.
2. S. Amelinckx, D. van Dyck, J. van Landuyt, and G. van Tendeloo, Electron Microscopy: Principles and Fundamentals, Wiley, 2008.
3. P.J. Goodhew, and F.J. Humphreys, Electron Microscopy and Analysis, 2nd Edition, Taylor and Francis, 1997.
4. R. Wiesendanger, Scanning Probe Microscopy and Spectroscopy-Methods and Applications, Cambridge University Press, 2010.
5. B. Voigtländer, Scanning Probe Microscopy, Springer, 2012.
6. B. D. Cullity, Elements of X-ray Diffraction, Addison-Wesley Publishing Co, 1979.
7. R. Jenkins and R. Snyder, Introduction to X-ray Powder Diffractometry, Wiley, 1996.
8. N. Colin, Fundamentals of Molecular spectroscopy, Tata McGraw-Hill Publishing Co. Ltd., 4th edition, 1994.
9. G. Gauglitz, and D. S. Moore, Handbook of Spectroscopy, 2nd Edition, Wiley, 2014
10. E.N. Kaufman, Characterization of Materials (Vol I, II and III), 2nd Edition, Wiley, 2003.
11. P.E.J. Flewitt, and R.K Wild, Physical Methods for Material Characterization, Institute of Physics Publishing, 1994.
12. D. B. Williams, and C. B. Carter, Transmission Electron Microscopy, Springer, 2009.
13. Y. Leng, Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, 2nd Edition, Wiley VCH, 2013.

		L	T	P	Credits	Marks
Theory Paper	Name					
MS 908C	Fundamental of Materials Science and Engineering	4	0	0	4	100

Course Objectives:

1. This course will introduce basic concepts of structure, and imperfection, phase transformations, and heat treatments in engineering materials.
2. To understand the fundamentals (structure, properties and processing) of materials and to apply those fundamentals for selecting and developing new materials for various engineering applications.

Course Outcomes:

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

1. Know the structure and properties of different materials.
2. Understand the phase diagrams and comprehend the phase transformations in materials.
3. Understand the mechanical, electrical, magnetic and optical properties etc. of engineering materials.

Module	Course content/ Lecture	Time (Hours)
1	Historical evolution of engineering materials Selection, Classification, properties and application of engineering materials, Significance of structure- property relationship, Few examples of structure-properties relationship in Engineering Materials,	06
2	Bonding and crystal Structure in Engineering materials, Amorphous Materials, Imperfections in solids, Diffusion phenomenon, Principles of solidification, Nucleation and Growth process, allotropy and polymorphism Solid solution and Hume-Rothery rules for forming a solid solution, interstitial solid solutions, ordering in solids, Order-Disorder transition	14
3	Phase diagrams and phase transformations, Fe- Fe ₃ C phase diagram, Concepts of Heat treatments, TTT diagram of steel, Diffusionless transformation: Martensitic transformation. Various strengthening mechanism, Cold working, Recovery, Recrystallization, Grain growth; Change in microstructure of materials caused by hot working and cold working etc.	14
4	Introduction to metallic, semiconductor, ceramic, polymer, superconductor, composite materials, nanomaterials and smart materials. Various Properties of Engineering materials: Electrical, Optical, Mechanical and Magnetic properties. Performance of engineering materials in service condition, A few case study	14

Reference books:

1. D.R. Askeland, P.P. Phule, W.J. Wright, The Science and Engineering of Materials, 6th ed., Cengage Learning, 2010.
2. W.D. Callister, D.G. Rethwisch, Materials science and Engineering: An Introduction, 8th Ed., Wiley, 2010.
3. V. Raghavan, Materials Science & Engineering: A first course, 5th ed., PHI learning, 2004
4. R. Abbaschian, R.E. Reed-Hill, Physical Metallurgy Principles, 4th ed., Cengage Learning, 2009.
5. S.H. Avener, Introduction to Physical Metallurgy, 2nd ed., Tata McGraw-Hill Education, 2011.

		L	T	P	Credits	Marks
Theory Papers	Name					
MS 909C	Materials Processing Technology	4	0	0	4	100

Course Objective:

1. To gain in-depth knowledge of various materials processing techniques.

Course Outcomes

1. Identify various manufacturing processes for materials joining.
2. Identify appropriate manufacturing process to develop composites.
3. Understand the additive manufacturing process for fabricating a part or product.
4. Understand the need for high purity materials and their manufacturing process.

Module	Course content/ Lecture	Time (Hours)
1	Joining Processes: Introduction to welding, different techniques such as TIG, MIG, plasma welding, friction stir welding, electron beam welding, laser beam welding, applications	12
2	Fabrication of composites: Introduction to composites, manufacturing methods for fiber reinforced composites – Resin impregnation, prepreg production process, injection molding, hot press molding, metal matrix composites – powder processing, reactive processing, ceramic matrix composites-powder sintering, powder slurry processing, hot isostatic pressing, laminates and sandwich panels	12
3	Additive Manufacturing: Introduction to additive manufacturing, different additive manufacturing processes, classification of additive manufacturing processes, rapid prototyping and 3D printing techniques, applications	12
4	Special processing techniques: Arc melting, vacuum induction melting, melt spinning, zone melting and refining, processing for high purity materials, manufacturing processes of single crystals - semiconductor and aerospace applications	12

Reference books:

1. R.S.Mishra, Friction stir welding and processing, ASM International, 2007.
2. Nadkarni S.V., Modern Arc Welding Technology, Oxford IBH Publishers, 1996.
3. Surender Kumar, Technology of Metal Forming Processes, Prentice- Hall, Inc., 2008.
4. Y. Waseda, A. Muramatsu, Yoshio Waseda, Morphology Control of Materials and

- Nanoparticles: Advanced Materials Processing and Characterization, Springer, 2004
5. Ian Gibson, David W Rosen, Brent Stucker., Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 2nd Edition, Springer, 2015.
 6. Chua Chee Kai, Leong Kah Fai, 3D Printing and Additive Manufacturing: Principles & Applications, 4th Edition, World Scientific, 2015.
 7. T.W. Clyne and D.Hull, An introduction to composite materials, 3rd Edition, Cambridge University Press.

		L	T	P	Credits	Marks
Theory Papers	Name					
MS 910E	Surface Engineering	4	0	0	4	100

Course Objectives:

1. To develop an in-depth understanding of the various methods used for surface engineering.

Course Outcomes

1. Identification of appropriate surface engineering process for different engineering applications.
2. Structural and mechanical characterization of the engineered surfaces.

Module	Course Content / Lectures	Time (Hours)
1	Basics of surface engineering, surfaces and interfaces, broad classification, surface dependent properties	6
2	Surface engineering Techniques: Diffusion methodologies - Boriding, carburizing, nitriding, cyaniding, and applications. Thin films and coatings - Thin film deposition processes -PVD, CVD, Thermal spray coatings – Flame spray, HVOF, Plasma spray, applications	14
3	Advanced Surface Engineering Techniques – Surface engineering laser beams, Surface engineering by electron beams, laser cladding, ion implantation, electroless plating, electroplating, ion implantation, microstructural modification of surfaces, optical lithography, applications to automobile, aerospace industries and biomedical implants	14
4	Characterization and evaluation of engineered surfaces: Techniques for coating thickness measurement, optical and electron microscopy techniques for topography, surface profilometry, spectrographic techniques for compositional analysis of surfaces, bond strength evaluation, microhardness, nanoindentation	14

Reference Books

1. M.Ohring, Material Science of Thin Films, Academic Press, 2002.
2. P. A. Dearnley, Introduction to Surface Engineering by, Cambridge University Press, 2017
3. H. Dimigen, Surface Engineering, Wiley-VCH, 2000.
4. J. B. Hudson, Surface Engineering: An Introduction, Butterworth Heinemann, 2000.
5. S. Grainger and J. Blunt, Engineering Coatings, Woodhead Publishing, 1998.
6. ASM Handbook, Surface Engineering, 1994.
7. J.R. Davis, Surface Engineering for Corrosion and Wear Resistance, ASM International, 2001
8. Chi Tat Kwok , Laser surface modification of alloys for corrosion and wear resistance, Woodhead Publishing Limited, 2012.

		L	T	P	Credits	Marks
Sessional Paper	Name					
MS911P	Materials Characterization Laboratory		0	8	4	100

Course Objectives:

1. Hands on experience on the different techniques/instruments used for materials characterization

Course Outcomes:

1. Knowledge about the experimental techniques, generation of data and interpretation of results

Syllabus:

1. Quantitative and qualitative analysis of microstructure using optical microscope.
2. Scanning electron microscope: sample preparation, imaging and interpretation of results.
3. Energy dispersive x-ray spectroscopy (EDS) characterization of materials
4. Atomic force microscope: sample preparation, imaging and interpretation of results.
5. X-ray Diffraction: Interpretation of results, study of XRD pattern, crystallite size and residual stress calculation, Simulation of XRD pattern.
6. UV-Vis-IR spectroscopic characterization of materials.
7. Differential Scanning Calorimetry: study of thermodynamic parameters of materials.
8. FTIR: experiments, results and data interpretation.

		L	T	P	Credits	Marks
Sessional Paper	Name					
MS 912P	Mini Project-01 (Submission of report/Seminar Presentation)	4	0	0	4	100

Course Objectives:

1. The students have to write a report on a given topic, which will be related to recent advances in material science for engineering applications. The report should be submitted along with a seminar presentation.

Course outcomes:

1. The student will gain knowledge on advance areas of material science and engineering along with applications.
2. The student will know how to write a scientific / technical report.
3. Read the concerned books and scientific literature on the chosen topic.
4. Improve the communication and presentation skills.

2nd Semester

		L	T	P	Credits	Marks
Theory Papers	Name					
MS 1001C	Electronic and Opto-electronic Materials	4	0	0	4	100

Course Objectives

1. To gain in-depth knowledge of semiconductor materials devices.

Course Outcomes

1. Explain different properties of semiconductors based on band theory.
2. Use different semiconductor materials for optoelectronic devices and energy harvesting.

Module	Course Content / Lectures	Time (Hours)
1	Energy band diagram and band theory; band gap energy, conduction band, valance band, Fermi level; metal, semiconductor and insulators based on band diagram	12
2	Bloch's theorem and periodic potential; Kronig-Penney model; effective mass; concept of holes; density of states; carrier density; carrier mobility; Hall effect; intrinsic and extrinsic semiconductors; doping in semiconductors; semiconductor junction	12
3	Optical properties of materials: absorption and emission; radiative and non-radiative transition; photo-conducting material	12
4	Semiconductor light interaction; electronic devices: photodiode, LED, photovoltaic cell, photoelectrochemical cell; LASER material.	12

Text/ Reference books:

1. Donald A. Neamen, Semiconductor Physics And Devices: Basic Principles, 4th edition (McGraw-Hill; 1 March 2011).
2. W. Gao, Z. Li, N. Sammes, An Introduction to Electronic Materials for Engineers, 2nd Edition, (World Scientific Publishing Co Inc, 16th May, 2011)
3. B. G. Streetman and S. K. Banerjee, Solid State Electronic Devices, 7th edition (PHI, 2014).
4. P. Horowitz, and W. Hill, The Art of Electronics, 2nd Edition (Cambridge University Press, 1995).
5. J. Milliman, & C. C. Halkias, Integrated Electronics, (Tata McGraw-Hill, 1995).
6. U. Woggon, Optical properties of Semiconductors, (Springer-Verlag, 2000).
7. C. Harper, Electronic Materials and Processes Handbook (Handbook), 3rd Edition (McGraw-Hill Professional; August 7, 2003)
8. S. O. Kasap, Principles of Electronic Materials and Devices, 3rd Edition, (McGraw-Hill, 2006).

		L	T	P	Credits	Marks
Theory Papers	Name					
MS 1002C	Science and Technology of Ceramics	4	0	0	4	100

Course objectives:

1. The course is aimed to enable the students to have a thorough knowledge on the advanced processing techniques in ceramics.

2. Course outcomes:

Develop an understanding and knowledge about various advanced processing techniques for ceramics.

Module	Course content/ Lecture	Time (Hours)
1	Physical ceramics: Bonding, Crystal structure and Imperfection in ceramics, Classification – Traditional and advanced ceramics, Oxide and Non oxide ceramics, Spectrum of applications, Phase diagram and Phase transition in ceramic. polymorphic modifications, stabilization in ceramics.	8
2	Process Ceramics: Ceramic raw materials (synthesis and characterization) Conventional and novel powder processing techniques, Shaping and forming of dense and porous ceramics. Synthesis of nano-structured ceramics, thin and thick film synthesis, growing ceramic single crystals.	12
3	Driving force of sintering, various sintering additives. A few case studies of sintering process. Advanced Sintering techniques: (Spark plasma sintering, microwave sintering and Reactive sintering, Liquid phase sintering, Sintering with an externally applied pressure), Problems in sintering process. A few case studies of sintering process. Effect of green microstructure on sintered microstructural features of the ceramic products.	12
4	Properties and Application Area of Ceramics: Mechanical, thermal, electrical, optical and magnetic properties of ceramics. Ceramics in biology and bio-medical applications, traditional ceramics (glass, glass-ceramics, white-ware, glass, cement, refractory, abrasive, Advanced ceramic (cellular ceramics, Ceramics in Energy Sectors, ceramic matrix composite, toughened ceramic etc.), Electro-ceramics, (insulating, ionic, semi-conducting, and conducting ceramics, Superconducting ceramics), Ferrites, Energy materials (rechargeable battery, supercapacitor, and fuel cell).	14

Text/Reference books:

Text/Reference books:

1. W. David Kingery, H. K. Bowen, Donald. R. Uhlmann, Introduction to Ceramics, 2nd Edition, by, Wiley-Interscience; April 20, 1976.
2. M.N. Rahman, Ceramic Processing and Sintering by Marcel Dekker, Inc.
3. C. Barry Carter, M. Grant Norton, Ceramic Materials, Science and Engineering Springer-Verlag New York.
4. Yet-Ming Chiang, Dunbar P. Birnie, W. David Kingery, Physical Ceramics: Principles for Ceramic Science and Engineering, John Wiley, 1997.
5. L. H. Van Vlack, „Physical Ceramics for Engineers, Addison Wesley, 1964.
6. Mechanical properties of ceramics by Watchman J. B., John Wiley New York, 1996.
7. J. Reed, Introduction to the Principles of Ceramic Processing, 2nd Ed., John Wiley & Sons. 1995.
8. Fundamentals of Ceramic Powder Processing and Synthesis: Terry A Ring, Academic Press.
9. Fundamentals of Ceramics: M.W. Barsoum, CRC Press.

		L	T	P	Credits	Marks
Theory Papers	Name					
MS 1003E	Nanomaterials	4	0	0	4	100

Course Objectives:

1. To develop in-depth understanding on the science and technology of nanoscale materials

Course Outcomes:

1. Knowledge of science, properties, synthesis routes and applications of nanomaterials

Syllabus:

Module	Course content/ Lecture	Time (Hours)
1	Atomic world, bulk and nanomaterials: an introduction; History and development of nanoscience and nanotechnology; Fundamental of nanomaterials: definition, shape, dimension and classification; Morphology of Nanomaterials.	5
2	Physics and chemistry of nanomaterials: surface energy, surface reactivity, surface chemistry, de-Broglie wave-particle duality, exciton Bohr radius, quantum confinement, energy states, band diagram, electronic structure, density of states, blue shift, shape and dimension dependence of electronic structure.	10
3	Properties of nano-materials: electronic, optical, chemical, mechanical, thermal and magnetic properties; Synthesis of nano-materials: bottom-up synthesis: chemical, electrochemical, wet chemical, template synthesis, PVD, CVD, PLD, sol-gel etc., Top-down synthesis: ball milling, lithography: optical and electron beam lithography, etching.	10
4	Special nanomaterials: Inorganic nanostructures, porous nanostructures, carbon nano-materials, nano-biomaterials, nano-heterostructures, layered nanomaterials, 2D nanomaterials; Applications of nanomaterials: electronics, energy and healthcare.	5

Reference books:

1. M. Wilson, K. Kannagara, G. Smith, M. Simmons and B. Raguse, Nanotechnology: Basic science and emerging technologies, UNSW Press, 2002.
2. A. T. S. Wee, C. H. Sow, and C. W. Shong, Science at the Nanoscale: An Introductory Textbook, Pan Stanford Publishing, 2016.
3. T. Pradeep, Nano: The Essentials, McGraw Hill, 2008.
4. B. S. Murty, P. Shankar, B. Raj, B. B. Rath, and James Murday, Textbook of Nanoscience and Nanotechnology, Springer, 2013.

5. G. Cao, Nanostructures and Nanomaterials: Synthesis, Properties and Applications, World Scientific, 2011.
6. D. Vollath, Nanomaterials: An Introduction to Synthesis, Properties, and Applications, 2nd edition, Wiley VCH, 2013.
7. S. Lindsay, Introduction to Nanoscience, Oxford University Press, 2009.
8. A.S. Edelstein, and R.C. Cammarata, Nanomaterials: Synthesis, Properties and Applications, 2nd Edition, CRC Press, 1998.
9. C. N. R. Rao, A. Müller, and A. K. Cheetham, The Chemistry of Nanomaterials: Synthesis, Properties and Applications (Vol 1 and 2), Wiley, 2004.
10. B. Bhushan, Springer Handbook of Nanotechnology, Springer, 2010.
11. B. Zhang, Physical Fundamentals of Nanomaterials, Elsevier, 2018.
12. R. Tantra, Nanomaterial Characterization: Introduction, Wiley, 2016.

		L	T	P	Credits	Marks
Theory Papers	Name					
MS 1008E	Advanced Engineering Materials	2	0	0	2	100

Course Objectives:

1. To gain knowledge on engineering materials for advanced applications.

Course Outcomes:

1. Identify polymers, metals & alloys, biomaterials used for advanced engineering applications.

Module	Course content/ Lecture	Time
1	Synthesis, properties and application of specialty polymers such as aromatic polyethers, polyacetals, polyamides, inorganic polymer, polymeric liquid crystals, heat and fire-resistant polymers, conducting and photo-conducting polymers, polymers for biomedical applications, biodegradable polymers	7
2	Metals and alloys: Dual phase steels, Micro alloyed, High strength low alloy (HSLA) steel, Transformation induced plasticity (TRIP) steel, Maraging steel, Light metals and alloys - magnesium and its alloys, aluminum and its alloys, titanium and its alloys, shape memory alloys, magnetic alloys	7
3	Materials for energy applications: Novel solar cell materials, Materials for photo catalysis and photo-electrochemical cell, Materials for supercapacitor and battery devices, Hydrogen storage materials. Bio materials: Introduction to Nanobiotechnology, Materials for Biosensors, bio electronics and biomedical materials.	8
4	High temperature materials: Superalloys–Iron, Cobalt and Nickel based super alloys, strengthening mechanisms at high temperatures, temperature and time dependent transformation, structure property correlation in super alloys; Ultra high temperature ceramics; Carbon-Carbon composites applications	8

Text Books:

1. Callister et al., Material Science and Engineering An Introduction, 10th edition, Wiley, 2017
2. Ian Polmear, Light alloys, Elsevier, 2017.
3. Superalloys: Source Book, ASM International.
4. Fahrenholtz et al., Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications, 2014.

		L	T	P	Credits	Marks
Sessional	Name					
MS 1009P	Materials Processing Laboratory	0	0	8	4	100

Syllabus:

1. Heat treatment (annealing, quenching) of steel specimens.
2. Ageing treatments in aluminium alloy specimens.
3. Fabrication of sintered ceramics by powder pressing and colloidal processing route.
4. Processing of polymer materials and determination of density and glass transition temperature.
5. Thin films / coatings by electrochemical techniques.
6. Synthesis of nano powder by sol-gel and co-precipitation techniques.
7. Fabrication of metal matrix / ceramic matrix composites
8. Oxidation behavior of metals / non oxide ceramics

		L	T	P	Credits	Marks
Theory Papers	Name					
MS 1010P	Mini Project-01 (Submission of Report/Seminar Presentation)	0	0	2	2	100

Course Objectives:

1. The students have to write a report on a given topic, which will be related to recent advances in material science for engineering applications. The report should be submitted along with a seminar presentation.

Course outcomes:

1. The student will gain knowledge on advanced areas of material science and engineering along with applications.
2. The student will know how to write a scientific / technical report.
3. Read the concerned books and scientific literature on the chosen topic.
4. Improve the communication and presentation skills.

3rd Semester

3 rd Semester (150 Marks) (16 credits)			
Paper	Name	Credits	Marks
MS 1101	Progress Report on Thesis	10	100
MS 1102	Seminar Presentation and Viva-Voce	6	50

4th Semester

4 th Semester (250 Marks) (16 credits)			
Paper	Name	Credits	Marks
MS 1201	Project Thesis Report	10	150
MS 1202	Project Presentation and Viva-Voce	6	100

***In 1st semester, the student has to take an elective offered by other departments for a total of 4 credits**

***MOOC/ SWAYAM PLATFORM**

- The student can take any course from MOOC/SWAYAM platform upto a maximum of 4 credits.
- The student can take MOOC/SWAYAM courses in lieu of MS 1003E or MS1008E or both.
- The student can to take MOOC/SWAYAM courses in addition to the syllabus up to a maximum of 4 credits.

Program: PhD

Program: PhD, Material Science and Engineering

Program Specific Objective:

PSO-1	Ability to design and conduct systematic research independently and critically analyze and interpret results/data.
PSO-2	Ability to design materials/devices for specific application considering economic, environmental, social, and sustainable development.
PSO-3	Ability to train and guide next generation of researchers both in academics and research and development.
PSO-4	Ability to prepare a detailed scientific report on the knowledge created by research and publish in manuscript for knowledge dissemination.

Program Outcome:

PO-1	An ability to design and conduct experiments and critically analyze and interpret data.
PO-2	An ability to design a process and/or material system to achieve specific requirements.
PO-3	An ability to identify, formulate, and solve engineering problems.
PO-4	Write substantial scientific/technical reports and present the same.
PO-5	Apply the knowledge of science and engineering to material issues.

PhD Syllabus

Paper code	Paper	Credits	Marks
PhD-9001	Research Methodology-I	04	100
PhD-9002	Research Methodology-II	04	100
PhD-9003	Advanced Area in Materials Science and Engineering	04	100
PhD-9004	Seminar & viva-voce /Practical/Projects & assignments on specific research topics	04	100

Research Methodology-I (Credits: 04)

1. Common for all science departments (as defined by Tripura University)

Research Methodology-II (Credits: 04)

1. Common for all under some group of science departments

		L	T	P	Credits	Marks
Theory Papers	Name					
PhD-9002	Research Methodology-II	4	0	0	4	100

Syllabus:

Research in Materials Science: introduction, a history, importance, outlook and future; How to define a research problem in Materials Science and Engineering; Computational methods in Materials Science research.

Experimental Materials Science research: laboratory formalities, instruments handling and maintenance, laboratory safety and troubleshooting; Materials Science research: development of a research idea, methods to perform experiments, data collections, errors in data collections, interpretation of results and related discussions, reproducibility of data.

Preparation of research reports/manuscript: authorship, graphical abstract, introduction, experimental/computational methods, results and discussion, conclusions.

Few reacted sections in materials research: acknowledgement, conflict of interest, copyright, ethics of research and publications; Patents; Post publication: citation of an article, profile of a researcher, communication with scientist and collaboration.

(Following courses will be offered according to the research area of the scholar)

Advanced Area in Materials Science and Engineering (Credits: 04)

		L	T	P	Credits	Marks
Theory Papers	Name					
PhD-9003	Advanced Area in Materials Science and Engineering	4	0	0	4	100

Advanced Characterization of Materials (Credits: 04)

Syllabus:

Microscopy techniques: Optical microscopy, Electron microscopy: Scanning electron microscopy and Transmission electron microscopy, Scanning probe microscopy: Scanning tunnelling microscopy, Atomic force microscopy, Magnetic force microscopy (MFM), and piezoelectric force microscopy (PFM): analysis of data and interpretation of results; X-ray: basic physics, X-ray diffraction techniques: analysis of data and interpretation of results; Spectroscopy: Atomic absorption spectroscopy, UV-Vis spectroscopy, Energy dispersive X-ray spectroscopy, Infrared spectroscopy, Raman spectroscopy, Photoluminescence spectroscopy, X-

ray fluorescence spectroscopy (XRF), Time-resolved fluorescence spectroscopy and X-ray photoelectron spectroscopy: working principles, analysis of data and interpretation of results; Thermal characterization: DTA, DSC, TGA, Mechanical testing and NDT. Electrical characterization of materials and Electrochemical characterization of materials.

14. L. Yang. Materials Characterization, Wiley-VCH, 2nd Edition, 2015
15. S. Amelinckx, D. van Dyck, J. van Landuyt, and G. van Tendeloo, Electron Microscopy: Principles and Fundamentals, Wiley, 2008
16. P.J. Goodhew, and F.J. Humphreys, Electron Microscopy and Analysis, 2nd Edition, Taylor and Francis, 1997
17. R. Wiesendanger, Scanning Probe Microscopy and Spectroscopy-Methods and Applications, Cambridge University Press, 2010
18. B. Voigtländer, Scanning Probe Microscopy, Springer, 2012
19. B. D. Cullity, Elements of X-ray Diffraction, Addison-Wesley Publishing Co, 1979
20. R. Jenkins and R. Snyder, Introduction to X-ray Powder Diffractometry, Wiley, 1996
21. N. Colin, Fundamentals of Molecular spectroscopy, Tata McGraw-Hill Publishing Co. Ltd., 4th edition, 1994
22. G. Gauglitz, and D. S. Moore, Handbook of Spectroscopy, 2nd Edition, Wiley, 2014
23. E.N. Kaufman, Characterization of Materials (Vol I, II and III), 2nd Edition, Wiley, 2003
24. P.E.J. Flewitt, and R.K Wild, Physical Methods for Material Characterization, Institute of Physics Publishing, 1994
25. D. B. Williams, and C. B. Carter, Transmission Electron Microscopy, Springer, 2009
26. Y. Leng, Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, 2nd Edition, Wiley VCH, 2013

Advanced Nanomaterials (Credits: 04)

Syllabus:

Atomic, nano and bulk world; Bulk, amorphous and nanostructure materials; Fundamental of nanomaterials: definition, basics, history, morphology of Nanomaterials ; Physics and chemistry of nanomaterials: surface energy, surface reactivity, de-Broglie wave-particle duality, exciton Bohr radius, quantum confinement, energy states, band diagram and density of states; Properties of nano-materials: electronic, optical, chemical, mechanical, thermal and magnetic properties; Synthesis of nano-materials: bottom-up synthesis: chemical, electrochemical, wet chemical template synthesis, PVD, CVD, PLD, sol-gel etc., Top-down synthesis: ball milling and lithography; Special nanomaterials: Inorganic nanostructures, porous nanostructures, carbon nano-materials, nano-biomaterials, nano-heterostructures, Energy nanomaterials, 2D nanomaterials, layered nanomaterials; Applications of nanomaterials: electronics, energy and healthcare.

Reference Books:

1. M. Wilson, K. Kannagara, G. Smith, M. Simmons and B. Raguse, Nanotechnology: Basic science and emerging technologies, UNSW Press, 2002.
2. A. T. S. Wee, C. H. Sow, and C. W. Shong, Science at the Nanoscale: An Introductory Textbook, Pan Stanford Publishing, 2016.
3. T. Pradeep, Nano: The Essentials, McGraw Hill, 2008.

4. B. S. Murty, P. Shankar, B. Raj, B. B. Rath, and James Murday, Textbook of Nanoscience and Nanotechnology, Springer, 2013.
5. G. Cao, Nanostructures and Nanomaterials: Synthesis, Properties and Applications, World Scientific, 2011.
6. D. Vollath, Nanomaterials: An Introduction to Synthesis, Properties, and Applications, 2nd edition, Wiley VCH, 2013.
7. S. Lindsay, Introduction to Nanoscience, Oxford University Press, 2009.
8. A.S. Edelstein, and R.C. Cammarata, Nanomaterials: Synthesis, Properties and Applications, 2nd Edition, CRC Press, 1998.
9. C. N. R. Rao, A. Müller, and A. K. Cheetham, The Chemistry of Nanomaterials: Synthesis, Properties and Applications (Vol 1 and 2), Wiley, 2004.
10. B. Bhushan, Springer Handbook of Nanotechnology, Springer, 2010.
11. B. Zhang, Physical Fundamentals of Nanomaterials, Elsevier, 2018.
12. R. Tantra, Nanomaterial Characterization: Introduction, Wiley, 2016.

Advanced Polymer Materials (Credits: 04)

Syllabus:

Basic concepts; polymer raw materials ; polymerization principles and processes (step, chain and other polymerizations, polymer kinetics, polymerization techniques); polymer manufacture (unit operations, polymer reactors, polymer isolation, handling and storage); polymer structure and property; polymer characterization; polymer modification, multi-component polymeric materials (polymer miscibility, polymer blends and alloys, filled plastics, polymer composites); polymer compounding and fabrication (polymer additives, compounding processes, fabrication techniques, post fabrication operations); polymer testing (sample preparation, testing standards and methods, analysis of polymer and additives) ; polymer product design; polymer applications; frontiers of polymer materials (biodegradable polymers, biomedical polymers, conducting polymers, magnetic polymers, polymers for space, nonlinear optical polymers); problems of polymer (thermooxidative degradation, fire hazards, toxicity, effluent disposal, feedstock scarcity).

Reference Books:

1. G. Odian, Principles of Polymerization, Wiley, London, 2004.
2. John Brydson, Plastics Materials, Elsevier.
3. P. Ghosh, Polymer Science and Technology of Plastics and Rubber, Tata
4. McGraw Hill, New Delhi, 2000.
5. V. R. Gowarikar, N. V. Viswanathan and J. Sreedhar, Polymer Science, John
6. Wiley and Sons 1986.

Advanced Processing of Ceramics (Credits: 04)

Syllabus:

Ceramic powder preparation by mechanical and chemical methods, solid-state reaction, directed metal oxidation, reaction bonding, polymer pyrolysis, spray drying, freeze drying, spray pyrolysis, particle size reduction and optimized particle size distribution by Crushing, grinding, milling by various techniques. Processing and fabrication of ceramics by dry and semi-dry pressing, cold isostatic compaction, Hot Pressing and Hot Isostatic Pressing, slip casting, pressure casting, gel casting, tape casting, extrusion, injection moulding. Colloidal Processing of ceramics: basic surface forces, Hamaker constant, DLVO theory, double-layer formation, Stern layer, zeta potential, Debye length, stabilization phenomena of colloidal suspensions, electrostatic stabilization, electrical double layer theory, zeta potential, electrophoresis, steric stabilization, electrosteric stabilization, rheology of colloidal suspension and ceramic slurry, role of additive (plasticizers, binders, surfactants, foaming and antifoaming agents) in ceramic forming, Forming of Ceramics: particle packing in green ceramics, drying behaviour of ceramics: drying shrinkage drying defects, Various drying techniques. binder removal by solution de-binding and thermal de-binding, Advanced sintering techniques: Liquid phase sintering, mechanism, stages and microstructure of liquid phase sintering. Pressure assisted liquid phase sintering, activated sintering, microwave sintering and spark plasma sintering, Explosive Shock Consolidation, sintering with an externally applied pressure – Hot Pressing and Hot Isostatic Pressing, role of stress in densification factor Densification and coarsening, simultaneous densification and grain growth. Grain growth in ceramics due to sintering, Normal and exaggerated grain growth, mechanism, stages and microstructure evolution during sintering. Material examples of ceramic materials for various applications, Few case study on ceramic processing and fabrication, Various ceramic industries in India.

Reference Books:

1. M. N. Rahaman, *Ceramic Processing and Sintering*, CRC Press, 2003
2. J.S. Reed, *Introduction to the Principles of Ceramic Processing, 2nd Ed.*, John Wiley & Sons. 1995.
3. Ceramic Processing before Firing Onoda & Hench.
4. Advanced Ceramics Vol 9, Forming of Ceramics.

PhD-9004	Seminar & viva-voce /Practical/Projects & assignments on specific research topics	04	100
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Seminar & viva-voce /Practical/Projects & assignments on specific research topics (Credits: 04)

(Seminar presentation related to the research works done by the research scholars)

DEPARTMENT OF HISTORY
TRIPURA UNIVERSITY
SYLLABUS
FOR
MASTER OF ARTS IN HISTORY
SEMESTERS-I TO IV (VII TO X FOR IMD)
UNDER
CBCS PATTERN

(Approved by 10th Meeting of BPGS held on 16/10/2020)

TRIPURA UNIVERSITY

DEPARTMENT OF HISTORY SYLLABUS FOR MA IN HISTORY

SEMESTER-I

PAPER CODE	PAPER NAME	CREDIT S	CATEGORY OF COURSE
HIST-701C	HISTORIOGRAPHY	4	CORE
HIST-702C	ANCIENT SOCIETIES	4	CORE
HIST-703C	FEUDALISM	4	CORE
HIST-704C	CAPITALIAM AND IMPERIALISM	4	CORE
CSK-I	COMPUTER SKILL	4	COMPULSORY ELECTIVE

SEMESTER-II

PAPER CODE	PAPER NAME	CREDITS	CATEGORY OF COURSE
HIST-801C	NATIONALISM	4	CORE
HIST-802C	SOCIETY AND CULTURE IN COLONIAL INDIA	4	CORE
HIST-803C	ECONOMIC HISTORY OF COLONIAL INDIA	4	CORE
HIST-804C	INDIAN NATIONALISM	4	CORE
HIST-805E	BRITISH COLONIAL POLICY AND EXPANSION IN COLONIAL INDIA	4	ELECTIVE
HIST-806E	M.K. GANDHI AND INDIA	4	ELECTIVE

SEMESTER-III

PAPER CODE	PAPER NAME	CREDITS	CATEGORY OF COURSE
HIST-901C	SOCIO-POLITICAL HISTORY OF EUROPE(1870-1945)	4	CORE
HIST-902C	CONTEMPORARY WORLD (1945-1991)	4	CORE
HIST-903C	SOCIO-ECONOMIC HISTORY OF NORTHEAST INDIA	4	CORE
HIST-904C	TRIPURA	4	CORE
HIST-905E	MODERN U.S.A	4	ELECTIVE
HIST-906E	MODERN SOUTH EAST ASIA	4	ELECTIVE

SEMESTER-IV

PAPER CODE	PAPER NAME	CREDITS	CATEGORY OF COURSE
HIST-1001C	POST-INDEPENDENCE INDIA	4	CORE
HIST-1002C	ECOLOGY AND ENVIRONMENT IN HISTORY	4	CORE
HIST-1003C	GENDER IN INDIAN HISTORY	4	CORE
HIST-1004C	CASTE AND TRIBES IN INDIAN HISTORY	4	CORE
HIST-1005C	PROJECT/DISSERTATION	4	CORE

FIRST SEMESTER

ALL THE PAPERS ARE OF 4 CREDITS

(CORE Courses)

Course No. HIST-701C: Historiography

Course Specific Outcome:

1. The students will be taught about the meaning and scope of History.
2. They will also be taught about the relationship of History with other disciplines like Archaeology, Geography, Anthropology, Linguistic, Sociology, Philosophy, Political Science and Applied Science and Literature.
3. They will learn about the traditions of Historical writing.
4. The course provides information about Indian Historical writing, Marxist, Subaltern and recent trends in Historical writing in North East India.
5. Major theories of history and techniques of Historical Research are also taught to the students.

Course Content:

- A. Meaning and Scope of History: Historical facts, Causation, Historicism, Generalization, Objectivity
- B. History and other disciplines: Archaeology, Geography, Anthropology, Linguistics, Sociology, Philosophy, Political Science, Natural science, Applied Science and literature
- C. Traditions of Historical writing: World: Greco-Roman, Chinese, Western, Arabic, Persian, Church, Medieval Historiography, Renaissance Historians;
- D. India: Colonial, Nationalist, Communalist, Marxist, Subaltern and Annals; Recent trends in Historical writing in North-East India; Dominant trends.
- E. Major theories of History: Cyclical, Historical materialism, Sociological, Comparative, Structural, World system, Ecological and post-modernist critiques of History.
- F. Techniques of Historical Research: Methods, Collection and Classification of data, Analytical and Synthetic Operations

Reference Books:

1. Arthur Marwick, The Nature of History, Penguin, 1993, Rep.
2. R. G. Collingwood, The Idea of History, Madras, 1989.
3. Keith Jenkins, Rethinking History, London, 1991.
4. Mark T Gilderhus, History and Historians: A Historiographical Introduction, Prentice Hall, New Jersey, 1992.
5. E. H. Carr, What is History, London, 1963.
6. RomilaThapar, Interpreting Early India, OUP, Delhi, 1993
7. HarbansMukhia, Historians and Historiography during the reign of

- Akbar, Vikas, New Delhi, 1976.
8. IrfanHabib, Interpreting Indian History, NEHU, Shillong, n.d
 9. Manorama Sharma, History and History Writing in North East India, Regency Publishers, Delhi, 1999
 - 10.C. H. Philips, Historians of India, Pakistan and Ceylon, OUP, London, 1967, Reprint.
 - 11.B. Sheikh Ali, History : Its Theory and Methods
 - 12.D. P. Choudhury: Idea of History in a Changing World (KP Bagchi)
 - 13.E. Sreedharan : A Text Book of Hitoriography

Course No. HIST-702C: Ancient Societies

Course Specific Outcome:

1. The students are taught about the Human Evolution.
2. The course also discusses about the first Urbanization in Human History, about the Iron Age Civilization in India and the Aegean World and the about the decline of early Empire like the Mauryan Empire and the Imperial Rome.

Course Content:

- A. Human Evolution: Geographical Background and Chronology; social evolution and trends: Hunters gatherers and the origins of food production in Ancient World
- B. First Urbanization: Copper- Bronze using Cultures: Development and metallurgical technology; Pastoral Nomadism in Ancient World
- C. Iron age Civilization: Beginning of the use of Iron; Metallurgical technique; Emergence of Urban centers and proto-states Civilization in India and Aegean World
- D. Structure of early Societies : Transition from pre-state to early state with special reference to the Gangetic plan; Slave Societies in Ancient Greece and Rome
- E. Decline of Early Empires, With special reference to Maurya India and Imperial Rome.

Reference Books:

1. V. Gordon Childe, What Happened in History, Penguin Books, 1975, Rep.
2. G. Clark, Archaeology and Society, London, 1966.
3. E. J. Hobsbawm (ed.), Karl Marx: Pre-Capitalist Economic Formations, London, 1964.
4. Cart Piggot, Prehistoric Societies, Penguin Books, 1980
5. D.P. Agarwal, The Copper Bronze Age of India, Poona, 1969
6. D.D.Kosambi, An Introduction to the Study of Indian History, 2nd Revised Edition, Bombay, 1975
7. RomilaThapar, From Lineage to State, OUP, Delhi, 1983
8. R.S.Sharma, Material Culture and Social Formations in Ancient India, Macmillan, Delhi, 1983
9. V. Gordon Childe, Social Evolution, Penguin Books, New York, 1951
- 10.H.J.M Claessen, P. Skalnik (ed.) The Early State, Vol. I and II, Mouton Publishers, New York, 1978 and 1981
- 11.George Dalton (ed.), Tribal and Peasant Economics, The Natural History Press, New York, 1967
- 12.RomilaThapar, Asoka and the Decline of the Mauryas, OUP, 1961
- 13.Amar farooqui: Early Social Formations (Manas)

Course No. HIST 703 C: Feudalism

Course Specific Outcome:

1. The students will learn about the transition of Societies from Ancient to Feudal Societies.
2. The course will discuss about the transition of early Medieval Indian Society
3. The concept of Feudalism in Europe, India and the North East India is clearly defined for the understanding of the students.
4. The students will also learn about the Indian Feudalism in Slavery, Urban Decay, Peasantry and about Feudal Land Tenure.

Course Content:

- A. Concept of Feudalism: European, India and North-East India.
- B. Transition of Societies: Ancient to Feudal Societies- Western Europe; Mode of production; slave, serfdom and peasant societies
- C. The Second feudal age: Population Growth, trade and urbanization; New Economy Growth; Crisis of Feudalism; Decline of Feudalism
- D. Transition of Early Medieval Indian society: Material Changes and New Social Order with unequal distribution of power, increasing social tension
- E. Indian Feudalism: Slavery, Urban Decay, Agricultural technology, Peasantry, feudal land tenure.

Reference Books:

1. Marc Bloch, Feudal Society, 2 vols., London, 1962
2. Perry Anderson, Passages from Antiquity to Feudalism, London, 1975
3. Henry Pirenne, Economic and Social History of Medieval Europe, London, 1961
4. R.S. Sharma, Perspective in Social and Economic History of Early India, New Delhi, 1983
5. R.S. Sharma, Indian Feudalism, New Delhi, 1985
6. HarbansMukhia, Perspectives on Medieval History, New Delhi, 1993
7. R. Coulbran, Feudalism in History, Princetown, 1956
8. R. H. Hilton (ed.), Transition from Feudalism to Capitalism, London, 1976
9. R. S. Sharma, Urban Decay in India, New Delhi, 1987
10. V. K. Thakur, Historiography of Indian Feudalism, Patna, 1992
11. B. D. Chattopadhyay: making of Early Medieval India (OUP)
12. F.L. Ganshof : Feudalism

Course No. HIST 704C: Capitalism and Imperialism

Course Specific Outcome:

1. The course discusses about the theories and practices of Capitalism and Imperialism.
2. The Students will be taught about the Political Economy of capitalism and imperialism.
3. The course also discusses about England in transition during the 16th up to the 17th Century
4. The students are also taught about the development of Capitalism and Imperial expansion and its impact in World History

Course Content:

- A. Theories and Practices of Capitalism & Imperialism.
- B. Political economy of Capitalism: Development of Capitalism: Age of Merchant Capitalism, Mercantilism, Expansion and Rivalries, Pattern of Colonization.
- C. England in Transition, 16th–17thCentury: Transition from Mercantilism to Industrialization (Industrial Revolution), Factory, Labour and Legislation.
- D. Europe in 18thCentury: Economic pattern and social structure of Britain, France and Netherlands; Industrial Capital development and its impact on colonial trade and expansion.
- E. Development of capitalism and imperial expansion and its impact; Capital development in Europe, USA; Imperial expansion in Africa and Asia; Colonial rivalries prior to 1914; World Economic Crisis and Aftermath; Imperial Expansion of Germany, Italy and Japan; Second World War: Decolonization.

Reference Books:

1. MeenaxiPhukan, Rise of the Modern West, Macmillan India Ltd., New Delhi, 1998
2. R. H. Hilton, (ed.) The Transition from Feudalism to Capitalism, London, 1976
3. Maurice Dobb, Studies in the Development of Capitalism, London, 1963-4
4. Cambridge Economic History of Europe, Vol. V, CUP, 1991
5. D.K. Fieldhouse, The Colonial Empire, New York, 1993
6. D.K. Fieldhouse, Economics and Empire, 1830-1914, London, 1976
7. E.J. Hobsbawm, Industry and Empire, London, 1975
8. Sydney Pollard, European Economic Integration 1815-1970, Thames and Hudson, London, 1974
9. Michael Barrat, Economics of Imperialism, Brown Press, 1989
10. A.J.P. Taylor, Struggle for the Mastery in Europe, OUP, 1971
11. A.J.P. Taylor, Origins of the First World War, OUP, 1979
12. A.J.P. Taylor, Origins of the Second World War, Penguin, Hammond Sworth, 1964

13. James J. O'Connell, *Europe since 1870: An International History*, Hammond Swarth, 1976
14. V.I. Lenin, *Imperialism: The Highest Stage of Capitalism*, Introduction by Prabhat Patnaik, Leftword Books, New Delhi, 2000
15. Roger Owen, *Studies in the Theory of Imperialism*, Longman, London, 1972

SECOND SEMESTER

ALL THE COURSES ARE OF 4 CREDITS

(CORE Courses)

Core Course No. HIST 801 C: Nationalism

Course Specific Outcome:

At end of the course student will:

1. Be familiar with the theories of nationalism
2. Learn about the socio-economic and political aspects of European history
3. Learn about the early nationalist stirrings, the impact of the First World War, the Russian Revolution, about India and China till the 1940s and the Japanese nationalism
4. Help the students to understand the Second World war and its impact on national movements in Asia and Africa

Course Content:

- A. Theories of Nationalism: Ernest Gellner, Anthony D. Smith, B. Anderson, ParthaChatterjee and Others
- B. Socio- economic and political aspects of European Nationalism; Liberalism in England; French Revolution of 1789, 1830 and 1848, their impact on Europe; Rise of nationalism in Russia, and unification of Germany and Italy, the Balkans – pan Slavism
- C. Early nationalist stirrings, impact of First World War, Russian Revolution, Kemalist Revolution, Zionism and Palestinian Nationalism, India and China till the 1940s, Japanese Nationalism.
- D. Second World War and impact on Nationalist movements in Asia and Africa, case studies of Nigeria and Egypt, Indonesia and Vietnam.
- E. Nation building in Africa and Asia, problems of national integration, social-economic development, ethnicity and continued nationalist upsurges within the newly formed states.

Reference:

1. Edward Royle, Modern Britain, A Social History 1750-1985, Edward Arnold, London, 1992
2. Agatha Ramm, Europe in the Nineteenth Century, Longman, London, 1989
3. E.J. Hobsbawm, Nations and Nationalism since 1780: Myth, Reality, CUP, Cambridge, 1990
4. Paul Brass, Ethnicity and Nationalism: Theory and Comparison, New Delhi, 1991

5. Peter Alter, Nationalism, Edward Arnold, London, 1994
6. Michael Crowder, The Cambridge History of Africa 1943-1970, CUP, 1996
7. MeenaxiPhukan, Rise of Modern West, Macmillan India Ltd, New Delhi, 1998
8. Nicholas Tarling (ed.), The Cambridge History of South East Asia, Vol. II, The 19th and 20th centuries, CUP, Cambridge, 1992
9. R. Emersson, From Empire to Nation: The Rise and Self-Assertion of Asian and African Peoples, Harvard University Press, 1960
10. Steven Grossby, Nationalism: A Very Short Introduction
11. Anthony D. Smith, Nationalism and Modernism
12. Anthony D. Smith, The Ethnic Origins of Nations
13. E. Hobsbawm and T. Ranger (ed.), The Invention of Tradition
14. Ernest Gellner, Nations and Nationalism
15. Hans Kohn, The Idea of Nationalism
16. Hans Kohn, The Age of Nationalism
17. Benedict Anderson, Imagined Communities
18. ParthaChatterjee, Nationalist Thought and Colonial World: A Derivative Discourse?
19. ParthaChatterjee, Nation and Its Fragments

Core Course No. HIST 802C: Society and Culture in Colonial India

Course Specific Outcome:

At end of the course student will:

1. Learn about the religious dissent and protest, caste structure, education and economy of 18th Century India.
2. Be familiar with Sanskritization, westernization, modernization, Bengal Renaissance in colonial India.
3. Be familiar with the socio-religious reform movements in India
4. Learn about the development of education and press in colonial India
5. Be familiar with the different lower caste and backward caste movements in colonial India.

Course Specific Content:

- A. India in the 18th Century: religious dissent and protest, Caste structure and organization, education and economy
- B. Understanding social and cultural changes in colonial India: conceptual issues: Sanskritization, westernization, modernization: Debate on Bengal Renaissance, women as the focus of reform.
- C. Reform movements. Nature of socio-religious reform movements. Raja Ram Mohan Roy: his ideas, thoughts, and reforms, Brahmo Samaj. Prarthana Samaj. Dayanand Saraswati and Arya Samaj. Vivekananda and Ramakrishna Mission. Faraizi movements, Wahabi movement, Sayeed Ahmed Khan and Aligarh movements. Deoband school of thought. Ishwarchandra vidyasagar and his movement for emancipation of women
- D. Colonial education and press: Different agencies for the growth and expansion of modern education (Anglicist vs Orientalist controversy) Woods' Despatch of 1854, Impact of western education. Rise of modern Indian literature. Rise of press in English and Indian languages and its impact. Emergence of an Indian middle class
- E. Lower caste and backward caste movements: Nature of caste movement, Jyotibha Phule's movement; B.R.Ambedkar's depressed class movement; Justice party movement. Self-respect movement, Role of Congress.

Reference:

1. S.C. Roy Chowdhury, Social, Cultural and Economic History of India, Vol. III
2. A.R. Desai, Social Background of Indian Nationalism
3. K.K. Dutt, Social History of Modern India
4. Heimsath, Indian Nationalism and Hindu Social Reform
5. K.K.Dutt, Survey of Social Life and Economic Condition of India in the 18th c.

6. B.B. Misra, Indian Middle Class
7. Susobhan Sarkar, Bengal Renaissance and Other Essays
8. Dharma Kumar, Land and Caste in South India
9. Sumit Sarkar, Modern India
10. Sumit Sarkar, A critique of colonial India
11. Sumit Sarkar, Writing Social History
12. Tanika Sarkar, Hindu Wife, Hindu nation
13. Amiya Sen, Social and Religious Reform: the Hindus of British India
14. Gail Omvedt, Dalit Visions
15. Susan Bayly, Caste, Society and Politics in India from the 18th century to the Modern Age
16. Kenneth W. Jones, Socio-Religious Reform Movement in British India
17. Nicholas B. Dirks, Castes of Mind
18. P.J. Marshall (ed.), India in the 18th c.
19. Seema Alavi, (ed.), India in the 18th c.
20. Subaltern Studies, Relevant Volumes
21. R.P. Dutt, India Today
22. S. Bandopadhyay, From Plassey to Partition and after, History of Modern India
23. S. Bandopadhyay, From Plassey to Partition and after, History of Modern India
24. S. Bandopadhyay, Caste, Culture and Hegemony
25. Ishita Bannerjee Dube: History of Modern India (Cambridge)
26. Sumit Sarkar : Modern Times (Orient Blackswan)

Core Course No. HIST 803C: Economic History of Colonial India

Course Specific Outcome:

At end of the course student will:

1. Be familiar with the Indian economy of 18th Century
2. Learn about the various land tenure systems and commercialization of agriculture in colonial India.
3. Learn about the famines and peasant uprisings during colonial India
4. Learn about the agency houses, modern banking, transport and communications, working class during colonial period.

Course Specific Content

- A. The 18th century Indian Economy : trade & Commerce, land and agriculture, urban economy, regional formations, East India Company : From Trading Company to State
- B. Agrarian Conditions: regional variations; land tenure systems- Permanent, Ryotwari, Mahalwari & their consequences; commercialization of agriculture
- C. Famines, Peasant uprisings
- D. Fate of Handloom and other artisanal production : Debate and Regional Experiences, emergence of modern industrial sector & British Policy, the Indian capitalist class
- E. Agency Houses, Modern Banking, Transport & Communications, working class

Reference:

1. D.N. Dhanagare, Peasant Movements in India
2. A.R.Desai, (ed.), Peasant Struggles in India
3. Aditya Mukherjee, Imperialism, Nationalism and the Making of the Indian Capitalist Class
4. Rajat Ray, (ed.) Entrepreneurship and Industry in India
5. A.K.Bagchi, Private Investment in India
6. SukomalSen, Working Class in India
7. DipeshChakraborty, Rethinking working class history
8. Tirthankar Roy, Economic History of India
9. V.B. Singh, (ed.), Economic History of India
- 10.IrfanHabib, Indian Economy, 1858-1914
- 11.Cambridge Economic History of India, Vol. II
- 12.B.R. Tomlinson, The Economy of Modern India (1860-1970)

13. Dwijendra Tripathi, The Concise Oxford history of Indian Business
14. Ishita Bannerjee Dube: History of Modern India (Cambridge)
15. Sumit Sarkar : Modern Times (Orient Blackswan)
16. P.J. Marshall (ed.), India in the 18th c.
17. Seema Alavi, (ed.), India in the 18th c.
18. Subaltern Studies, Relevant Volumes
19. R.P. Dutt, India Today
20. S. Bandopadhyay, From Plassey to Partition and after, History of Modern India
21. K.K. Dutt, Survey of Social Life and Economic Condition of India in the 18th c.
22. Sumit Sarkar: Modern India
23. Sumit Sarkar: Modern Times

CORE COURSE NO.HIST 804C: Indian Nationalism

Course Outcome:

At end of the course student will:

1. Be familiar with the historiography of the national movement.
2. Learn about the origin of Indian Nationalism
3. Be familiar with the idea of Swadeshi and anti-partition movement
4. Be familiar with the various aspects of the national movement of the Gandhian phase.
5. Will learn about rise and growth of communalism in colonial India

Course Specific Content:

- A. Indian National Movement and its interpretations : Historiography, Economic Critique of Colonialism, Ideological Dimension.
- B. Origin of Indian Nationalism; Press and public opinion, Early Organization, INC-Constitution and Strategies.
- C. Partition of Bengal and Swadeshi Movement; Rise of Extremism, Home-Rule Movements, Communalism, Militant Nationalism. Left Wing, Rise of Muslim Politics, women and students.
- D. Major phases-Khilafat, Rowlatt Satyagraha, Non-Cooperation, Civil Disobedience.
- E. National Movement during World War II; Quit India and INA; Muslim Politics, Communalism and Partition of India.

Reference:

1. C. A. Bayly, *Indian Society and the Making of the British Empire*, New Cambridge History of India.
2. Bipan Chandra, *Rise and Growth of Economic Nationalism in India*.
3. Ranajit Guha, ed., *A Subaltern Studies Reader*.
4. R.C. Majumdar, ed., *History and Culture of Indian People*, Vols. IX and X. *British Paramountcy and Indian Renaissance*.
5. Bipan Chandra, K.N. Panikkar, Mridula Mukherjee, Sucheta Mahajan and Aditya Mukherjee, *India's Struggles for Independence*.
6. A.R. Desai, *Peasant Struggles in India*.
7. A.R. Desai: *Social Background of Indian nationalism*.
8. R.P. Dutt, *India today*.
9. Sekhar Bandyopadhyay: *From Plassey to Partition and Beyond*.
10. Sumit Sarkar: *Modern India*
11. Sumit Sarkar: *Modern Times*
12. Ishita Bannerjee Dube: *History of Modern India*

ELECTIVE COURSES

SECOND SEMESTER

ALL THE COURSES ARE OF 4 CREDITS

Elective Course No. 805E: British Colonial Expansion and Policy in India

Course Specific Outcome:

At end of the course student will:

1. Learn about the decay and decline of Mughal rule in India and how European settlements were established.
2. Learn about the British policy and strategy of expansion from Clive to Dalhousie.
3. Impart a detailed knowledge on the various aspects of the Revolt of 1857.
4. Learn about British expansion in North east India.
5. Give student an idea about the political and economic aspects of decolonization.

Course Content:

- A. Historiography of British Rule in India: Decay and Disintegration of the Mughal Empire; European Settlement, trade and commerce.
- B. British expansion; Clive to Dalhousie; Ascendancy in Bengal, Carnatic, relations with Mysore, Hyderabad, Marathas, Sikhs; Ideology of expansion.
- C. Nature and consequences of the Revolt of 1857; Policies towards landholder, peasants, Indian States; Arms of the States-the Army and I.C.S.
- D. British policy, expansion and consolidation in North East India.
- E. Colonial Political and Economic aspects of Decolonization; Impact on Indian polity and society

Reference Books:

1. C. A. Bayly, *Indian Society and the Making of the British Empire*, New Cambridge History of India.
2. Bipan Chandra, *Rise and Growth of Economic Nationalism in India*.
3. SubashChakravarty, *The Raj Syndrome: A Study in Imperial Perceptions*, 1989.
4. J.S. Grewal, *The Sikhs of the Punjab*, New Cambridge History of India
5. P.J. Marshall, *Bengal: The British Bridgehead*, New Cambridge History of India.
6. R.C. Majumdar, ed., *History and Culture of Indian People*, Vols. IX and X. *British Paramountcy and Indian Renaissance*.
7. Eric Stokes, *English Utilitarians and India*.
8. R.P. Dutt, *India today*.
9. M.J. Fisher, ed., *Politics of Annexation* (Oxford in India Readings).
10. P.C. Joshi, *Rebellion 1857: A Symposium*.
11. SekharBandyopadhyay : From Plassey to partition and After
12. PriyamGoswami : From Yandaboo to partition : A history of Assam

13. Stuart Gordon : The Marathas
- 14.LaxmiSubrahmanian : A History of India (1757-1857)
- 15.Bipan Chandra : History of Modern India
- 13.A.R. Desai, *Peasant Struggles in India*.
- 14.R.P. Dutt, *India today*.
- 16.Sekhar Bandyoadhayay: From Plassey to Partition and Beyond

Elective Course No. 806E: M.K. Gandhi and India

Course Specific Outcome:

At end of the course student will:

1. Learn about Gandhian philosophy.
2. Learn about Gandhi's method and strategy during national movement.
3. Learn about Gandhi's relation with contemporary leaders and personalities like Rabindranath Tagore, Nehru, Ambedkar.
4. Get a detailed overview on Gandhi and his critiques.
5. Learn about the contemporary relevance and impact of Gandhi.

Course Content:

- A. Gandhi: his Early Life, South African Experience and participation in the India National Movement.
- B. Gandhi: Political Philosophy: Hind Swaraj, Satyagraha, Ahimsa, Communal Harmony; His relation with Contemporaries: i) Subhash, ii) Ambedkar, iii) Jinnah, iv) Tagore etc.
- C. Gandhi: Socio-Economic Philosophy: Ecology, Peasantry, Rural Development, untouchability, women, trusteeship, education.
- D. Gandhi and his Critique: Imperialists, Left, Feminists, Capitalists, Psycho-dynamic critique
- E. Gandhi and his relevance: i) Contemporary socio-political movements, ii) Contemporary environmental movements, iii) Conflict resolution and Gandhian ethics.

Reference Books:

1. Judith Brown: Gandhi's rise to Power.
2. Judith Brown : Prisoner of Hope
3. Rajmohan Gandhi : The Good Boatman
4. Rajmohan Gandhi: Mohandas
5. David Hardiman: Gandhi in his time and ours
6. ParthaChatterjee : nationalist Thought and Colonial World
7. Denis Dalton : Gandhi's Power
8. Louis Fischer : Gandhi
9. Pannalal Dasgupta : Revolutionary Gandhi
10. Anthony Copley : Gandhi
11. M.K. Gandhi : My Experiments with Truth

THIRD SEMESTER

ALL THE COURSES ARE OF 4 CREDITS

(Core Courses)

Course No. HIST 901C: Socio-Political History of Europe (1870-1945)

Course specific outcome: After studying this course:

1. Students will learn about Political development in Germany (1871-1914).
2. Students will learn about the rise in population, emigration, social structure of working class, middle class, aristocracy, social upheavals in Europe.
3. Students will have detailed knowledge about the Balkans and Russia (1870-1914).
4. Students will also learn about the state and social welfare, education, position of women, factory reforms, health care, and Social conditions in Europe.
5. Students will also learn about the two World Wars and its assessments.

Course Content:

- A. Political development in Germany (1871-1914), Post- unification and domestic and foreign policies, internal development in France (1871- 1914), Establishment of the third republic, the Paris Commune and its collapse, its social and economic policy.
- B. The rise in population, emigration, social structure of working class, middle class, aristocracy, social upheavals in France, Britain, Germany, Russia, Italy.
- C. The Balkans and Russia (1870-1914): European interest in the Balkans, the rise of nationalism in Balkan States, the Russian Empire upto 1917, emancipation of Serfs, Peasant and working class movements, revolution of 1917, Communism in Russia 1917-1939, New Economic Policy, Working Class Movement in Europe.
- D. The state and social welfare, education, position of women, factory reforms, health care, Social conditions in Europe.
- E. World between two World Wars: The First World War, Pace of Versailles, The League of Nations- its assessment, Fascism in Italy, Nazism in Germany, Rise of Hitler, Socio-Economic Policy of Nazi State, Origin and aftermath of the Second World War

Reference:

1. Harold Perkins, The Origins of Modern English Society, London, 1969
2. Hugh Seton-Watson, The Russian Empire 1801-1917, OUP, Oxford, 1989
3. G. M. Trevelyan, English Social History, Orient Longman, New Delhi, 1970
4. A. J. P. Taylor, English History 1914-1945, Penguin Hammand-Smith, 1970
5. P. Richard, A Social History of the Third Reach, Penguin Hammand-Smith,

1974

6. Agatha Ramm, *Europe in the Nineteenth Century 1789-1905*, Longman, 1984
7. Allan Bullock, *The Twentieth Century, Relevant Volumes*, New York, 1995
8. J.M. Roberts, *The Penguin History of the 20th century*
9. E. J. Hobsbawm, *The Short 20th century*
10. E. J. Hobsbawm, *The Age of Empire*
11. E. J. Hobsbawm, *The Age of Capital*
12. James Joll, *Europe since 1870s*
13. David Thompson, *Europe since Napoleon*
14. Gordon A. Craig, *Germany (1866-1945)*
15. A. S. Milward and S.B. Saul, *The Development of Economies of Continental Europe (1850-1914)*
16. Clive Trebilcock, *The Industrialisation of the Continental Europe (1780-1914)*
17. H. Bohme, *Introduction to the Social and Economic History of Germany*
18. C. M. Cipolla (ed.) *The Fontana Economic History of Europe, Relevant Volumes*
19. L.C.A. Knowles, *Economic Development in the 19th Century*
20. George Dupeux, *French Society (1789-1970)*
21. Theodore Zeldin, *France Society, (1789-1970)*
22. Eric Calm, *Politics and Society in Contemporary France (1789-1971)*
23. J.H. Clapham, *Economic Development of France and Germany (1815-1914)*
24. R.D. Anderson, *France 1870-1914 Politics and Society*
25. A. Gerschenkron, *Cambridge Economic History of Europe, Vol-VI*
26. J.N. Westwood, *Endurance and Endeavour: Russian History, 1812-1971*
27. M.S. Miller, *Economic Development of Russia 1905-1914*
28. E.H. Carr, *A History of Soviet Russia: the Bolshevik Revolution.*
29. Martin McCauley: *The Soviet Union since 1917*
30. Maurice Dobb: *Soviet Economic Development since 1917*
31. Lipton, *An Economic and Social History of Europe*
32. W. Laquer (ed.): *Fascism: A Reader's Guide*
33. J. C. Fest: *The Face of the Third Reich*
34. A.J.P. Taylor, *the Origins of the Second World War.*
35. R. Grunberger, *The Social History of the Third reich.*
36. F. Neumann, *Behemoth: the Structure and Practice of National Socialism (1933-1944)*
37. M. Broszat: *The Hitler State*
38. W. W. Carr: *Hitler: A study in personality and politics*
39. E. H. Carr, *The Russian Revolution from Lenin to Stalin, 1917-1929*
40. I. Deutscher: *Stalin*
41. G. Carocci: *Italian Fascism*
42. S. W. Halperin, *Mussolini and Italian Fascism*
43. A.J. Gregor, *Italian Fascism, the Developmental Dictatorship*
44. J. P.T. Bury, *France: 1814-1940*
45. A. Cobban, *A History of Modern France, Vols. III: 1871-1962.*

Core Course No. HIST 902C: Contemporary World (1945-1991)

Course specific outcome: After studying this course, students will:

5. Be familiar with the Post Second World War Reconstruction.
6. Learn about the Decolonization in Asia and Africa.
7. Learn about the Social Movements.
8. Help the student's to understand the major areas of tension.
9. Will also learn about the Global associations and their functioning.

Course content:

- A. Post Second World War Reconstruction, Cold War: different phases; Fall of USSR and Communism in Eastern Europe.
- B. Decolonisation in Asia and Africa: Indo-China, Ghana, Algeria; Apartheid: Rise and fall
- C. Social Movements: Civil Rights in the USA, Feminist Movements, Environmental Movements, Human Rights.
- D. Major areas of tension: Israel-Palestine Conflict, USSR-China schism, nuclear arms race, economic disparity between North and South Countries etc.
- E. Global associations and their functioning: UNO, IMF, World Bank

Reference:

1. Norman Lowe: Mastering Modern World History
2. Daniel R. Brower: The World Since 1945, A Brief History
3. Wayne C. McWilliams and Harry Piotrowski: The World Since 1945 , A History of International Relations
4. Sneh Mahajan: Issues in Twentieth Century World History
5. Vijay Malhotra: International Relations
6. Peter Calvocorressi: The World Since 1945
7. Francis Fukuyama: The End of History
8. Samuel Huntington: The Clash of Civilisations
9. John Baylis and S. Smith: The Globalisation of World Politics
10. Eric Hobsbawm: Age of Extremes: The Short Twentieth Century.

Core Course No. HIST 903C: Socio-Economic History of North East India

Course specific outcome: After studying this course:

1. Students will learn about the Pre-colonial societies in North East India.
2. Students will learn about Aristocracy and tribal chieftain.
3. Students will have detailed knowledge about the Pre-Colonial Economy.
4. Students will also learn about the Literary and cultural development in North East India.
5. Students will also learn about the Growth of Industry like tea, coal, oil, handloom and handicrafts, etc.

Course Content:

- A. Pre-colonial societies in North East India; Social Institution-Pyke system in Assam, Tribal Social Organisations, Socio-Religious movements in Assam
- B. Aristocracy and tribal chieftain, Rise of New Social Milieu, Modern Education, Role of Christian Missionaries, Language and Script Controversies
- C. Pre-Colonial Economy, Early European Trade in the Region, Anglo-Ahom Treaty of 1793; Introduction of Money Economy, land and revenue administration, the Agrarian Protest, wasteland settlement rules, Agriculture, Forrest utilization.
- D. Literary and cultural development in North East India; traditional Institution, custom and modernization in tribal society, position of women in North Eastern India.
- E. Growth of Industry-tea, coal, oil, handloom and handicrafts, industrial unrest and labour movement, Development of transport and communication, trade and commerce, effects of Partition of India on North East economy, economic Development since 1947, role of NEC in the economic development in the North East.

References:

1. Priyam Goswami : From Yandaboo to Partition , A History of Assam
2. H. K. Barpujari : A Comprehensive History of Assam, 5 Vols
3. Dipankar Bannerjee : labour Movement in Assam
4. NEIHA Proceedings
5. J.B. Bhattacharjee : Trade and Colony
6. Amaendu Guha: Planter Raj to Swaraj
7. Amalendu Guha : Medieval and Early Colonial Assam: Society, Polity, Economy
8. C. Nunthra : Mizo Society
9. Visier Sanyu:A History of Nagas and Nagaland: Dynamics Of Oral Tradition In Village Formation2008
10. Piketo Sema: A History of Nagaland
11. Lokendra Singh : Unquiet Valley
12. G. Kamei: History of Manipur Pre-colonial Period
13. Milton Sangma: A History of American Baptist Mission in North-East India

Core Course No. HIST-904C: Tripura

Course specific outcome: After studying this course:

1. Students will learn about Sources of the history of Tripura.
2. Students will learn about Tripura's land, people, settlement, etc.
3. Students will have detailed knowledge about British relations with Tripura.
4. Students will also learn about growth of political developments in Tripura during 1947-1958.
5. Students will also learn about the Socio- Economic condition in Tripura 19th -20th Century.

Course Content:

- A. Sources of the history of Tripura: Archeological, Numismatic, Literary, Oral traditions.
- B. Land, people, Settlement; Pre-colonial state formation; Sanskritisation; State structure.
- C. British relations with Tripura; administrative changes, Resistance Movements- Tipra, Jamatia, Reang; Tripura in the 1st and 2nd world wars, Merger of Tripura with India Union.
- D. Tripura 1947-1958: demographic changes; political developments to statehood and formation of TTAADC
- E. Socio- Economic condition in Tripura 19th -20th Century: Land and agriculture, migration, forest resource, trade and commerce; language, education and literature; Christianity in Tripura; Art and Architecture

Reference:

1. A. Mackenzie, History of the relations of the government with the Hill Tribes of North East Frontier of Bengal
2. E. F. Sandys, History of Tripura, Calcutta, 1915
3. J.G. Gumming, Survey and Settlement of the Chakla Roshanabad Estate in the District of Tripura and Noakhali, 1892-99
4. W. W. Hunter, A statistical account of Bengal, Vol. VI, London, 1876
5. Captain T.H.Lewin, the Hill tracts of Chittagong and the Dwellers therein, 1869
6. Tripur Chandra Sen, Tripura in transition 1923-1957, Agartala, 1970
7. Apurba Ch. Bhattacharya, Progressive Tripura, Calcutta, 1930
8. Charu Bhuson Deb (C), Ancient Tripura and its Modest Rulers, Agartala, 1940
9. P. R. Bhattacharjee, Economic transition in Tripura, New Delhi, 1993
10. M. Chakraborti, Rajamalaba Tripura ritihis, Agartala, 1985
11. D. Ch Datta and S. Bandopadhyay, Rajgi Tripurar Sarkari Bangla, Agartala, 1976.
12. Somendra Ch. Debbarma, Census Bibarini, Agartala, 1932
13. Bajendra Ch. Dutta, Tripura Rajye TrisBatsar, Agartala, 1985.
14. J. B. Ganguly, Tripura: The Benign Hills, Agartala, Calcutta 1983
15. J. B. Ganguly, Economic problems of the Jhumias of Tripura, Calcutta, 1969
16. B. P. Misra, Socio-Economic Adjustment of Tribals: A Case Study of Tribal Jhumias, New Delhi, 1976

17. H.K. Sur, British relations with the State of Tripura 1760-1947, Agartala, 1986
18. Suprasanna Bandopadhyay, Tripura State Gazette Sankalan, 1971
19. M. Chakroborti, Administrative Reports of Tripura Vol.I-IV, Agartala
20. G. Bhattacharjee, Refugee Rehabilitation and Its Impact on Tripura's Economy, Gua, 1988
21. A. Goswami ed., Land Reforms and Peasant Movement: A study of the North East India, Guwahati, 1986
22. Census of India Series
23. Sukhendu Debbarma, Origin and Growth of Christianity in Tripura, New Delhi, 1996
24. North East India History Association Proceedings
25. Tribal Research Institute, Government of Tripura, Agartala.

ELECTIVE COURSES

THIRD SEMESTER

ALL THE COURSES ARE OF 4 CREDITS

Elective Course No. HIST 905E: MODERN USA

Course specific outcome: After studying this course:

1. Students will know about the American War of Independence.
2. Students will know about USA under the Republicans and the Democrats.
3. The student will learn about the Cotton Plantation Economy in USA.
4. Students will learn about Industrialization of the USA.
5. The student will learn about the Progressive Movement from Roosevelt to Wilson.

Course Content:

- A. The American War of Independence: Background, Course and Consequences; The framing of the US Constitution-Federal States relation; The federalist Rule-President George Washington, John Adams
- B. USA under the Republicans and the Democrats: Jeffersonian and Jacksonian Democracy; Tariff and Nullification Issue; Anglo-US War 1812; Territorial expansion of USA; Westward Expansion 1815-1848; formation of New States; Missouri Compromise 1820 – Impact on Northern and Southern states.
- C. Cotton Plantation Economy; The Slavery Issue; The Civil War; Emergence of the Republican Party and Lincoln's Administration, Reconstruction of the South.
- D. Industrialization of the USA; Growth of Big Business, Agrarian and Labour Problems; Reforms, Growth of US Imperialism.
- E. Progressive Movement from Roosevelt to Wilson; US Role in the 1st World War, Consequences; the Inter-War period; USA during the WWII; Emergence as a global power, Cold War and USA.

Reference:

1. Charles Sellers, *A Synopsis of American History, Vols. I&II, Macmillan, India, Delhi, 1990*
2. Stanley L Gallman, (ed.), *The Cambridge Economic History of the USA, CUP, Cambridge, 1996.*
3. Bernard Bailyn, *The Great Republic.*
4. Bernard Bailyn, *The Ideological Origins of the American Revolution.*
5. Charles Beard, *An Economic Interpretation of the American Constitution.*
6. Dee Brown, *Bury My Heart at Wounded Knee, An Indian History of the American West.*
7. Peter Carroll and David Noble, *Free and Unfree: A New History of the United States.*
8. David B. Davis, *The Problem of Slavery in the Age of Revolution.*

9. U. Faulkner, *American Economic History*.
10. Robert Fogel, *Railroads and American Economic Growth*.
11. Eric Foner, *America's Black Past*.
12. John Hope Franklin, *From Slavery to Freedom*.
13. Gerald N. Grobb and Geogre A. Billias, *Interpretations of American History: Patterns and Prespectives*, 2 Vols.
14. Richard Hofstadter, *The Age of Reform, From Bryan to FDR*
15. Linda Kerber, *Women's America: Refocusing the Past*.
16. David M. Potter, *The Impending Crisis*.
17. W. Pratt, *A History of the United states Foreign Policy*.
18. James Randail, *The Civil War and Reconstruction*.
19. J. G. Randall and David Donald, *The Civil War and Recontruction*.
20. Kenneth Stamp, *The Peculiar Institution, Slavery in the Ante-bellum South*.
21. Fcderick Jackson Turner, *The Frontier in American History*.
22. Robert Wiebe, *The Search for Order*.
23. Lee Benson, *The Concept of Jackson Democracy*.
24. Ray A. Billington, *Westward Expansion*.
25. Paul Boyer, Harvard Sitkoff, Nancy Woloch, *The Enduring Vision: A History of the American People*, Vols. Land 2.
26. Thomas Cochran, *The Inner Revolution*.
27. A. O. Craven, *The Growth of Southern Nationalism, 1848 – 1861*. Lance E. Davis (ed.), *American Economic Growth*.
28. Carl N. Degler, *At Odds: Women and Family in America from the Revolution to the Present*.
29. Fogel and Engerman? *Time on the Cross*.
30. Lewis L. Gould (ed.), *The Progressive Era*.
31. John D. Hicks, *The Federal Union: A History of USA Since 1865*.
32. R.P. Kaushik, *Significant Themes in American History*.
33. David M. Kennedy, Thomas Baileyand Mel Piehl, *The Brief American Pageant*.
34. Irving Kristol, *Gordon Wood and others, America's Continuing Revolution*.
35. Richard W. Leopold, *The Growth of American Foreign Policy*.
36. Perry Miller, *From Colony to Province*. Gary Nash (ed.), *Retracing the Past*.
37. Henry Pelling, *American Labor*.
38. Edward Pessen, *Jacksonian Panorama*.
39. Charles Sellers, Henry May and Neil McMillen, *A Synopsis of American History*; 2 Vols.
40. Donald Shihan, *The Making of American History: The Emergence of the Nation*, Vols. I & II.
41. DwijendraTripathi and S.C. Tiwari, *Themes and Prespectives in American History*.
42. James Weinstein, *The Corporate Ideal in the Liberal state*.

Elective Course No. 906E: Modern South East Asia

Course specific outcome: After studying this course, students will:

1. Be familiar with Colonialism in South East Asia.
2. Learn about the National Movement in South-East Asia.
3. Learn about Japanese Imperialism.
4. Help the students' to understand about the Independence path in South-East Asia.
5. Learn about the Emergence of Modern South East Asia in Global Economics and Politics.

Course Content:

- A. Colonialism in South East Asia: The Portuguese, French, Dutch, Spanish, British and the USA.
- B. National Movement: Indonesia, Malaysia, Indo-China, Burma.
- C. Japanese Imperialism; Conquest and Occupation, the sponsorship of independence, satellite states.
- D. Independence path: Burma, Vietnam, Laos, Indonesia, Malaysia, Philippines and Singapore; South East Asia in Global politics; American impact; Vietnam War and Chinese interest.
- E. Emergence of Modern South East Asia in Global Economics and Politics; ASEAN

Reference:

1. B. Anderson: *Imagined Communities*.
2. H. Benda: *The Crescent and the Rising Sun*.
3. Furnivall: *Colonialism and the Plural Society*.
4. G. Hart, ed., *Agrarian Transformations: Local Processes and the State in South-east Asia*.
5. J. Kemp, ed., *Peasants and Cities, Cities and Peasants: Rethinking South-east. Asian Models*.

6. Milton Osborne, *South East Asia: An Introductory History*.
7. Nicholas Tarling, ed., *Cambridge History of South-east Asia*, Vol. II
8. B. Anderson: *Mythology and the Tolerance of the Javanese*.
9. C. van Dijk, *Trousers, Sarongs and Jubbahs*.
10. C. Dobbin, *Islamic Revivalism in a Changing Peasant Economy (1784-1847)*.
11. Charles F. Keys, *The Golden Peninsula*.
12. Daniel S. Lev and Ruth T. McVey, eds., *Making Indonesia – Essays on Modern Indonesia*.
13. Victor Purcell, *The Chinese in Southeast Asia*.
14. Tongchai Winichakul; *Siam Mapped*.
15. D. R. Sardesai : *South East Asia : Past and Present*
16. John F. Cady : *South East Asia : A History*

FOURTH SEMESTER

ALL THE PAPERS ARE OF 4 CREDITS

(Core Courses)

Core Course No. 1001C:Post-Independence India

Course specific outcome:

1. The course intends to acquaint students with the contemporary history of India after independence
2. Students will get acquainted with the nation building programme after Independence.
3. Students will learn about India's economic development after Independence.
4. Students will get a clear idea about independent India's foreign policy.

Course Content:

- A. Emergence of India Republic- transfer of power, integration of India states, making of the Indian Constitution, reorganization of States, New states.
- B. Democracy at work-Democratic Socialism and Welfare State, working of the centre-states relations; J.P. Movement and Emergency, Coalition politics; Democratic Decentralization, Panchayati Raj; problem of Communalism, Regionalism, ethnicity, militancy, caste and untouchability.
- C. Foreign relation; foundation of foreign policy, Panchsheel and Nehru Era; India in Commonwealth, UN, NAM and SAARC.

- D. Social development; ideology of planned economic growth; agricultural growth-Green revolution, land reforms, industrial progress; economic reforms and globalisation; political economy of development, education, literacy; problem of the marginalized peasants, works Dalits; India Women since Independence.
- E. Achievements- Science and technology, art, literature and culture, mass communication.

Reference:

1. Bipin Chandra : India after Independence
2. RamchandraGuha: India after Gandhi
3. Paul Brass : Indian politics since impendence
4. BidyutChakraborty : Indian Government and Politics
5. ParthaChatterjee: Politics in India
6. BipinChandra : Essays in Contemporary India.
7. PratapBhanu Mehta : Politics in India

Core Course No.1002C: Ecology and Environment in History

Course Specific outcome:

1. the course makes an attempt to apprise the students of History with a crucial issue of ecology and environment
2. Students will get an in-depth idea about the nature of Human- Nature interaction ancient India.
3. Students will get an in-depth idea about the nature of Human- Nature interaction in medieval India.
4. The course intends to apprise the students about the impact of colonial rule on India's environment
5. Students will also learn about environmental issues in post-independence India.

Course Content:

- A. Scope of Ecology, Ecology-Science or Art, its relation to other subjects, Terminology of Ecology, Basic concept of Ecology, Approaches to Ecology, Component of Environment, Living and Non-Living components, Management and conservation of living and non-living resources of environment for sustainable development, Environmental degradation and its impact on present and future generations.
- B. Environment consciousness in ancient India: Indus Valley civilization; planned urbanization, drainage system, watershed management, waste management, worship of different components of nature, concept of prakriti and purush. Pre-Vedic and Post-Vedic civilization. Forest and wild life management in Maurya and Gupta period small scale

- industries based on natural resources in ancient India.
- C. Environmental consciousness in Medieval India. Exploration of natural resources for economic development in early Medieval India, exploration of natural resources for sustainable economic and ecological development in Mughal period, Over exploitation and ecological destabilization during later Mughal period.
 - D. Environmental and ecological consciousness in Modern India; British economic policy and imperialism; Ruin of India small scale industries; Over exploitation of natural resources; Establishment of industries based on Indian natural resources and its impact on environment and ecology.
 - E. Environmental issues after independence: Environmental policies of government of India after independence; the continuing debate between environmental protection and economic development; environmental movements in India- Chipko Movement, Save Narmada Movement, The Silent Valley movement, Impact of global development on Indian Environmental policy.

Reference:

1. Stern, Klaus and Rocha, Laurence, Genetics of Forest Ecosystems, Heidelberg, 1974
2. Gadgil, Madhava and Guha, Ramachandra, This Fissured Land: An Ecological History of India, Delhi, 1992
3. Ribeentrop, B, Forestry in British India, Calcutta, 1900
4. RamachandraGuha Omnibus, OUP
5. Kannau, K.P., Forest for Industry's profit in Economic and Political Weekly, June 5, 1982.

Core Course No.1003C: Gender in Indian History

Course specific outcome:

1. The course intends to provide students a broad understanding of different theoretical outlook on the gender issue.
2. The course intends to apprise various gender issues in ancient India.
3. The course intends to apprise various gender issues in medieval India.
4. The course intends to apprise various gender issues in colonial India.
5. The students will get apprised of various women's organizations and movements in colonial and post colonial India.

Course Contents:

- A. Introduction to Gender history: Gender as a category of Historical analysis: Invisibility of women in History, Interdisciplinary approaches to gender history Methodologies of analyzing gender history, Gender and Labour: key concepts of body, class, caste, feminism, gender, masculinity, patriarchy, and sexual division of labour.**
Development of Feminist thought: First wave feminism, Marxist feminism, Socialist Feminism, Second wave Feminism, Third wave feminism, Emergence of Gender/Women Studies in India
- B. The position of women in pre-modern India - I (Ancient Period):**
Different debates (Altekar's paradigm and its critique, Orientalist construction of gender relations in ancient India, etc...), Historical representation of women (literary and inscriptional references), Women in different religious traditions, viz. Brahmanical (Vedic and post-Vedic period), Buddhist and Jain, Women in

Bhakti tradition.

C. The position of women in pre-modern India - II (Medieval period):

Women in the public sphere (rulers, patrons and livelihood earners); Masculinity of the Mughal court culture (body and emotions; norms of masculinity; love, eros and devotion in mystical thought), Women's agency – Imperial women (Razia Sultana and Nur Jahan, Mughal marriages with Rajput women), Women in everyday life: harem, women and law and gender relations in the household.

D. The position of women in Modern India:

Culture as a critical site of constructions of gender - The bhadramahila, sati, female honor, age of consent bill, widow remarriage, child marriage and purdah., Social reform movements in the 19th century C.E.

Women in private/public sphere (women, education and work); Women's rights (19th and 20th centuries C.E. legislations, which related to women's issue - Regulation XVII of 1829, Regulation VI of 1802, Widow Remarriage Act of 1856, India Act V of 1843, the Age of Consent Act, 1891, Child Marriage Restraint Act of 1929, etc.)

Women education (19th and 20th centuries C.E.): Government (Wood's Despatch, 1854; Hunter Commission of 1882, The Sadler Committee and the Sergeant Committee recommendations of the 20th century C.E.) Jyotirao and Savitribai Phule, Tarabhai Shinde and Pandita Ramabhai, Missionary activities

E. Women's Movement

Women and Indian national movement: Gandhi and women, Participation of women in the Indian national movement

Women's questions: E.V. Ramasami (Thanthai Periyar) and women, Sarojini Naidu

Women's Organizations: All India Women's Conference

References:

1. Agarwal, Bina. "The Gender and Environment Debate". *Feminist Studies*. (Spring, 1992).
2. Agnihotri, Indu and Vina Mazumdar. "Changing Terms of Political Discourse: Women's Movement in India, 1970-1990". *Economic and Political Weekly* 30, no. 29. (1994).
3. Ali, Daud. *Courtly Culture and Political Life in early Medieval India*. Cambridge University Press, 2004.
4. Anandhi S. Bharadwaj. "Women's Question in the Dravidian Movement c. 1925-1948". *Social Scientist* 19, no. 5/6. (May-Jun, 1991): 24-41.

5. Anagol, Padma. *The Emergence of Feminism in India, 1850-1920*. Hampshire: Ashgate Publishing Limited, 2005.
6. Bagchi, Barnita. *Pliable Pupils and Sufficient Self-Directors: Narratives of Female Education by Five British Women Writers 1778-1814*. New Delhi: Tulika, 2004.
7. Bagchi, Jashodhara, "Representing Nationalism: Ideology of Motherhood in Colonial Bengal". *Economic and Political Weekly*. (October 20, 1990).
8. Bagchi, Jasodhara and JabaGuha. Et.al., *Loved and Unloved: The Girl Child in the Family*. Kolkata: Stree, 1997.
9. Basu, Amrita and C. Elizabeth McGrory. Eds. *The Challenge of Local Feminisms: Women's*

Core Course No.1004C: Caste and Tribes in Indian History

Course specific outcome:

1. The paper intends to provide students a detailed knowledge about different approaches towards caste and tribe.
2. Students will be apprised of the history of caste in India particularly in the colonial period.
3. Students will be apprised of the history of tribes in India particularly in the colonial period.
4. students will know about the multilayered interaction between caste, tribe and the state.
5. Students will be apprised of the history and experiences of tribes and castes in post colonial India.

Course Content:

- A. Approaches towards caste and tribe: Marxist, Colonial, Orientalist, Nationalist, and Subalterns, Dalit (tribe caste-peasant continuum)
- B. Caste and Tribes in Ancient and Medieval India: Varna, Jati (Mlecchas and Asuras), Bhakti movements, state policy towards caste and tribes
- C. Caste in Colonial India: Policy of the colonial state towards caste (pre-1857); Policy of the Colonial State (post-1857): the role of census and ethnography; Indian Renaissance and caste issues; Perriyar and the Dravidian Movement; Nationalist debates on caste (Gandhi and Ambedkar); Temple entry movements
- D. Tribes in Colonial India: Criminalising the tribes; Denotified tribes; Colonial policy of sedentarisation; Tribal movements in colonial India: Santhal, Birsa Munda, Khasis
- E. Caste and Tribes in Post-Colonial India: **Caste:** Caste reservation (the Mandal Commission), Dalit Panthers movement, Caste Politics. **Tribes:** Nehru, Elwin and the

Northeast; the 6th schedule and reservation; identity movements among the tribes; policy on criminal tribes.

References:

1. Braj Rajan Mani, *Debrahmanising History: Dominance and Resistance in Indian Society*, Manohar, New Delhi, 2008.
2. S. Bhattacharya and C. Rao (ed.), *Past of Outcastes*, Orient Blackswan, New Delhi, 2010.
3. S. Jaiswal, *Caste: Origin, Functions, and Dimensions of Change*, Manohar, Delhi, 2000.
4. BR Ambedkar, *Dr. Babasaheb Ambedkar: writings and speeches*, ed. By Vasant Moon, 15 vols., education Department, Govt. of Maharashtra, 1987-97.
5. Meena Radhakrishnan, *Denotified Tribes*, KS Singh (ed.) *Tribal Movements in India*, Manohar-IIAS,
6. DD Kosambi, *Myth and Reality*, Popular, Bombay, 1962.
7. DD Kosambi, *The Culture and Civilisation of Ancient India in Historical India*, Vikas, 1965.
8. DD Kosambi, *An Introduction to the Study of Indian History*, Popular, Bombay, 1956.
9. RS Sharma, *Sudras in Ancient India*, Motilal, New Delhi, 1958.
10. RS Sharma, *Aspects of Political Ideas and Institutions in ancient India*, Motilal, New Delhi, 1991.
11. Jyoti Rao Phule, *Selected Writings*, ed. By JP Deshpande, 1873.
12. Rosalind O'Hanlon, *Caste Conflicts and Ideology: Mahatma Jotirao Phule and the Low caste protest in nineteenth century western India*, CUP, Delhi, 1985.
13. Rosalind O'Hanlon, *A Comparison women and men: Tarabai Shinde and the critics of gender relations in colonial India*, Delhi, OUP, 1994.
14. Gail Omvedt, *Cultural Revolt in a Colonial Society: The Non-Brahmin movement in Western India, 1873-1830*, Bombay, 1976.
15. Gail Omvedt, *Dalits and the Democratic Revolution: Dr. ambedkar and the Dalit Movement in Colonial India*, Sage, Delhi, 1994.
16. Gail Omvedt, *Dalit Vision*, Delhi, Orient Longman, 1995.
17. Gail Omvedt, *Buddhism in India: challenging Brahmanism and Caste*, Delhi, Sage, 2003.
18. Elanor Zalliot, *From Untouchables to Dalit: Essays on the Ambedkar Movement*, Delhi, Manohar, 1996.
19. MSA Rao, *Social Movements in India*, Delhi, Manohar, 2000.
20. Chinna Rao (ed.) *Dividings Dalit*, Rawat, 2010.

Core Course No.1005C: PROJECT/DISSERTATION

Course Specific Outcome:

The project/ dissertation is intended to apprise the students of the art of

historical research and to encourage them in critical and analytical thinking and writing. This paper will give the students an idea how a project/dissertation is written.

INTEGRATED MASTER DEGREE PROGRAMME IN MATHEMATICS

Programme Outcomes

The Integrated Master degree programme aims at holistic development of the students through the innovative and comprehensive educational ideology of Tripura University. The programme exposes the students to core disciplines of Mathematics, Economics, English, History, Hindi, Bengali, Philosophy, Political Science and Rural studies, as well as in the disciplines of Statistics, Sociology, Education and foundation courses. The necessary competencies in the respective areas will be developed for which all essential theoretical, practical and field based skills will be provided. On completion of the Programme, students will be able to:

- gain in depth knowledge of all core disciplinary courses,
- develop independent learning abilities and analytical thinking through problem-based assignments, practical exercises and projects,
- understand a scientific problem, logically analyse it and systematically find its solution,
- become an responsible citizen with a strong value base and ethics,
- apply knowledge and understanding in order to initiate and carry out a work or project for societal benefit,
- develop communication skills and ability to work in a team,
- train the students for attainment of technical skills, intellectual capability with exposure to modern technologies to serve as an individual or as a team leader in industries,
- learn and handle various analytical techniques and appreciate its importance,
- raise sensitivity to professional ethical codes of conduct, social values and respect for all,
- create awareness among students about need for conservation of environment and sustainable development,
- integrate different aspects of physical, practical, aesthetic, moral and intellectual dimensions of educations to develop a holistic personality of each student.

Programme Specific Outcomes

PO1: Knowledge: Obtain in depth knowledge on various topics in pure and applied mathematics, which will enable them to pursue higher degrees and research at reputed academic institutions. Get the knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains. It also enriches their analytical, critical, creative faculties.

PO2: Planning ability: Demonstrate effective planning abilities including time management, resource management and organizational skills. Ability to develop and implement plans and organize work to meet deadlines.

PO3: Problem analysis and solving: Inculcate mathematical reasoning, logical thinking skills and creativity; be equipped with skills to analyze problems, find solutions of them, formulate a hypothesis, evaluate and validate results, and draw reasonable conclusions thereof.

PO4: Modern tool usage: Learn computer programming and computational tools like C, MS-Excel, MATLAB, etc. with an understanding of their potential uses as well as their limitations.

PO5: Leadership skills: Develop potential among students to excel as leaders in academics, entrepreneurship, industry and management.

PO6: Ethics: Develop scientific ethics, including confidentiality and accountability. Apply ethical principles and commit to professional ethics, responsibilities, and norms of science practices.

PO7: Communication: Ability to express effectively, write effective reports, design documentation, make effective presentations, give and receive clear instructions and effectively communicate with others.

PO8: Environment and sustainability: Create awareness about environment protection and conservation of resources and the need for sustainable development for long time betterment of the living beings on earth.

PO9: Life-long learning: Develop the ability to read and learn mathematical and statistical tools on their own that encourage independent exploration in the area of Mathematics and enable them to continue acquiring mathematical and statistical knowledge and skills appropriate to professional activities in the fast changing world.



TRIPURA UNIVERSITY
Department of Mathematics

M.Sc. in Mathematics

Programme Specific Outcome

At the end of the programme student-

- Inculcate mathematical reasoning, be equipped with skills to analyze problems, find solutions of them, formulate an hypothesis, evaluate and validate results, and draw reasonable conclusions thereof.
- get knowledge on various topics in pure and applied mathematics, which will enable them to pursue research at reputed academic institutions
- get the knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains
- develop effective scientific and/or technical communication skills(both oral and writing)
- get proper preparation for appearing in NET, SET, GATE, etc.
- choose career options in Financial sector, Banking sector, IT sector, R&D Department of varous industrial sections, Administrative services, Teaching, independent consultant, or become enterpreneur with the knowledge of Mathematics.

SEMESTER I- (Core Course (C): 16 Credits)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
MATH 701C	Linear Algebra	4	0	0	04	100
MATH 702C	Real Analysis	4	0	0	04	100
MATH 703C	Complex Analysis	4	0	0	04	100
MATH 704C	Ordinary Differential Equations	4	0	0	04	100
Sub-Total		16	0	0	16	400

SEMESTER II-(Core Course (C): 12 Credits; Foundation Course (F): 4 Credits)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
MATH 801C	Abstract Algebra	4	0	0	04	100
MATH 802C	Topology	4	0	0	04	100
MATH 803C	Integral Equations and	4	0	0	04	100

	Calculus of Variations					
CSK 801F	Computer Skill-III	4	0	0	04	100
Sub-Total		12	0	0	12	400

SEMESTER III- 25 Credits (Core Course (C): 16 Credits)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
MATH 901C	Functional Analysis	4	0	0	04	100
MATH 902C	Numerical Analysis	4	0	0	04	100
MATH 903C	Partial Differential Equations	4	0	0	04	100
MATH 904C	Project-I	4	0	0	04	100
Sub-Total		16	0	0	16	400

SEMESTER IV- 18 Credits (Core Course (C): 12 Credits)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks
		L	T	P		
MATH 1001C	Lebesgue Measure and Integration	4	0	0	04	100
MATH 1002C	Computer Programming with practical	2	0	2	04	100
MATH 1003C	Project-II	4	0	0	04	100
Sub-Total		10	0	02	12	300

L: Lecture, T: Tutorial, P: Practical

LIST OF ELECTIVE COURSE

Course Code	Elective Course	Credit	
		Theory	Practical
MATH 705E	Operations Research	04	00
MATH 706E	Logic	04	00
MATH 707E	Mathematical Finance	04	00
MATH 708E	Fuzzy Set Theory	04	00
MATH 805E	Category Theory	04	00
MATH 806E	Discrete Mathematics	04	00
MATH 807E	Fuzzy Logic and Applications	04	00
MATH 808E	Dynamical Systems	04	00
MATH 905E	Fuzzy Topology	04	00

MATH 906E	Set Theory	04	00
MATH 807E	Differential Topology	04	00
MATH 908E	Rough Sets and Applications	04	00
MATH 909E	Abstract Measure Theory	04	00
MATH 1004E	Classical Mechanics and Fluid Mechanics	04	00
MATH 1005E	Sequence Space, Summability Theory and its Applications	04	00
MATH 1006E	Riemannian Geometry	04	00
MATH 1007E	Algebraic Topology 4	04	00
MATH 1008E	Number Theory	04	00
MATH 1009E	Advanced Topology	04	00
MATH 1010E	Graph Theory	04	00
MATH 1011E	Fixed Point Theory	04	00

Programme Outcomes

- (1) Knowledge Domain: Demonstrate an understanding of the basic concepts in Mathematics and its importance in our practical life.
- (2) Problem Analysis: Analyze and solve the well-defined problems in Mathematics and related subjects. Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decision. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
- (3) Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and computing tools such as MATLAB, MATHEMATICA etc. with an understanding of the limitations.
- (4) Technical Skills: Understand tools of modeling, simulation, and data analysis to bear on real-world problems, producing solutions with the power to predict and explain complex phenomena.
- (5) Ethics: Analyze relevant academic, professional and research ethical problems and commit to professional ethics and responsibilities with applicable norms of the data analysis and research practices.
- (6) Communication: Effectively communicate about their field of expertise on their activities, with their peer and society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations.
- (7) Project Management: Apply knowledge and understanding of principles of Mathematics effectively as an individual, and as a member or leader in diverse teams to manage projects in multidisciplinary environment.
- (8) Research Proposal: Define, design and deliver a significant piece of research work that is clear and concise. Demonstrate the necessary skills and knowledge of deeper understanding of their chosen research area. Understand the philosophy of research in mathematical sciences and appreciate the value of its development.
- (9) Life-long learning: Demonstrate the ability to read and learn Mathematical tools on their own that encourage independent exploration in the specific area of Mathematics and related fields. Continue to acquire Mathematical knowledge and skills appropriate to professional activities in the context of technological change.

Tripura University

Department of Information Technology



Curriculum Structure

2-year Master of Computer Applications (MCA)

First Semester Examination, December-2020

Second Semester Examination, April/May-2021

Third Semester Examination, December-2021

Fourth Semester Examination, April/May-2022

Tripura University

A Central University, Suryamaninagar

Tripura West (799022)

2-year Master of Computer Applications Detail Syllabus (CBCS Pattern) AY 2020-21

Curriculum Structure

MCA SEMESTER I							
Course Code	Course Title	L-T-P	Credits	Hours	Mark	MOOC	
MCA0101C	Mathematical Foundations of Computer Applications	3-1-0	4	4	100	Yes*	
MCA0102C	Programming in C	3-1-0	4	4	100	Yes*	
MCA0103C	Computer Organization & Assembly Language Programming	3-1-0	4	4	100	Yes*	
CSK III	Computer Skill-III	4-0-0	4	4	100	Yes	
MCA0104C	Programming Laboratory	0-0-4	2	4	100	N/A	
MCA0105C	Assembly Language Laboratory	0-0-4	2	4	100	N/A	
Total Credits	4 Theory, 2 Laboratories	13-3-8	20	24	600		
MCA SEMESTER II							
Course Code	Course Title	L-T-P	Credits	Hours	Mark	MOOC	
MCA0201C	Software Engineering	3-1-0	4	4	100	Yes*	
MCA0202C	Data Structures & Algorithm	3-1-0	4	4	100	Yes*	
MCA0203C	Operating System	3-1-0	4	4	100	Yes*	
MCA0204C	Data Structures & Algorithm Laboratory	0-0-4	2	4	100	N/A	
MCA0205C	Software Development Laboratory	0-0-4	2	4	100	N/A	
MCA0206C	Seminar & Technical Writing	0-0-8	4	8	100	N/A	
Total Credits	4 Theory, 3 Laboratories	9-3-16	20	28	600		
MCA SEMESTER III							
Course Code	Course Title	L-T-P	Credits	Hours	Mark	MOOC	
MCA0301C	Database Management Systems	3-1-0	4	4	100	Yes*	
MCA0302C	Data Communication & Computer Network	3-1-0	4	4	100	Yes*	
MCA00XXE	Elective I	4-0-0	4	4	100	Yes*	
MCA00XXE	Elective II	4-0-0	4	4	100	Yes*	
MCA0303C	Database Management Systems Laboratory	0-0-4	2	4	100	N/A	
MCA0304C	Computer Network Laboratory	0-0-4	2	4	100	N/A	
MCA0305C	Project Phase I	0-0-4	2	4	100	N/A	
Total Credits	4 Theory, 3 Laboratories	14-2-12	22	28	700		
MCA SEMESTER IV							
Course Code	Course Title	L-T-P	Credits	Hours	Mark	MOOC	
MCA0401C	Project and Viva Voce	0-0-20	10	20	400	N/A	
MCA00XXE	Elective III	4-0-0	4	4	100	Yes*	
MCA00XXE	Elective IV	4-0-0	4	4	100	Yes*	
Total Credits	2 Theory, 1 Laboratories	8-0-20	18	28	600		

Total Credit= 80, Core Credit= 56 (Theory=32, Practical=24), Foundation=4, Elective= 20 (Departmental Elective= 16, Non-Departmental Elective= 04)

NB: If Semester-IV Project done outside department (in Industry) the Elective III and IV may be completed via taking extra electives in Semester III or Credit Transfer from MOOCs as per TU norms

Yes*: If available online in the particular semester but as per TU credit transfer norms

ELECTIVE SUBJECTS (DEPARTMENTAL) (16 Credits) to be completed in 2nd year (Semester III/IV)

Course Code	Course Title	L-T-P	Credits	MOOC
MCA0001E	Adhoc & Sensor Networks	4-0-0	4	Yes*
MCA0002E	Advanced Networking	4-0-0	4	Yes*
MCA0003E	Advances in Database	4-0-0	4	Yes*
MCA0004E	Artificial Intelligence	4-0-0	4	Yes*
MCA0005E	Cloud Computing	4-0-0	4	Yes*
MCA0006E	Cryptography and Network Security	4-0-0	4	Yes*
MCA0007E	Data Mining	4-0-0	4	Yes*
MCA0008E	Data Science	4-0-0	4	Yes*
MCA0009E	Deep Learning	4-0-0	4	Yes*
MCA0010E	Digital Logic & Basic Electronics	4-0-0	4	Yes*
MCA0011E	Digital Signal Processing	4-0-0	4	Yes*
MCA0012E	Discrete Mathematical Structures	4-0-0	4	Yes*
MCA0013E	Distributed Computing	4-0-0	4	Yes*
MCA0014E	Formal Language and Automata Theory	4-0-0	4	Yes*
MCA0015E	Image Processing	4-0-0	4	Yes*
MCA0016E	Information Retrieval and Web Mining	4-0-0	4	Yes*
MCA0017E	Internet of Things	4-0-0	4	Yes*
MCA0018E	Internet Technology	4-0-0	4	Yes*
MCA0019E	Machine Learning	4-0-0	4	Yes*
MCA0020E	Multimedia Technology	4-0-0	4	Yes*
MCA0021E	Natural Language Processing	4-0-0	4	Yes*
MCA0022E	Network Synthesis	4-0-0	4	Yes*
MCA0023E	Numerical Methods	4-0-0	4	Yes*
MCA0024E	Object Oriented Analysis and Design	4-0-0	4	Yes*
MCA0025E	Pattern Recognition	4-0-0	4	Yes*
MCA0026E	Social Networks	4-0-0	4	Yes*
MCA0027E	Soft Computing	4-0-0	4	Yes*
MCA0028E	Software Project Management	4-0-0	4	Yes*
MCA0029E	Speech and Natural Language Processing	4-0-0	4	Yes*
MCA0030E	TCP/IP Network Programming	4-0-0	4	Yes*
MCA0031E	Web Technology	4-0-0	4	Yes*
MCA0032E	Information System Security	4-0-0	4	Yes*
MCA0033E	Advanced SoC Design	4-0-0	4	Yes*
MCA0034E	Advanced Computer Architecture	4-0-0	4	Yes*
MCA0035E	Embedded Linux	4-0-0	4	Yes*
MCA0036E	Graphics and Mobile Gaming	4-0-0	4	Yes*
MCA0037E	Introduction to Robotics Systems	4-0-0	4	Yes*
MCA0038E	Embedded Systems Design	4-0-0	4	Yes*
MCA0039E	Object Oriented Programming	4-0-0	4	Yes*
MCA0040E	Programming in Python	4-0-0	4	Yes*

- Elective Subjects (Departmental): 16 Credits, Open Elective (Non-Departmental) Subjects: 4 Credits.
- Yes*: If available online in the particular semester but as per TU credit transfer norms.

First Semester

Mathematical Foundations of Computer Applications

MCA0101C

3 - 1 - 0 : 4 Credits

Prerequisites: *None*

Course Outcomes

At the end of the Course student will have

- Ability to apply mathematical logic to solve problems. Understand sets, relations, functions, and discrete structures.
- Ability to use logical notation to define and reason about fundamental mathematical concepts such as truth table, DeMorgan's Law and Predicate Calculus.
- Ability to formulate problems and solve Determinants and Matrices.
- Ability to model and solve real-world problems using Statistics and Probabilities.

Syllabus

Set Theory and Relations: Set, Properties, sub-set, Equality of sets, Union, Intersection and Complements, Symmetric Difference, De Morgan's Law, Cartesian Product, Binary Relations, Principles of Inclusions and Exclusions, Generating Function, Recurrence relation, Venn Diagram. The Pigeonhole Principle (Definition and Problem), Product Sets and Partition, Relations and their Properties and Representation, Equivalence of Relations, Manipulation of Relations, Graph Theory.

Discrete Mathematics: Proposition, Truth value, Truth tables, Connectives, Negation, Conjunction, Disjunction, Implication, Combination of Connectivity's, Converse, Inverse and Contra positive of an Implication, Tautology, Logical Equivalence, Idempotent, Associative-, Commutative-, Distributive and De Morgan's Laws, Disjunctive and Conjunctive Normal Forms, Predicate Calculus

Linear Algebra: Vector algebra and calculus, Determinants, Matrices, Solution of linear algebraic equations, Cayley-Hamilton Theorem, Linear differential equations of second and higher order, Partial differentiation and Partial difference equations, The expected difference operator and solution using E-operator

Statistics and Probability: Concept of mean, medial, and mode, moments about mean, variance, skewness, kurtosis, Classical definition of probability, probability density functions, conditional and marginal probabilities, expectation, Bayes' theorem, Binomial, Poisson, Normal and Gaussian distributions, Hypothesis testing

Textbooks:

1. "Mathematical Foundations Of Computer Science" – G. Shankar Rao
2. "Discrete Mathematical Structures With Applications To Computer Science" – Jean-Paul Tremblay and R. Manohar
3. "Engineering Mathematics"- Kryzig

References:

1. "Discrete mathematics Structures" – Bernard Kolman, Robert C. Busby, Sharoncutler Ross
2. "Discrete mathematics" - Olympia Nicodemi.
3. "Elements of Discrete Mathematics" - C. L. Liu
4. "Introduction to Numerical Analysis, Probability and Statistics" - A. K. Mukhopadhyay

Programming in C

3 - 1 - 0: 4 Credits

MCA0102CPrerequisites: *None***Course Outcomes****At the end of the Course student will be able to**

- Implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems. Understanding of computer programming language concepts.
- Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.
- Able to define data types and use them in simple data processing applications also be able to use the concept of array of structures.
- Define union and enumeration user defined data types. Develop confidence for self-education and ability for life-long learning needed for Computer language.

Syllabus

Introduction to Problem Solving through programs, Flowcharts/Pseudo codes, The compilation process, Syntax and Semantic errors, Variables and Data Types, Arithmetic expressions, Relational Operations, Logical expressions; Introduction to Conditional Branching; Conditional Branching and Iterative Loops
Arrays: 2-D arrays, Character Arrays and Strings
Basic Algorithms including Numerical Algorithms
Functions and Parameter Passing by Value
Passing Arrays to Functions, Call by Reference; Recursion
Structures and Pointers; Self-Referential Structures and Introduction to Lists

Textbooks:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Computer Organization & Assembly Language Programming

3 - 1 - 0: 4 Credits

MCA0103CPrerequisites: *None***Course Outcomes****At the end of the Course student will be able to**

- Discuss the architecture of 8085 processors, instruction sets and timing diagram.
- Have the concept of Computer Architecture along with micro and macro programming.
- Understand various interrupts and the concept of interfacing.
- Understand the basics of different processors and their architecture

Syllabus

Computer: Definition, Block Diagram, Organizations architecture, Computer Evolution, Performance, History; Von Neumann Architecture, Designing for Performance, Computer Components, Computer Function, Bus Interconnection; Number System: Conversions and Operations, Data Representation; 1's and 2's Complement Arithmetic, Floating Point Number Arithmetic. Boolean Algebra: Simplification of Boolean function using K-Map, Logic Gates, Binary Adder, Subtractor, Decoders, Encoders, Multiplexers, De-Multiplexers.

General Register Organization: Arithmetic and Logic Unit Organization; Organization of Central Processing Unit; Stack Organization; Memory Organization: Memory Hierarchy, Main Memory, Cache Memory, Virtual Memory, Memory Mapping Techniques; RISC & CISC Architectures and their Comparison.

Introduction to Microprocessor: Microcomputer and Assembly Language, Evolution of Microprocessor and their Application; Architecture and Organization of 8 bit microprocessor; Intel 8085A Microprocessor- Pin Description, Functional block diagram; Registers, Flags; Interrupt structure; Instruction format, Instruction set: Classification, Execution; Addressing modes, Instruction Cycle, Timing diagram: op-code fetch machine cycle, memory read/write machine cycles, I/O read/write machine cycles; Simple Assembly Language Programming.

Programmable peripheral devices: Pin configuration and Architecture of 8237/8257 DMA Controller, 8253/8254 Programmable Interval Timer, 8255 Programmable Peripheral Interface, 8259 Programmable Interrupt Controller and 8279 Programmable Keyboard/Display;

Text Books:

1. Romesh Gaonkar, “Microprocessor Architecture, Programming and Application with the 8085”, PRI publication
2. Senthil Kumar, “Microprocessors and Microcontroller”, Oxford
3. Morris Mano, “Computer System Architecture”, PHI

References:

1. Srinath, “8085 Microprocessor, programming and interface”, PHI
2. B. Ram, “Computer Fundamental Architecture & Organization”, New Age

Computer Skill-III

4 - 0 - 0 : 4 Credits

CSK III

Prerequisites: *Basic Programming and Logic*

Course Outcomes

At the end of the Course student will be able to

- Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
- Read and make elementary modifications to Java programs that solve real-world problems.
- Validate input in a Java program. Identify and fix defects and common security issues in code.
- Use a version control system to track source code in a project.

Syllabus

Fundamentals of Object-Oriented Programming, Java Evolution, Java History

Java Features: Overview of Java Language, Constants, Variables and Data Types, Operators and Expressions, Decision making, branching and looping.

Classes, Objects and Methods, Arrays, String and Collections, Interfaces, Packages, Managing Errors and Exceptions

Multithreading, Applet Programming, Java AWT, Event Handling

Java I/O Handling, Java Database Connectivity.

Books/References:

1. Programming in Java by Sachin Malhotra and Saurabh Choudhary, Oxford Higher education.
2. Java: The Complete Reference by Herbert Schildt, McGraw-Hill Education.
3. Java: A Premier by E. Balaguruswami, Tata Mcgraw Hill Education Private Limited.

Programming Laboratory**MCA0104C**

0 - 0 - 4 : 2 Credits

Prerequisites: *Knowledge of Programming in C***Course Outcomes****At the end of the Course student will be introduced to**

- Familiarization of a computer and the environment (Editor, Compiler and Debugger); Execution of sample programs.
- Expression evaluation; Conditionals and Branching; Control Statements; Iteration; Functions; Recursion.
- Arrays; Pointer; Dynamic Memory Allocation; File Input Output; Numerical Methods; Searching & Sorting techniques.
- Advanced Topic based on the Programming Language used/ Object Oriented Programming topics.

Syllabus

Laboratory activities will be based on the syllabus of subject '**Programming in C**'. or any other Programming Language like Java (as per CSK III) or Python or C++.

Assembly Language Laboratory**MCA0105C**

0 - 0 - 4 : 2 Credits

Prerequisites: *Knowledge of Assembly Language Programming***Course Outcomes****At the end of the Course student will be introduced to**

- Differentiating between High Level and Low Level Programming languages
- Understanding Assembly Level Programming and Mnemonics
- Implementing hardware programming using 8085 and other 8 bit microprocessors
- 16bit Programming and Higher order bit programming

Syllabus

Laboratory activities will be based on **Assembly Language Programming** part of subject 'Computer Organization & Assembly Language Programming'.

Second Semester

Software Engineering

3 - 1 - 0 : 4 Credits

MCA0201C

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Acquire strong fundamental knowledge in fundamentals of computer science, software engineering and multidisciplinary engineering to begin in practice.
- Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
- Deliver quality software products by possessing the leadership skills as an individual and demonstrating effective strategies by applying both communication and negotiation management skill.
- Application of software models, techniques and technologies to bring out innovative and novelistic solutions and professional development.

Syllabus

Introductory concepts: The evolving role of software – Its characteristics, components and applications- A layered technology – the software process – Software process models - Software process and project metrics – Measures, Metrics and Indicators- ethics for software engineers.

Software Project Planning: Project planning objectives – Project estimation – Decomposition techniques – Empirical estimation models - System Engineering- Risk management. Analysis and Design – Design concept and Principles, Methods for traditional, Real time of object oriented systems – Comparisons – Metrics- Quality assurance

Testing fundamentals: Test case design – White box testing – Basis path testing – Control structure testing – Black box testing – Strategies: Unit testing integration testing – Validation Testing – System testing – Art of debugging – Metrics, Testing tools.

Formal Methods: Clean-room Software Engineering – Software reuse – Reengineering – Reverse Engineering – standards for industry

Text Books:

1. Rajib Mall, “Fundamentals of Software Engineering”, 3rd Edition, PHI, 2009.
2. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 5th Ed., McGraw Hill Int. Ed., 2001.

References:

1. Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN,1996.
2. James Peter, W. Pedrycz, “Software Engineering: An Engineering Approach”, JohnWiley& Sons.
3. Ian Sommerville, Software engineering, 8thEdition,Pearson education Asia, 2007.
4. PankajJalote, “An Integrated Approach to Software Engineering”, Springer Verlag,1997.

Data Structures & Algorithm

3 - 1 - 0 : 4 Credits

MCA0202C

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Ability to analyze algorithms and an algorithm correctness
- Ability to describe stack, queue and linked list operation
- Ability to have knowledge of tree and graphs concepts
- Ability to summarize searching and sorting techniques

Syllabus

Data Structures & Algorithm: Definition, Characteristics, Analysis of an Algorithms, Complexity, big O notation, Space Time trade-off; Data Structure - Definition, Classifications, Operations on data structure, Applications; Recursion - Definition, Properties, Algorithms for factorial and Fibonacci series.

Array & Linked List: Array - Definition, Representation, Multidimensional Arrays; Algorithms for insertion and deletion, Regular Array, Pointer Array, Jagged Array, Sparse matrix. Linked List - Definition, Representation, Types of Linked List, Algorithms for insertion and deletion, Applications.

Stack & Queue: Stack - Definition, Representation, Algorithms for push and pop, Conversion from infix to postfix and evaluation of postfix expression; Queue - Definition, Representation, Algorithms for insertion and deletion, Types of queue.

Searching & Sorting: Searching - Linear and Binary search with algorithms and complexity analysis; Hashing – hash functions, collision resolution techniques; Sorting - Definition, Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort; Radix sort; Heap sort with Complexity analysis;

Tree & Graphs: Tree - Definition; Representation; Binary Tree- Definitions and Properties, Binary tree traversal algorithms (pre, post, in), BST (Binary Search Tree) – creation, insertion and deletion, AVL tree, B-tree; B+ tree, B* tree, Application of trees; Graphs - Definitions, Representations; Breadth-first and Depth-first Search; Spanning Tree; Prim's and Kruskal's algorithms.

Text Books:

1. S.Lipschutz, "Theory and Problem of Data Structure", Schaum's Outline Series, Tata McGraw-Hill
2. Tannenbaum, "Fundamentals of Data Structures", PHI

References:

1. R.L. Kruse, B.P. Leary, C.L. Tondo, "Data structure and program design in C" , PHI
2. Horowitz and Sahani, "Fundamentals of Data structures", Galgotia publications
3. "Data Structures Using C" - ReemaThareja
4. "Introduction to Data Structures in C" – Ashok N. Kamthane
5. "Classic Data Structures" - D Samanta

Operating System

3 – 1 – 0 : 4 Credits

MCA0203C

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Analyze the structure and basic architectural components involved in OS
- Demonstrate competence in recognizing and using operating system features
- Understand and analyze theory and implementation of different operating system aspect
- Apply knowledge of different operating system algorithms

Syllabus

Introduction: Concept, Evolution, Functions; Single user, Multi-user and multitasking, Networked OS, Operating System structures: Monolithic, Layered, Virtual machine, OS services, System calls.

Processes & Threads: Concept, Process State and State Transitions, Process Control Block, Suspend & Resume of Process, Inter-process communication, Interrupt Processing, Process scheduling; Process Synchronization: critical-section Problem, Dekker's Algorithm, Semaphores, producer-consumer problem. Threads: Single & Multithreading Models, Threading issues, P threads, Solaris 2 Threads, Window 2000 Threads, Linux Threads, Java Threads.

Resource Management: Deadlocks: System Model, Characterization, Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance & Banker's Algorithm, Deadlock Detection, Deadlock Recovery. Memory Management: Memory Organization, Storage Hierarchy, Storage Management Strategies, Virtual memory: Paging, Segmentation, Segmentation with Paging, Page replacement algorithms. Device Management: I/O devices and subsystem, Polling, Interrupts; DMA: Principles and Operational details, Kernel I/O subsystem.

File-System & Security: File Concepts, File Organization, Access Methods, Directory Structure, File-system Mounting, File Sharing, Protection; File-system Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery. The security Problem, User Authentication, Program Threats, System Threats, Securing Systems and Facilities, Intrusion Detection, Cryptography, Computer-Security Classifications.

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin & Greg Gagne, John & Wiley & Sons, Inc.
2. Operating System, H M Deitel, Pearson Education, LPE.

References:

1. An Introduction to Operating System Concepts & Practice, Pramod Chandra P Bhatt, PHI Pvt Ltd.
2. An Introduction to Operating System, NIIT, PHI Pvt Ltd.

Data Structures and Algorithm Laboratory MCA0204C

0 – 0 – 4 : 2 Credits

Prerequisites: *Data Structures*

Course Outcomes

At the end of the Course student will be introduced to

- Professional/academic knowledge and skills, Understand the properties of various data structures.
- Identify the strengths and weaknesses of different data structures.
- Design and employ appropriate data structures for solving computing problems.
- Possess the knowledge of various existing algorithms; Analyze and compare the efficiency of algorithms

Syllabus

Laboratory activities will be based on the syllabus of subject "Data Structures and Algorithm".

Software Development Laboratory MCA0205C

0 – 0 – 4 : 2 Credits

Prerequisites: *Operating System, Software Engg***Course Outcomes****At the end of the Course student will be**

- Capable to acquire the generic software development skill through various stages of software life cycle.
- Able to ensure the quality of software through software development with various protocol based environment.
- Able to generate test cases for software testing, handle software development models through rational method.
- Able to design Modelling, UML Notation, Test cases, Test Suits, Rational Unified Process algorithms

Syllabus

Laboratory activities will be based on the syllabus of subject “Software Engineering” and Application development.

Seminar & Technical Writing**MCA0206C**

0 - 0 - 8 : 4 Credits

Prerequisites: None

Course Outcomes**At the end of the Course student will be introduced to**

- Research Skills
- Correspondence Skills
- Promotional Writing Skills
- Visual Communication Skills

Syllabus

Writing technical paper or research paper in ACM/ IEEE /Elsevier format.

Introduction to Technical Writing: how differs from other types of written communication Purpose of technical writing, Correspondence: prewriting, writing and rewriting Objectives of Technical Writing.

Audience Recognition: High-tech audience, Low tech audience, Lay audience, Multiple Audience.

Correspondence: Memos, Letters, E-mails, Its differentiation, types of letters, Document Design, its importance, Electronic Communication: Internet, Intranet, extranet, Writing effective e-mail.

Summary: Report Strategies, Effective style of technical report writing: Structures: content, introduction, conclusions, references, etc., Presentation, Writing first draft, revising first draft, diagrams, graphs, tables, etc. report lay-out.

Report Writing: Criteria for report writing, Types of Report: Trip report, Progress report, lab report, Feasibility report, project report, incident report, etc. Case Studies.

Proposals & Presentation: Title page, Cover letter, Table of Content, list of illustrations, summary, discussion, conclusion, references, glossary, appendix, Case Studies. Oral Presentation/ Seminar:

References:

1. Sharon J. Gerson & Steven M. Gerson “Technical Writing – Process & Product”, Pearson Education.
2. Sunita Mishra, “Communication Skills for Engineers” Pearson Education
3. Davies J.W. “Communication for engineering students”, Longman Eisenberg, “Effective Technical Communication”, Mc. Graw Hill.

Third Semester

Database Management Systems

3 - 1 - 0 : 4 Credits

MCA0301C

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- An understanding of the needs for and uses of database management systems. Understanding of the context, phases and techniques for designing and building database systems.
- An understanding of the components of a computerized database information system (application).
- An ability to correctly use the techniques, components and tools of a typical database management system, such as Access or Oracle, to build a comprehensive database information system (application).
- An ability to design a correct, new database information system for a business functional area and implement the design, in either Access or Oracle.

Syllabus

Evolution of data management, File management vs. Data management, Components of a DBMS, DBMS Architecture, Data models.

Entity-Relationship Model, Conversion from E-R data model to Relational model

Relational Algebra, Relational Calculus and SQL; Normalization- Functional dependency, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF

Basic File structure, Operation on file, Hashing techniques, Indexing structures, Primary and secondary indexing, Multilevel indexing using B tree.

Query Processing and Optimization-Optimization through algebraic manipulation. Cost based optimization. Join algorithm.

Transaction-ACID properties, Serializability-Conflict and View, Testing Serializability;

Concurrency control and Recovery technique- Two phase locking technique, Deadlock and stagnation based protocol; Log-based Recovery.

Object Oriented Data Bases: Approaches, Modeling and Design, Persistence, Transaction, Concurrency, Recovery;

Books Recommended

1. Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, The McGraw-Hill, Sixth edition.
2. Fundamentals of Database Systems, Dr. Ramez Elmasri, Shamkant B. Navathe, Fourth edition, Pearson.
3. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, The McGraw-Hill, 3rd edition.

Data Communication & Computer Networks

3 - 1 - 0 : 4 Credits

MCA0302C

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Syllabus

Data communication- Component, Data flow, Data representation, protocol and standards; Computer Network-Definition, Use, measuring a network - latency, data transfer rate, bandwidth; Types of network; Network model: Client Server and peer-to-peer model; Network Models;

Digital-to-Analog Conversion: ASK, FSK, PSK; Quadrature Amplitude Modulation; Analog-to-Analog Conversion: AM, FM, PM; Line Coding, Line Coding Schemes Block Coding;

Sampling theorem, Nyquist interval, PAM, PWM, PPM, Sampling and quantization, PCM, Encoder, Decoder, DPCM, Delta Modulation

Physical Layer-Analog and Digital signal of data, sine wave, Time and Frequency Domain; Digital Signal- Bit rate, Bit interval, Baud rate, Noise, Attenuation, Distortion, Throughput, Propagation speed, Propagation time, Wavelength. Transmission mode; Transmission media: Guided and unguided.

Data Link Layer-Errors: Single bit, Burst error; Error Detection- Redundancy, Parity check, CRC, Checksum; Flow and Error control mechanism. Stop-and-Wait ARQ, GO-BACK-N-ARQ, Sliding Window Protocol, Error detection mechanism, VRC, LRC, CRC, Automatic Repeat Request (ARQ)- stop-and wait, go-back-n, Selective Repeat-ARQ; HDLC- configuration and transfer modes, frames, frame format, frame type.

Medium Access Control- ALOHA, Slotted ALOHA, CSMA, CSMA/CD, Ethernet, Token Ring, CSMA/CA. Access method: point-to-point, multi point.

LAN- Traditional Ethernet, MAC Sub layer, Physical layer, Three generation of Ethernet. 10Base2, 10Base5, 10Base-T, 10Base-FL

Network Layer-Connection-oriented and connectionless services, Internetworking; Repeater, Hub, NIC, Switch, Bridge, Router, Gateway; Addressing: IP address, classful address, subnetting, supernetting, Classless Addressing; Routing techniques –Static, Dynamic, flooding, Distance vector and link-state routing, Basics of IP. Protocol- ARP, IPv4, ICMP

Transport Layer-Congestion control algorithm. Basics of TCP and UDP;

Application Layer- Basics of Protocols: DNS, TELNET, FTP, SMTP and MIME, HTTP HTML, CGI, WWW –Hypertext and Hypermedia; browser; static and dynamic documents.

Text Book:

1. Data Communication and Networking, 4th Edition, McGrawhill, Forouzan.

References:

1. A. Tanenbaum, "Computer Networks", 4th Ed., Pearson Education Asia (LPE), 2003.
2. L.L. Peterson and B.S. Davie, "Computer Networks: A Systems Approach", 2nd Ed., Morgan Kaufman, Harcourt Asia, 2000.
3. W. Stallings, "Data and Computer Communications", 6th Ed., Pearson Education Asia (LPE), 2000.
4. F. Halsall, "Data Communications, Computer Networks and Open Systems", 4th Ed., Pearson Education Asia (LPE), 1996.
5. L. Garcia and I. Widjaja, "Communication Networks: Fundamental Concepts and Key architectures", Tata-McGraw-Hill Ed., 2000.
6. J.F. Kurose and K.W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education Asia (LPE), 2001.
7. L. Kleinrock, "Queueing Systems, Vol. 1: Theory", John Wiley, 1975.

Database Management Systems Laboratory

0 - 0 - 4 : 2 Credits

MCA0303CPrerequisites: *None***Course Outcomes****At the end of the Course student will be introduced to**

- Design and implement a database schema for a given problem-domain.
- Create and maintain tables using PL/SQL Course Outcome
- Populate and query a database, Prepare reports
- Application development using PL/SQL & front end tools

SyllabusExercises will be based on the syllabus of subject '**Database Management Systems**'.**Computer Network Laboratory**

0 - 0 - 4 : 2 Credits

MCA0304CPrerequisites: *None***Course Outcomes****At the end of the Course student will be introduced to**

- Understand computer network basics, network architecture, TCP/IP and OSI reference models; Identify and understand various techniques and modes of transmission
- Describe data link protocols, multi-channel access protocols and IEEE 802 standards for LAN
- Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme
- Discuss the elements and protocols of transport layer; Understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

SyllabusExercises will be based on the syllabus of subject '**Data Communication & Computer Network**'.**Project Phase I**

0 - 0 - 4 : 2 Credits

MCA0305CPrerequisites: *None***Course Outcomes****At the end of the Course student will be introduced to**

- Collaborate to learn new content and gain diverse perspectives.
- Understand the concept of any particular hardware software area and survey it.
- Acquire skills like collaboration, communication and independent learning, lifelong learning and the challenges ahead.
- Define a problem and try to conceptualize a solution

Syllabus

This shall be the initial phase of project.

Forth Semester

Project and Viva Voce

0 - 0 - 20 : 10 Credits

MCA0401C

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Acquire the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Achieve skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.
- Attain collaborative skills through working in a team to achieve common goals.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

Syllabus

This shall be the final phase of project work.

Elective Subjects

Departmental Electives (16 Credits) to be completed in 2nd year (Semester III & IV)

Adhoc & Sensor Networks

MCA0001E

4 - 0 - 0 : 4 Credits

Prerequisites: *Basic concepts on Data Communications and Networking*

Course Outcomes

At the end of the Course student will be introduced to

- Understanding of various aspects of Adhoc sensor networks, describe the concepts, implementation, and usage.
- Discuss the challenges in designing MAC, routing and transport.
- Describe protocols for wireless ad-hoc/sensor networks
- Describe and implement protocols on a sensor testbed network and propose, implement, and evaluate new ideas for solving wireless sensor network design issues.

Syllabus

MANET - Introduction, Self-organizing behavior, Co-operation, MAC, Routing;
Multicast routing, Mobility model, Transport layer,
Opportunistic Mobile Networks, UAV networks, Wireless Sensor;
Networks (Introduction)- WSN (Coverage, Topology management), Mobile Sensor Networks;
MAC, Congestion control, Routing; Underwater WSN;
Security, Structure of sensor nodes;

Advanced Networking

MCA0002E

4 - 0 - 0 : 4 Credits

Prerequisites: *Computer Networks*

Course Outcomes

At the end of the Course student will be introduced to

- Differentiate between different LAN-based forwarding devices so that they can make thoughtful suggestions on how to build a network.
- Write networking code that uses TCP and UDP in client-server applications.
- Design and implement networking protocols.
- Design and implement networking applications.

Syllabus

Review for networking basics and IP networks, Introduction to wireless networks
Introduction of Algorithm Design and Optimization and their applications in networking. Scheduling algorithms and MAC layer protocols;
Routing algorithms and protocols (network layer), Congestion control algorithms and protocols
Cross-layer design, Quality of Service (QoS) provisioning; Network security

References:

1. Computer Networks: A Systems Approach (4th Edition) by Larry Peterson and Bruce Davie.
Morgan Kaufmann.

Course Outcomes

At the end of the Course student will be introduced to

- To provide a strong foundation in advanced database concepts from an industry perspective.
- To covers advanced data modeling concepts like OOD Modeling and ORD Modeling
- To learn query processing and transaction management concepts for object-relational database and distributed database.

Syllabus

Data Storage and Querying : Storage and File Structure - Indexing and Hashing –Physical Database Design and Tuning - Query Processing Algorithms – Query Optimization Techniques – Transaction Management: Transaction Processing Concepts – Concurrency Control – Recovery Techniques – Database Security.

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism –Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies.

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies –Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems : Object Relational features in SQL / Oracle – Case Studies.

Active Database Concepts and Triggers – Temporal Databases – Spatial Databases – Multimedia Databases – Deductive Databases – XML Databases: XML Data Model – DTD - XML Schema - XML Querying - Geographic Information Systems - Genome Data Management.

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols – Web Databases – Information Retrieval - Data Warehousing - Data Mining.

References:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, “ Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan, ”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw Hill, Third Edition 2004.

4 - 0 - 0 : 4 Credits

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Identify the type of an AI problem (search, inference, decision making under uncertainty, game theory, etc).
- Formulate the problem as a particular type. (Example: define a state space for a search problem)
- Compare the difficulty of different versions of AI problems, in terms of computational complexity and the efficiency of existing algorithms.
- Implement, evaluate and compare the performance of various AI algorithms. Evaluation could include empirical demonstration or theoretical proofs.

Syllabus

Introduction to AI. The foundations of AI. Importance of AI and related fields; Propositional and predicate logic, representation atoms, connectives, literals, CNF, DNF and casual form, interpretation and model, satisfiability, resolution principle and unification; **Rules:** working memory, rule base, conflict set, conflict resolution strategies, backward and foreword chaining, meta rules.

Reasoning under Uncertainty: basic probability notation, probabilistic reasoning, Bayesian networks, certainty factor methods, Dempster-Shafer theory, basics of fuzzy logic; Structure Representation: semantic networks, frames, conceptual dependency, scripts, inheritance, default values.

Logical agents, reasoning and resolution, adequacy, richness, granularity, ease of representation and use, modeling uncertainty, the fame problem, declarative and procedural representation; Problem solving by Searching: State space repetition, heuristics, heuristic evolution function, and problem reduction. Searching for solutions. Informed and uninformed search strategies.

Search Methods: generate and test, hill climbing, means-ends analysis, depth-first, breath-first, best first, exploiting domain constraints, dependency-directed back tracking, minimax, alpha- beta pruning, iterative deepening; Planning by forward and backward reasoning, Nonlinear planning, scheduling

References:

1. Artificial Intelligence by E Rich and K Knight, KcGraw-Hill.
2. Artificial Intelligence (3rd Ed) PH Winston, Addison-Wesley.
3. Introduction of Artificial Intelligence and expert systems by DW Patterson, PHI.
4. Artificial Intelligence a Modern Approach-Stuart Russell, Peter Norvig, PHI
5. Artificial Intelligence and Soft Computing by A. Konar, CRC Press 2000

Cloud Computing

4 - 0 - 0 : 4 Credits

MCA0005E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Introduction to Cloud Computing and Architecture
- Understanding Service, Data and Resource Management in Cloud Computing
- Improvising Cloud Security, Open Source and Commercial Clouds, Cloud Simulator
- Ideating research trends in Cloud Computing and Fog Computing

Syllabus

Cloud architecture and model: Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

Cloud infrastructure: Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

Programming model: Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

Security in the cloud: Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

REFERENCES:

1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley,2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010

Cryptography and Network Security MCA0006E

4 - 0 - 0 : 4 Credits

Prerequisites: *Computer Networks*

Course Outcomes

At the end of the Course student will be introduced to

- Analyze and design classical encryption techniques and block ciphers.
- Understand and analyze data encryption standard.
- Understand and analyze public-key cryptography, RSA and other
- Public-key cryptosystems such as Diffie-Hellman Key Exchange, ElGamal Cryptosystem.

Syllabus

Introduction to cryptography, Classical Cryptosystem, Cryptanalysis on Substitution Cipher, Play fair Cipher, Block Cipher; Data Encryption Standard (DES), Triple DES, Modes of Operation, Stream Cipher, Pseudorandom Sequence;

LFSR based Stream Cipher, Mathematical background, Abstract algebra, Number Theory;

Modular Inverse, Extended Euclid Algorithm, Fermat's Little Theorem, Euler Phi-Function, Euler's theorem, Quadratic Residue, Polynomial Arithmetic; Advanced Encryption Standard (AES), Introduction to Public Key Cryptosystem, Diffie-Hellman Key Exchange, Knapsack Cryptosystem, RSA Cryptosystem.

More on RSA, Primarily Testing, ElGamal Cryptosystem, Elliptic Curve over the Reals, Elliptic curve Modulo a Prime; Generalised ElGamal Public Key Cryptosystem, Chinese Remainder Theorem, Rabin Cryptosystem, Legendre and Jacobi Symbol.

Message Authentication, Digital Signature, Key Management, Key Exchange, Hash Function; Universal Hashing, Cryptographic Hash Function, Secure Hash Algorithm (SHA), Digital Signature Standard (DSS), More on Key Exchange Protocol.

Cryptanalysis, Time-Memory Trade-off Attack, Differential Cryptanalysis, More on Differential Cryptanalysis, Linear Cryptanalysis; Cryptanalysis on Stream Cipher, Algebraic Attack, Implementation Attacks, side channel attack.

Internetwork Security, SSL, PGP, Cloud Security, Introduction to Blockchain and Bitcoin.

Data Mining

4 - 0 - 0 : 4 Credits

MCA0007E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Find a meaningful pattern in data.
- Graphically interpret data.
- Implement the analytic algorithms.
- Handle large scale analytics projects from various domains.

Syllabus

Introduction, Data Preprocessing

Association Rule Mining, Classification Basics

Decision Tree, Bayes Classifier, K nearest neighbor

Support Vector Machine, Kernel Machine

Clustering, Outlier detection

Sequence mining

Evaluation, Visualization.

Data Science

4 - 0 - 0 : 4 Credits

MCA0008E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Proficiency with statistical analysis of data.
- Ability to build and assess data-based models.
- Execute statistical analyses with professional statistical software. Skill in data management.
- Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively issues.

Syllabus

Course philosophy and introduction to R; Linear algebra for data science: Algebraic view - vectors, matrices, product of matrix & vector, rank, null space, solution of over-determined set of equations and pseudo-inverse) ; Geometric view - vectors, distance, projections, Eigen value decomposition;

Statistics (descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates)

Optimization; Typology of data science problems and a solution framework;

Simple linear regression and verifying assumptions used in linear regression; Multivariate linear regression, model assessment, assessing importance of different variables, subset selection;

Classification using logistic regression; Classification using knn and k-means clustering

Suggested reading materials:

1. Introduction to linear algebra - by gilbert strang
2. Applied statistics and probability for engineers – by douglas montgomery

Deep Learning

MCA0009E

4 - 0 - 0 : 4 Credits

Prerequisites: *Linear Algebra, Probability Theory*

Course Outcomes

At the end of the Course student will be introduced to

- Know the main techniques in deep learning and the main research in this field.
- Able to identify new application requirements in the field of computer vision.
- Able to identify reasonable work goals and estimate the resources required to achieve the objectives.
- Able to structure and prepare scientific and technical documentation describing project activities.

Syllabus

History of Deep Learning, Deep Learning Success Stories, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm

Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feedforward Neural Networks, Representation Power of Feedforward Neural Networks

FeedForward Neural Networks, Backpropagation

Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition, Basis

Principal Component Analysis and its interpretations, Singular Value Decomposition

Autoencoders and relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders

Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout

Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization

Learning Vectorial Representations Of Words

Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Fooling

Convolutional Neural Networks

Recurrent Neural Networks, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs

Encoder Decoder Models, Attention Mechanism, Attention over images

REFERENCES:

1. Deep Learning, An MIT Press book, Ian Goodfellow and Yoshua Bengio and Aaron

Digital Logic & Basic Electronics**MCA0010E**

4 - 0 - 0 : 4 Credits

Prerequisites: *None***Course Outcomes****At the end of the Course student will be introduced to**

- Design and analyse sequential logic circuits and synchronous finite state machines.
- To learn the Basics of HDL modelling and design techniques.
- To Design controller using ASM chart method.
- Design and analysis of asynchronous finite state machines.

Syllabus

Digital system and binary numbers: Signed binary numbers, binary codes, cyclic codes parity generators and checkers, hamming codes. Floating point representation; Gate-level minimization: The map method up to five variable, don't care conditions, POS simplification, NAND and NOR implementation.

Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers, demultiplexers;

Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure; Registers and counters: Shift registers, ripple counter, synchronous counter, other counters.

Memory Devices: Metal-Oxide-Semiconductor Field Effect Transistor (MOS), Complementary Metal-Oxide-Semiconductor Field Effect transistor (CMOS), Charge- Coupled Device (CCD).

Network Theorems: Statements of Thevenin's, Norton's-, Superposition- and Maximum Power Transfer Theorems and their uses; Diode: Forward Bias and Reverse Bias: Use as Rectifier (Half Wave, Full Wave and Bridge); Load Regulation and Line regulation; Transistors: Common Base, Common Emitter and Common Collector Configurations, Transistor a and b, Their Relation. Common Emitter Amplifier; Power Supply: Circuit with 78** and 79** series, SMPS

Text Books:

1. Morris Mano, "Digital logic and Computer Design", Prentice-Hall of India, 1998.
2. Integrated Electronics: Milman and Halkias

References:

1. Digital Principles and applications: Malvino and Leach
2. Digital Principles: Schaum's Series
3. William I. Fletcher, "An Engineering Approach to Digital Design ", PHI, 1980.
4. Floyd T.L., "Digital Fundamentals", Charles E. Merrill publishing Company, 1982.
5. Tokheim R.L., "Digital Electronics- Principles and Applications ", Tata McGraw Hill, 1999.
6. Jain R.P., "Modern Digital Electronics ", Tata McGraw Hill, 1999.

Digital Signal Processing**MCA0011E**

4 - 0 - 0 : 4 Credits

Prerequisites: *Background of signals and systems***Course Outcomes**

At the end of the Course student will be introduced to

- Understand signal processing systems using basic concepts.
- Analyze signal using the discrete Fourier transform and its effective computation by FFT techniques.
- Specify and design FIR and IIR type digital filters and identify the fundamentals of multi rate signal processing and its applications.
- Understand advanced digital signal processing techniques.

Syllabus

Properties of a discrete-time linear time-invariant system, Compare the properties of different signal types including: continuous-time signal, discrete-time signals, periodic signals, a periodic signals, deterministic signals, and random signals, Calculate the power and energy of a signal, properties of fundamental signals using mathematical equations which includes impulse function, unit-step function, sinusoid function, and exponential function, Apply Euler's formula to represent exponentials in terms of sinusoidal signals, function, and properties of convolution, application of complex exponential terms to calculate the Fourier Transform and Inverse Fourier Transform of a signal, application of the Fourier Transform to represent time and frequency domains of an impulse, a constant, a rectangular pulse, a sinc function, a sinusoid, and an impulse train, demonstration of the scaling, frequency shifting, and convolution properties of the Fourier Transform.

Identify and compare signal behavior during sampling and reconstruction in frequency and time domains, the implication of low pass filtering in frequency and time domains, convolution properties of the Fourier Transform during signal sampling, the effects of signal aliasing, the importance and implementation of antialiasing filters and the Nyquist theorem in signal processing applications, define the z-transform in the representation of signals and systems, the usage of z-transform and its relationship with Laplace transform, the equivalences between z-transform and DTFT (Discrete-Time Fourier Transform), the properties of z-transform zeros, poles, and Region of Convergence (ROC), demonstration of the linearity, shift, convolution, and order of summation properties of z-transform, the convolution and multiplication properties between time domain and z-domain.

Properties of a moving average filter, the mathematical properties of the impulse and frequency response of a Finite Impulse Response (FIR) filter and a moving average filter, working of FIR filter, relationship between an FIR filter and a moving average filter in terms of filter coefficients, relationship between the continuous frequency response of an FIR filter and the DTFT of the filter coefficients, mathematical and graphical form the frequency response of low pass, high pass, bandpass, and bandstop filters, designing of an FIR filter using the window method, the mathematical form for an Infinite Impulse Response (IIR) filter, the properties of impulse invariance method for IIR filter design, the properties of the bilinear transform method for IIR filter design, the implementation of different structure types of IIR filter including Direct form I, Direct form II, and cascaded Second-Order Stage (SOS).

Usage of the Fourier Transform, Fourier Series, Discrete-Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT) for various signal types in time and frequency domains, Fast Fourier Transform (FFT) and explain its relationship with DFT, properties of twiddle factors Fast Fourier Transform(FFT) in mathematical form using twiddle factors, calculation of Discrete Fourier Transform (DFT), the relationship between N-point DFT with N/2-point DFT of even and odd values of the signal, the benefits of the radix method for FFT and its computational savings, characteristics of adaptive systems, functionality and operation of a closed-loop configuration involving adaptive filters, applications for the system identification configuration with adaptive filters, the concept and purpose of the Steepest Descent and the Least Means Squares (LMS) algorithm.

SUGGESTED READING

1. “Digital Signal Processing” by A. Oppenheim and R. Schafer
2. “Discrete Time Signal Processing” by A. Oppenheim and R. Schafer
3. “Digital Signal Processing” by J. G. Proakis and D. G. Manolakis
4. “Digital Signal Processing” by S. K. Mitra
5. “Digital Signal Processing using Arm Cortex-M based Microcontrollers: Theory and Practice” <https://www.arm.com/resources/education/textbooks/dsptextbook>
6. “Digital Signal Processing Using the ARM Cortex M4 Paperback” by Donald S. Reay

Discrete Mathematical Structures

MCA0012E

4 - 0 - 0 : 4 Credits

Prerequisites: *none*

Course Outcomes

At the end of the Course student will be introduced to

- Introduce concepts of mathematical logic for analyzing propositions and proving theorems.
- Use sets for solving applied problems, and use the properties of set operations algebraically.
- Work with relations and investigate their properties AND Investigate functions as relations and their properties.
- Introduce basic concepts of graphs, digraphs and trees.

Syllabus

Sets, relations, and functions:- Basic operations on sets, Cartesian products, disjoint union and power sets. Types of relations, compositions and inverses; Types of functions, compositions and inverses; Arbitrary union, intersection and product; Propositional Logic:- Proof systems, Satisfiability, Validity, Soundness, Completeness, Deduction Theorem. Decision problems on propositional logic;

First order logic and First order theory, Set theory, Axiom of choice. Finite and Infinite sets, Countable and Uncountable, Cantor’s diagonal argument and power set theorem, non-computability of all number theoretic; functions.

Partially ordered sets: Complete partial ordering, chain, lattice. Complete, distributive, modular, and complemented lattices. Boolean and pseudo Boolean lattices. Different sublattices, monotone map and morphisms, quotient structures, filters. Tarski’s fixed point’s theorem.

Algebraic Structures: Algebraic structures with one binary operation, semigroup, monoid and group. Congruence relation and quotient structures. Morphisms. Free and cyclic monoids and groups. Permutation group. Substructures, normal subgroup. Error correcting code. Algebraic structures with two binary operations- ring, integral domain, and field. Boolean algebra and Boolean ring.

Counting: Basic counting techniques, inclusion and exclusion, pigeon-hole principle, permutation, Combination, Summations. Recurrence Relation and Generating Function.

Graph: Graphs and their basic properties, Eulerian and Hamiltonian walk, Graph Colouring, Trees.

Text Books:

1. Lipschutz, Seymour, “ Discrete Mathematics”, McGraw Hill.
2. Tremblay and Sorenson, Discrete Mathematical Structures, McGraw-Hill.

References:

1. C L Lieu, “Elements of Discrete Mathematics”
2. B. Kolman, R. Busby, R. C. Ross, “Discrete Mathematics”, Pearson

- R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed, Addison-Wesley, 1994.

Distributed Computing

4 - 0 - 0 : 4 Credits

MCA0013E

Prerequisites: *none*

Course Outcomes

At the end of the Course student will be introduced to

- Demonstrate knowledge of the basic elements and concepts related to distributed system technologies.
- Demonstrate knowledge of the core architectural aspects of distributed systems. Design and implement distributed applications.
- Use and apply important methods in distributed systems to support scalability and fault tolerance.
- Design and implement distributed applications and Demonstrate experience in building large-scale distributed applications.

Syllabus

Computer architecture: CICS, RISC, Multi-core; Computer networking : ISO/OSI Model; Evolution of operating systems; Introduction to distributed computing systems (DCS) DCS design goals, Transparencies, Fundamental issues

Distributed Coordination: Temporal ordering of events; Lamport's logical clocks; Vector clocks; Ordering of messages; Physical clocks; Global state detection

Process synchronization: Distributed mutual exclusion; Algorithms; Performance matrix

Inter-process communication: Message passing communication; Remote procedure call; Transaction communication; Group communication; Broadcast atomic protocols; Deadlocks in distributed systems, Load scheduling and balancing techniques, Distributed database system: A Case study

Text Books:

1. Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet (DCC) by Kai Hwang, Jack Dongarra& Geoffrey C. Fox.
2. "Distributed Systems: Principles and Paradigms" (DSPD), Prentice Hall, 2nd Edition, 2007.

Formal Language and Automata Theory

4 - 0 - 0 : 4 Credits

MCA0014E

Prerequisites: *none*

Course Outcomes

At the end of the Course student will be introduced to

- Outline of different concepts in automata theory and formal languages.
- Structure of Regular Languages (RL), Regular Expressions (RE) and construction of corresponding Finite Automata (FA).
- Study of Context Free Grammar (CFG) and designing Push Down Automata (PDA).
- Explain and designing of Turing Machines (TM). Concept of un-decidable problems related to TM and CFG.

Syllabus

Finite Automata – deterministic and nondeterministic, regular operations; Regular Expression, Equivalence of DFA, NFA and REs, closure properties; Non regular languages and pumping lemma, DFA Minimization, CFGs, Chomsky Normal Form; Non CFLs and pumping lemma for CFLs, PDAs, Equivalence of PDA and CFG; Properties of CFLs, DCFLs, Turing Machines and its variants
Configuration graph, closure properties of decidable languages, decidability properties of regular languages and CFLs;
Undecidability, reductions, Rice's Theorem, introduction to complexity theory

SUGGESTED READING

1. Introduction to the Theory of Computation by Michael Sipser.
- Identify and analyze the fundamental steps in Image processing.
 - Characterize the hardware and software components of imaging systems.
 - Understand the models and interpret the spatial and frequency domain image processing algorithms and analyze and verify different image recognition techniques.
 - Apply the concepts and image processing tools for different image processing and pattern recognition applications.

Image Processing

4 - 0 - 0 : 4 Credits

MCA0015E

Prerequisites: *none*

Course Outcomes

At the end of the Course student will be introduced to

- Identify and analyze the fundamental steps in Image processing.
- Characterize the hardware and software components of imaging systems.
- Understand the models and interpret the spatial and frequency domain image processing algorithms and analyze and verify different image recognition techniques.
- Apply the concepts and image processing tools for different image processing and pattern recognition applications.

Syllabus

Introduction and signal digitization; Pixel relationship; Camera models & imaging geometry
Image interpolation; Image transformation; Image enhancement
Image restoration & Image registration
Colour image processing; Image segmentation
Morphological image processing; Object representation, description and recognition

SUGGESTED READING

1. Digital Image Processing by Rafael C Gonzalez & Richard E Woods, 3rd Edition
2. Fundamentals of Digital Image Processing by Anil K Jain
3. Digital Image Processing by William K Pratt

Information Retrieval and Web Mining

4 - 0 - 0 : 4 Credits

MCA0016E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Understand the basic concepts of the information retrieval.
- Analyse the involvement of the information retrieval in modern life style & social media.
- Apply data pre-processing, indexing, retrieval methods and concepts
- Evaluate the effectiveness and efficiency of different information retrieval systems.

Syllabus

Information Retrieval: The nature of unstructured and semi-structured text. Inverted index and Boolean queries. Text Indexing, Storage and Compression: Text encoding: tokenization, stemming, stop words, phrases, index optimization. Index compression: lexicon compression and postings lists compression. Gap encoding, gamma codes, Zipf's Law. Index construction. Postings size estimation, merge sort, dynamic indexing, positional indexes, n-gram indexes, real-world issues.

Retrieval Models: Boolean, vector space, TFIDF, Okapi, probabilistic, language modeling, latent semantic indexing. Vector space scoring. The cosine measure. Efficiency considerations. Document length normalization. Relevance feedback and query expansion. Rocchio; Performance Evaluation: Evaluating search engines. User happiness, precision, recall, F-measure. Creating test collections: kappa measure, interjudge agreement.

Text Categorization and Filtering: Introduction to text classification. Naive Bayes models. Spam filtering. Vector space classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting; Text Clustering: Clustering versus classification. Partitioning methods. k-means clustering. Mixture of gaussians model. Hierarchical agglomerative clustering. Clustering terms using documents.

Web Information Retrieval: Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS; Retrieving Structured Documents: XML retrieval, semantic web; Advanced Topics: Summarization, Topic detection and tracking, Personalization, Question answering, Cross language information retrieval

References:

1. Introduction to Information Retrieval, Manning, Raghavan and Schutze, Cambridge University Press, draft.
2. Modern Information Retrieval Baeza-Yates and Ribeiro-Neto, Addison Wesley, 1999
3. Mining the Web, SoumenCharabarti, Morgan-Kaufmann, 2002.

Internet of Things

4 - 0 - 0 : 4 Credits

MCA0017E

Prerequisites: *Basic programming knowledge*

Course Outcomes

At the end of the Course student will be introduced to

- Understand advanced networking concepts and internet and web application architectures.
- Analyze and understand different advanced routing protocols being used in web application development.
- Analyze and evaluate different solution available in the field of networking and web application development
- Implement solution for different critical network related issue.

Syllabus

Introduction to IoT, What is IoT, Why and How, Challenges, Technologies that enable IoT, Mobile Devices – ARM Cortex-A class processor Introduction to Embedded Systems, CPUs vs. MCUs vs. Embedded Systems, , Embedded Devices – ARM Cortex-M class processor, Networking – Bluetooth Smart technology, Connected Community – ARM mbed platform, Features of Embedded Systems, Building Embedded Systems , Building Embedded System using MCUs, Introduction to the mbed™ Platform.

ARM Architectures and Processors, ARM Processors Families, ARM Cortex-M Series Family, Cortex-M0 Processor, ARM Processor Vs. ARM Architectures, ARM Cortex-M0 Processor, Cortex-M0 Processor Overview, Cortex-M0 Block Diagram, Cortex-M0 Registers, Cortex-M0 Memory Map, Cortex-M0 Exception Handling, ARM Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set, Cortex-M0 Instruction Set, Data Accessing Instructions, Arithmetic Instructions, Program Flow Control, Low-Power Features, Low-Power Requirements, Cortex-M0 Low-Power Features, Cortex-M0 Sleep Mode, Developing Low-Power Applications.

Interrupts, Entering an Exception Handler, Exiting an Exception Handler, Port Module and External Interrupts, Timing Analysis, Program Design with Interrupt, Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, Introduction to Smartphone, Smartphone hardware components, Mobile operating systems and Smartphone programming.

PSoC Terms, The Internet of Things Revolution, Design Challenge 1, Design Challenge 2, Design Challenge 3, PSoC 4 BLE One-Chip Solution, Bluetooth Low Energy Pioneer Kit, BLE Pioneer Baseboard and PSoC 4 BLE Module, BLE architecture and Component Overview, Programmable Analog Blocks, Sequencing SAR ADC Block, Continuous Time Block(CTBm), Programmable Digital Blocks, Universal Digital Block, Serial Communication Block, Timer/Counter/PWM Block, Sensor-Based IoT System Design.

Practical Implementations: Blinking LED, CPU Project: Square root approximation, C as implemented in Assembly Lab Exercise. Interrupt and low POWER features, Introduction to the ARM DS-5 TOOL, C and assembly coding - Processing Text in Assembly Language, Designing a basic Mobile Appcessory, Bluetooth Smart Heart Rate Sensor App, BLE connection and BLE heart rate monitor, Capsensor and RGB led

Text Books and references:

- "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
- "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)
- White Paper: Cortex-M for Beginners - An overview of the Arm Cortex-M processor family and comparison: <https://community.arm.com/developer/ip-products/processors/b/processors-ip-blog/posts/white-paper-cortex-m-for-beginners-an-overview-of-the-arm-cortex-m-processor-family-and-comparison>
- The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors, Third Edition by Joseph Yiu
- Cortex-A Series Programmer's Guide for ARMv7-A by Arm
<http://infocenter.arm.com/help/topic/com.arm.doc.den0013d/index.html>

Internet Technology

4 - 0 - 0 : 4 Credits

MCA0018E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas.
- Build interactive web applications using AJAX.

Syllabus

Web essentials – W3C - clients – servers - communication – markup languages – XHTML – simple XHTML pages style sheets – CSS; Client side programming – Java script language – java script objects – host objects Browsers and the DOM; Server side programming – Java servlets – basics – simple program – separating programming and presentation – ASP/JSP - JSP basics ASP/JSP objects – simple ASP/JSP pages.

Representing Web data – data base connectivity – JDBC – Dynamic Web pages – XML – DTD

XML schema – DOM – SAX – XQuery - Building Web applications - cookies – sessions – open source environment – PHP – MYSQL –case studies; Middleware Technologies – Ecommerce – Architectures – Technologies – Ajax – Advanced Web Technologies and Tools.

REFERENCES:

1. Jeffrey C Jackson, “Web Technology – A computer Science perspective”, Persoson Education, 2007.
2. Chris Bates, “Web Programming – Building Internet Applications, “Wiley India, 2006.

Machine Learning

4 - 0 - 0 : 4 Credits

MCA0019E

Prerequisites: *Basic programming, algorithm design, basics of probability & statistics*

Course Outcomes

At the end of the Course student will be introduced to

- Understand the basic theory underlying machine learning.
- Able to formulate machine learning problems corresponding to different applications.
- Understand a range of machine learning algorithms along with their strengths and weaknesses. Learn various AI paradigms.
- To be able to apply machine learning algorithms to solve problems of moderate complexity. Learn various ML tools.

Syllabus

Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation; Linear regression, Decision trees, overfitting

Instance based learning, Feature reduction, Collaborative filtering based recommendation

Probability and Bayes learning;

Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM; Neural network:

Perceptron, multilayer network, backpropagation, introduction to deep neural network

Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning; Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model

REFERENCES:

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Introduction to Machine Learning Edition 2, by Ethem Alpaydin

Multimedia Technology

4 - 0 - 0 : 4 Credits

MCA0020EPrerequisites: *None***Course Outcomes****At the end of the Course student will be introduced to**

- Understanding the basics of analog and digital video: video representation and transmission and analyze analog and digital video signals and systems.
- Knowing the fundamental video processing techniques.
- Acquiring the basic skill of designing video compression and to familiarize with video compression standards.
- Knowing the basic techniques in designing video transmission systems: error control and rate control.

Syllabus

Multimedia Technology-Introduction, Nature of Multimedia Data, Multimedia Peripherals & Devices, Storage of Multimedia Data; Multimedia systems design -An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

Different Data Compression Techniques: Run length encoding, quantization, wavelet transform, JPEG 2000 image compression, vector quantization and codebook method a Temporal Model for Interactive Multimedia; Multimedia file handling - Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – video image and animation – Full motion video – Storage and retrieval Technologies.

Multimedia Databases, Clustering for Multimedia Object Storage, Clustering Algorithms, Querying and Content Retrieval in Multimedia Databases, Distributed Multimedia Systems; Hypermedia - Multimedia Authoring & User Interface – Hypermedia messaging - Mobile Messaging – Hypermedia message component – creating Hypermedia message – Integrated multimedia message standards – Integrated Document management

References:

1. J. Keyes: Multimedia Handbook, MH.
2. G. Blair, L. Blair, A. Chetwynd, H. Bowman: Formal Specification of Distributed Multimedia Systems, UCL Press, London.
3. S. Khoshafian, A. Brad Baker: Multimedia and Imaging Databases, Morgan Kaufmann.

Natural Language Processing

4 - 0 - 0 : 4 Credits

MCA0021EPrerequisites: *Basic probabilities knowledge***Course Outcomes****At the end of the Course student will be introduced to**

- Recognize the feasibility of applying a soft computing methodology for a particular problem.
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- Apply genetic algorithm to combinational optimization problems.
- Apply neural networks to pattern classifications and regression problems. And compare solutions by various soft computing approaches for a given problem.

Syllabus

Introduction and Basic Text Processing, Spelling Correction, Language Modeling
 Advanced smoothing for language modeling, POS tagging
 Models for Sequential tagging – MaxEnt, CRF
 Syntax – Constituency Parsing, Dependency Parsing
 Lexical Semantics, Distributional Semantics
 Topic Models , Entity Linking, Information Extraction
 Text Summarization, Text Classification
 Sentiment Analysis and Opinion Mining

Network Synthesis

4 - 0 - 0 : 4 Credits

MCA0022E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Apply network topology concepts in the formulation and solution of electric network problems.
- Apply two-port network analysis in the design and analysis of filter and attenuator networks.
- Identify the properties and characteristics of network functions, and verify the mathematical constraints for their physical realisation.
- Synthesize passive one-port networks.

Syllabus

Network Topology: Graph of a network, concept of a tree and links, incidence matrix, principle of power invariance, Tellegen's Theorem, Network transformations, principle of duality in network.

Transient behavior and initial conditions in network: Behavior of circuit elements under transient condition, transient response of a circuit for A.C. and D.C. excitations, Importance of initial condition, Evaluation of initial conditions in R-L, R-C and R-L-C circuits.

Laplace Transform: Introduction, definition of Laplace Transform pairs, Properties of Laplace Transform, Laplace Transform of some important functions, Laplace Transform theorem, Waveform synthesis.

Analysis of Networking Laplace Transform: Laplace Transform of periodic function and related problems. Sinusoidal functions and its related problems, Initial value and final value theorem, convolution theorem with problems;

Network Functions: Introduction, Network functions of single point network and two point network, Classification of network functions: Driving point, impedance function, driving point admittance function, Transfer function, Poles and Zeros; necessary conditions for transfer functions, related problems.

Network Synthesis: +ve real functions, Hurwitz polynomials, Elementary synthesis operations, properties of L-C, R-C and R-L impedances and admittance, Synthesis of LL, RC and RL network using Foster and Cover methods.

Two point network Parameters: Open circuit impedance parameters, short circuit admittance parameters. Transmission parameters. Hybrid Parameters. Relation between parameter sets. Calculations of these parameters for a given network.

Filters: General theory of filters, designing of filters, Prototype low pass, and high pass filters. Composite filters, Band pass and Band elimination filters.

Text books:

1. Network Theory: Analysis And Synthesis By Smarajit Ghosh, Phi
2. Network Theory: A Simplified Approach By K Channa Venkatesh & D Ganesh Rao, Pearson

References:

1. A First Course In Network Theory By Ernesto Estrada And Philip A. Knight , Oxford

Numerical Methods

4 - 0 - 0 : 4 Credits

MCA0023E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Apply numerical methods to find solution of algebraic equations using different methods under different conditions, and numerical solution of system of algebraic equations.
- Apply various Differential Equations concepts and Multistep Methods.
- Derive numerical methods for various mathematical operations like interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution.
- Work numerically on the partial differential equations using different methods through the theory of finite differences.

Syllabus

Solution of equations and Eigen value problems: Iterative method, Newton – Raphson method for single variable and for simultaneous equations with two variables. Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobi and Gauss – Seidel methods. Inverse of a matrix by Gauss – Jordan method. Eigen value of a matrix by Power and Jacobi methods.

Interpolation: Newton’s divided difference formulae, Lagrange’s and Hermite’s polynomials. Newton forward and backward difference formulae. Stirling’s and Bessel’s Central difference formulae.

Numerical Differentiation And Integration: Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson’s (both 1/3rd and 3/8th) rules. Two and Three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson’s rule.

Initial Value Problems For Ordinary Differential Equations: Single step Methods – Taylor Series, Euler and Modified Euler, Runge – Kutta method of order four for first and second order differential equations. Multistep Methods- Milne and Adam’s Bashforth predictor and corrector methods.

Boundary Value Problems For Ordinary And Partial Differential Equations: Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation (both implicit and explicit), One-dimensional wave equation and two-dimensional Laplace and Poisson equations

Text Books:

1. Numerical Methods, Probability Theory and Statistics: A. K. Mukhopadhyay
2. Numerical Methods: Hilde and Brand

Object Oriented Analysis and Design

MCA0024E

4 - 0 - 0 : 4 Credits

Prerequisites: *Software Engineering*

Course Outcomes

At the end of the Course student will be

- Able to use an object-oriented method for analysis and design
- Able to analyse information systems in real-world settings and to conduct methods such as interviews and observations.
- Know techniques aimed to achieve the objective and expected results of a systems development process
- Know different types of prototyping, know how to use UML for notation

Syllabus

Object Oriented Design and Modelling: Object Oriented Fundamentals, Objects and object classes, object oriented design process, importance of modelling, principles of modelling, object oriented modelling.

Introduction to UML: Conceptual model of UML, building blocks of UML, Mechanisms in UML, architecture, software development life cycle.

Basic Structural Modelling Classes, relationships, common mechanisms, class and object diagrams. Advanced structural Modelling: Advanced classes, advanced relationships, Interfaces types and roles, packages, instances and object diagrams.

Collaboration Diagrams and Sequence Diagrams: Terms, concepts and depicting a message in collaboration diagrams. Terms and concepts in sequence diagrams. Difference between collaboration and sequence. diagram. Depicting synchronous messages with/without priority call back mechanism. Basic behavioural modelling: Interactions, use cases, Use Case Diagrams, Interaction Diagrams and activity diagrams.

Advanced behavioural modelling: Events and signals, state machines, process and threads, time and space, state chart diagrams. Architectural Modelling: Terms, Concepts, examples, Modelling techniques for component diagrams and deployment diagrams.

References:

1. Grady Booch, James Rum bough, Ivar Jacobson. 'The Unified Modeling Language User Guide. Pearson Eduataion 2002.
2. Ian Sommerville, 'Software Engineering Sixth Edition' 2003.
3. Meilir Page Jones, 'Fundamentals of Object Oriented Design in UML', Addison Wesley.
4. The Elements of UML(TM) 2.0 Style, Scott W. Ambler, Cambridge University Press (May 9, 2005)
5. UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design , Jim Arlow&Ila
6. Neustadt, Addison-Wesley Professional; 2 edition (June 27, 2005)

7. Real Time UML Workshop for Embedded Systems, Bruce Powel Douglass, Newnes; Pap/Cdr edition (September 20, 2006)

Pattern Recognition

4 - 0 - 0 : 4 Credits

MCA0025E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be able to

- Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.
- Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.
- Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.
- Apply pattern recognition techniques to real-world problems such as document analysis and recognition.

Syllabus

Introduction: Pattern recognition and learning (supervised, unsupervised), training and test sets, feature selection; **Supervised learning and classification:** Discriminant functions and decision boundaries Linear discriminant functions, relaxation procedure, non-separable behavior Minimum distance classifier. Bayesian decision theory. Maximum likelihood classification. Parameter estimation, sufficient statistics, component analysis and discriminants (PCA, Fisher's) Nonparametric techniques. Density estimation, Parzen window, K-NN estimation, Supervised neural learning: Back-propagation algorithm, Radial basis-function neural net; Support vector machine classifier, Learning vector quantization

Unsupervised learning and clustering: Data description and clustering –similarity measures, criterion for clustering, Methods of clustering - partitional, hierarchical, graph theoretic, density based, k-means, k-mediod, fuzzy c-means clustering, Cluster validity

Feature extraction and feature selection: Problems of dimensionality- Feature extraction --PCA- Feature selection –KarhunenLoeve, stochastic approximation, kernel approximation, divergence measures, Independent component analysis

References:

1. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification and Scene Analysis, 2nd ed., Wiley, New York, 2000.
2. J. T. Tou and R. C. Gonzalez, Pattern Recognition Principles, Addison-Wesley, London, 1974.
3. A. Konar, Computational Intelligence: Principles, Techniques, and Applications, Springer 2005

Social Networks

4 - 0 - 0 : 4 Credits

MCA0026E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Understand a broad range of network concepts and theories.

- Appreciate how network analysis can contribute to increasing knowledge about diverse aspects of society.
- Use a relational approach to answer questions of interest to them. Analyse social network data using various software packages.
- Present results from social network analysis, both orally and in writing.

Syllabus

Introduction
 Handling Real-world Network Datasets
 Strength of Weak Ties& Homophily, +Ve / -Ve Relationships
 Link Analysis
 Cascading Behaviour in Networks
 Power Laws and Rich-Get-Richer Phenomena and Epidemics
 Small World Phenomenon
 Pseudocore (How to go viral on web)

SUGGESTED READING:

1. Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge University Press, 2010
2. Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010.

Soft Computing

4 - 0 - 0 : 4 Credits

MCA0027E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Recognise the feasibility of applying a soft computing methodology for a particular problem.
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- Apply genetic algorithm to combinational optimization problems.
- Apply neural networks to pattern classifications and regression problems. And compare solutions by various soft computing approaches for a given problem.

Syllabus

Introduction to Soft Computing, Introduction to Fuzzy logic, Fuzzy membership functions, Operations on Fuzzy sets; Fuzzy relations, Fuzzy propositions, Fuzzy implications, Fuzzy inferences

Defuzzyfication Techniques, Fuzzy logic controller; Solving optimization problems, Concept of GA, GA Operators: Encoding, GA Operators: Selection, Crossover, Mutation;

Introduction to EC, MOEA Approaches: Non-Pareto, Pareto;

Introduction to ANN, ANN Architecture; ANN Training, Applications of ANN;

REFERENCES:

1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems 2nd Edition), Collelo, Lament, Veldhizer (Springer)
3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)

4. Neural Networks and Learning Machines Simon Haykin (PHI)

Software Project Management

4 - 0 - 0 : 4 Credits

MCA0028E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Identify the different project contexts and suggest an appropriate management strategy.
- Practice the role of professional ethics in successful software development.
- Identify and describe the key phases of project management.
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

Syllabus

Software components - COTS and infrastructure - Software variability management- Software architecture design methods - Architecture evaluation and assessment methods - architectural styles. Design Patterns - Evolution patterns - Software artifact evolution processes - Case studies - Java Beans.

Product, Process and Project – Definition – Product Life Cycle – Project Life Cycle Models

Format Process Models And Their Use -Definition and Format model for a process – The ISO 9001 and CMM Models and their relevance to Project Management –Emerging Models - People CMM-Metrics – Configuration Management – Software Quality Assurance – Risk Analysis

Engineering and People Issues in Project Management-Phases (Requirements, Design, Development, Testing, Maintenance, Deployment) –Engineering Activities and Management Issues in Each Phase – Special Considerations in Project Management for India and Geographical Distribution Issues

RERERENCES:

1. Len Bass, Paul Clements, and Rick Kazman, "Software Architecture in Practice", 2nd Edition, Addison-Wesley Longman, Inc., Reading, MA, 2003
2. Richard N.Taylor, NenadMedvidovic, and Eric M.Dashofy, "Software Architecture: Foundations, Theory and Practice", Wiley India Edition, 2012
3. Mary Shaw, and David Garlan, "Software Architecture in Practice: Perspectives on an Emerging Discipline", PHI Learning Private Limited,2010
4. Ramesh and Gopaldaswamy, "Managing Global Projects", Tata McGraw Hill,2001.

Speech and Natural Language Processing

4 - 0 - 0 : 4 Credits

MCA0029E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- How key concepts from NLP are used to describe and analyze language

- POS tagging and context free grammar for English language
- Understanding semantics and pragmatics of English language for processing
- Writing programs in Python to carry out natural language processing.

Syllabus

Introduction and Basic Text Processing
 Spelling Correction, Language Modeling
 Advanced smoothing for language modeling, POS tagging
 Models for Sequential tagging – MaxEnt, CRF
 Syntax – Constituency Parsing
 Dependency Parsing
 Lexical Semantics
 Distributional Semantics
 Topic Models
 Entity Linking, Information Extraction
 Text Summarization, Text Classification
 Sentiment Analysis and Opinion Mining

TCP/IP Network Programming

4 - 0 - 0 : 4 Credits

MCA0030E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- TCP/IP Network Programming, Describe the TCP/IP protocol suite, Describe Internet addressing.
- Describe the services at the IP (Internet Protocol) layer, Describe the auxiliary protocols that serves the IP layer.
- Explain error reporting and query mechanism in the Internet, Describe broadcasting mechanism in the Internet, Identify routing protocols in the Internet.
- Describe process-to-process communication, Describe the application protocols that use the services of other layers, Explain the rationale for changes in the next generation of Internet protocols.

Syllabus

Introduction to Socket Programming – Overview of TCP/IP Protocols –Introduction to Sockets – Socket address Structures – Byte ordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind, listen, accept, read, write, close functions – Iterative Server – Concurrent Server.

TCP Echo Server – TCP Echo Client – Posix Signal handling – Server with multiple clients – boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown – I/O multiplexing – I/O Models – select function– shutdown function – TCP echo Server (with multiplexing) – poll function – TCP echo Client (with Multiplexing).

Socket options – getsocket and setsocket functions – generic socket options – IP socket options – ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo Server – UDP echo Client – Multiplexing TCP and UDP sockets – Domain name system – gethostbyname function – Ipv6 support in DNS – gethostbyadr function – getservbyname and getservbyport functions.

Ipv4 and Ipv6 interoperability – threaded servers – thread creation and termination–TCP echo server using threads – Mutexes – condition variables – raw sockets – raw socket creation – raw socket output – raw socket input – ping program – trace route program.

References

1. W. Richard Stevens, TCP/IP Illustrated, Volume 1: The Protocols
2. W. Richard Stevens, Unix Network Programming, Volume 1: The Sockets Networking API
3. *Java Network Programming*, 2nd ed., by Hugues, Shoffner, and Hamner, read chapters 1-21 and Appendix A.
4. Introduction to Web Server Development
5. Java Programming examples Quick Reference
6. Charlotte, a web server for Windows © 2000, Stuart Patterson, ACM Crossroads, May 2000.

Web Technology

4 - 0 - 0 : 4 Credits

MCA0031E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site and develop basic programming skills using Javascript & DHTML.
- Understand how to plan and conduct user research related to web usability.

Syllabus

Introduction to Web, Web development strategies, Web applications, Working of Internet, Connections, TCP/UDP/IP, IP addressing, Ipv4 to Ipv6. ARP, RARP, DHCP, ICMP, HTTP, SMTP, and E-mail SNMP, Domain Name System (DNS), Internet Services, WWW, Web Servers.

Web Browsers.

HTML and DHTML HTML Tag, Rules of HTML, Text Formatting & Style, List, Adding Graphics to Html Document, Tables and Layout , Linking Documents, Frame, Forms, Project in HTML.

Introduction to DHTML, CSS, Class & DIV, External Style Sheet.

XML: DTD, XML schemes, presenting and using XML.

Scripting: Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; introduction to AJAX.

Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, JSP pages, Session, Application: data base action.

PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,mail, file upload, session, error, exception, filter, PHP-ODBC.

References:

1. Xavier, C, “ Web Technology and Design” , New Age International
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
3. Ramesh Bangia, “Internet and Web Design” , New Age International
4. Bhava, “Programming with Java”, Pearson Education
5. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
6. Deitel, “Java for programmers”, Pearson Education.

7. The complete Reference By Thomos A. Powell ,TMH publication
8. XML By Example, Sean McGrathPentice Hall Publication
9. Java Script :The definite Guide By Flangam .O'

Information System Security

MCA0032E

4 - 0 - 0 : 4 Credits

Prerequisites: *Computer Networks*

Course Outcomes

At the end of the Course student will be introduced to

- Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization.
- Practice with an expertise in academics to design and implement security solutions.
- Understand key terms and concepts in Cryptography, Governance and Compliance. Develop cyber security strategies and policies.
- Understand principles of web security and to guarantee a secure network by monitoring and analyzing the nature of attacks.

Syllabus

Basic Cryptography: - Classification of attacks, Evolution of Cipher Techniques, Symmetric and asymmetric key cryptography, Confusion and Diffusion.

Conventional Cryptography: - Substitution and Transposition ciphers. Cipher Implementation-P-Box, and Product Cipher, Fital structure, Block Ciphers-DES, AES, Meet in the Middle Attack, Triple DES and IDEA, Classical Techniques, Modern Techniques, Algorithms, Confidentiality Using Conventional Encryption.

Public-Key Encryption and Hash Functions:- Public-Key Cryptography ,Deffie -Hellman Cryptosystem , Man in the Middle Attack ,Message Authentication and Hash functions; Hash and MAC Algorithms,SHA-1 Algorithm, RSA and the Knapsack algorithm.

Authentication Protocols:-Authentication techniques based on Shared Secret Key, Key Distribution Centre, Kerberos, Public Key Encryption and Public Key certificates. Digital Signatures:-Secret Key Signatures. Public Key Signatures and DSS.

Network Security Practice: Authentication applications, Kerberos, X.509 Directory Authentication Service, Electronic Mail Security; S/MIME,IP Security Architecture, Combining Security Associations, Key Management, Web Security; Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction(SET), System Security: Intruders, Viruses and Related Threats, Types of Viruses, Trusted Systems.

E-mail and Internet Security: PGP and PEM, Firewalls, Types of Firewalls, Firewall Configuration, Firewall Design Principles, Classical attacks on the Internet, IP Sec, IP Spoofing attacks.

References:

1. William Stallings, Cryptography and Network Security, LPE Press.
2. A. Tanenbaum: Computer Networks, 3rd ed. Prentice Hall, 1996 (PHI 1997).
3. B. Schneider: Applied Cryptography, 2nd ed. Wiley, 1996.
4. C. Kaufman, R. Pearlman and M. Speciner: Network Security, Prentice Hall, 1995.
5. D. R. Stinson: Cryptography: Theory and Practice, CRC Press, 1995.
6. G. J. Simmons Ed.: Contemporary Cryptography, IEEE Press, 1991.
7. Behrouz A. Forouzen, Data Communication and Networking, TMH Press.

Course Outcomes**At the end of the Course student will be introduced to**

- Arm Cortex-A processor architectures and Arm Cortex-A based SoCs, Capture the design of Arm Cortex-A based SoCs in a standard hardware description language
- Low-level software design for Arm Cortex-A based SoCs and high-level application development.
- Ability to use and choose between different techniques for digital system design and capture
- Ability to evaluate implementation results (e.g. speed, area, power) and correlate them with the corresponding high level design and capture.

Syllabus

SoC Design Concept Developed, Moore's Law, The Design Productivity Gap, Bridging the Design Productivity Gap, Example Arm-based SoC, Advantages of SoCs, Limitations of SoCs, SoC v Microcontroller v Processor, SoC Design Flow, SoC Example: NVIDIA Tegra 2, SoC Example: Apple SoC Families, Arm Processors and Applications, Arm Processor Families, Arm Processors vs Arm Architectures, Arm and Thumb Instruction Sets, AAPCS, Processormodes, Vector table, Memory model, Memory types example CachedArmMacrobell, Data Alignment, Endianness, Coprocessors, PMU, Trust Zone, Virtualization, Arm Cortex-A Series Processors, Arm Cortex-A9 Processor, Cortex-A9 MP Core, What is NEON, NEON Registers.

Arm DS-5 Development Studio Overview, ARM DS-5 Code, ARM DS-5 Build, ARM DS-5 Debug, Debug Hardware, Virtual Debug Interface – VSTREAM, ARM DS-5 Analyser – Streamline, ARM DS-5 Analyser – Energy Probe, ARM DS-5 Simulation, ARM DS-5 Device Configuration Database, ARM assembler file syntax, Single/ Double register data transfer, Addressing Memory, Pre- and Post -Indexed Addressing, Multiple Register Data Transfer, Data Processing Instructions, Shift/Rotate Operations, Instructions for loading constants, Multiply/Divide, Bit Manipulation Instructions, Byte Reversal, Flow control, Branch instructions, Interworking, Compare and Branch if zero, Conditional Instructions, If Then, Coprocessor instructions, PSR access, DSP instructions overview, Saturated Maths and CLZ, Saturation, SIMD.

Cortex-A9 MPCore, Cortex-A9 MPE Configuration, Cortex-A9 Media Processing Engine, Register Renaming, Virtual Flags Registers, Small Loop Mode, Program Flow Prediction, Performance Monitoring Unit (PMU), Cortex A9 supports ARMv7-A Architecture, caches, Data Cache, Memory Management Unit, ARM v7 Architecture Effects, AMBA AXI4-Lite, AXI Low Power Interface, GPIO Overview, AXI4-Lite GPIO, Computer Memory, Memory Accessing, Volatile vs Non Volatile Memory, Types of Memory, Static RAM, Dynamic RAM, Non -Volatile Memory, Memory Controller, The Roles of a Memory Controller, Bus Types, Bus Terminology, Bus Operation, Communication Architecture Standards, ARM AMBA System Bus, AMBA 3 AXI Interface, AXI Components and Topology, Transaction Channels, Basic Signals, Clock and Reset, Channel Timing, Relationship Between the Channels

Serial Communication, Serial Communication vs Parallel Communication, Types of Serial Communication, UART Overview, UART Protocol, Character- Encoding Scheme, ASCII Encoded Characters, AXI UART Implementation, UART Control, UART Register Block, First In First Out(FIFO), Stream Data Transmission, AX-14 Stream Protocol, Data Streams, Global Signals, Master Signals, Slave Signals, Clock and Reset, Handshake, Packet Boundaries, VGA AXI4-LITE Overview, VGA Timing, VGA Interface, Utilization of FIFO, HDMI Overview, HDMI Interface, HDMI Signals: TMDS Channels, TMDS

Timing, Data Display Channels, Consumer Electronics Control, Hot Plug Detect, Edge Detection, Image Scaling, Gray Scale, Intensity Gradient Magnitude, Software Programming: Edge Detection Algorithm.

Practical Implementations: Coding - Processing Text in Assembly Language; Design an GPIO Peripheral; Design an AXI4-Stream VGA-out Peripheral; Integrating Display Peripherals to Zynq SoC– HDMI to VGA Converter; Accelerate Image Processing Using NEON; Accelerate Image Processing Using FPGA

Text Books and References:

- ARM System-on-Chip Architecture by Steve B. Furber
- ARM Assembly Language: Fundamentals and Techniques by William Hohl
- Cortex-A Series Programmer's Guide for ARMv7-A by Arm
<http://infocenter.arm.com/help/topic/com.arm.doc.den0013d/index.html>

Advanced Computer Architecture	MCA0034E
4 - 0 - 0 : 4 Credits	Prerequisites: <i>None</i>

Course Outcomes

At the end of the Course student will be introduced to

- Perform computer arithmetic operations.
- Use the concepts and design of all type of sequential and combinational circuits.
- Design and conduct experiments, as well as to analyze of the hardware of a computer system and its components such as control unit, arithmetic and logical (ALU) unit, input/output, and memory unit.
- Be able to design techniques such as pipelining and microprogramming in the design of the central processing unit of a computer system.

Syllabus

Computer architecture definition and analyze historical and future computer architecture trends, illustrate the organization and function of components needed for a simple processor design, principles of instruction set design and demonstrate the use of Armv8-A Instruction Set Architecture, pipelining concepts, implementation, hazards, impact on performance, and application of them in the Arm10 processor pipeline.

Different methods of handling branches including dynamic branch prediction, predictors, branch target buffer, and their application in the Cortex-A15 processor, Working of exception handling, limits of pipelining, Compare and contrast the benefits and drawbacks of super pipelined and superscalar processor, approaches to Instruction-Level Parallelism (ILP) and components needed in a generic superscalar processor, Implementation of ILP concepts in the Cortex-A75, Cortex-A77, and Cortex-A55 processors.

Different types of memory and their comparison, memory hierarchy, working principle of Memory Management Unit (MMU), Translation Lookaside Buffers (TLBs), and Direct Memory Access (DMA), operation of MMU and TLBs work in the Cortex-A9 processor, purpose of a cache, different types of cache designs, cache policies, multi-level caches and cache performance metrics, with the Cortex-A9 processor as a case study, Usage of multicore processors by considering communication aspects, cache-coherence protocol and memory consistency, implementation of these aspects in the big.LITTLE combination in a DynamIQ cluster and Cortex-A55,

Operational concept of multithreading and the various approaches to multithreading. Compare Simultaneous Multithreading (SMT) and multicore, explore SMT feature in Cortex-A65, Compare and

contrast the functions and benefits of processor specialization such as vector processors, Graphics Processing Units (GPUs) and Single Instruction, Multiple Data (SIMD) architectures, Demonstration of the application of these specialization in Arm NEON, Scalable Vector Extension (SVE), Mali GPU G76, and Mali G77.

Text Books and References:

- Digital Design and Computer Architecture Arm Edition by Sarah L. Harris & David Money Harris
- ARM System-on-Chip Architecture by Steve B. Furber
- Computer Organization and Design, The Hardware/Software Interface Arm Edition by David A. Patterson and John L. Hennessy
- Computer Organization and Architecture Themes and Variations by Alan Clements

Embedded Linux

4 - 0 - 0 : 4 Credits

MCA0035E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Embedded Linux operating system architecture.
- Linux-based embedded system component stack, Linux kernel modules.
- System configuration and boot process.
- Communication between kernel space and user space, System debugging and profiling.

Syllabus

Introduction to Embedded System, Embedded system components, Basic software, Operating systems for embedded systems, Linux-based embedded system components, Linux-based embedded system components, Reference hardware model, Reference hardware model implementations, CPU memory map, The role of the boot loader, The role of the boot loader, Possible scenarios, Possible scenarios, Linux kernel, Device tree, System programs and Application, Typical layout of the root file system.

Linux architecture, Conceptual view of the kernel, Process scheduler, Process scheduler, Memory manager, Memory manager external interfaces, Memory manager architecture, Virtual file system, i-node, i-node interface, File interface, Virtual file system architecture, Inter-process communication, Inter-process communication architecture, Network, Device trees, Build systems: Buildroot vs Yocto – general aspects, Buildroot vs Yocto – configuration, Buildroot vs Yocto – purpose, The Yocto Project, The Yocto build system, The build system workflow – configuration files, user configuration, Metadata, Machine (BSP) configuration, Distribution policy, image generation, SDK generation.

Introduction Linux kernel modules, CPU – I/O interface, CPU – I/O interface with polling, CPU – I/O interface with interrupt, CPU – I/O interface, CPU – I/O interface latency, CPU – I/O interface, Direct memory access (DMA) architecture, Direct memory access (DMA) transfer modes, I/O taxonomy, Typical operations, Linux devices, The Virtual File System (VFS): abstraction, functions – include/linux/fs.h, The device file concept, Linux kernel modules, The CPU/Device interface, The module level: file operations, octl() implementation, open()/release() implementation, read() implementation, Passing data to/from the kernel, Memory mapped I/O, GPIO-based I/O, The interrupt handler, Interrupt handling, Top-half and bottom-half, Needed support, Work queue, The user level, The user level – the application

Introduction to Application Demo: Building a Ranging Sensor Kernel Module, The sysfs file system – controlling GPIOs, Adding entries to the sysfs file system, Using sysfs and virtual file system API, The HC-SR04 ultrasonic ranging sensor, The HC-SR04 ultrasonic ranging sensor, Building Linux support for the HC-SR04 sensor, Module data structure definition, Module initialization function, Module clean-up

function, Module open function, Module close function, Module write function, Module read function, Module show and store function, Module test applications.

Practical Implementations: Introduction to the Board and Workspace set-Up; Custom Embedded Linux Build using the Manual Approach; Introduction to Linux kernel modules under Yocto; Handling general purpose i/o using Linux kernel modules; Handling HC-SR04 ranging sensor using Linux kernel modules; Introduction to code development and debugging using Yocto; Introduction to Linux kernel and application profiling

Text book titles and reference material

- Embedded Linux Systems with the Yocto Project by Rudolf K. Sterif
- Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux by Derek Molloy

Graphics and Mobile Gaming

4 - 0 - 0 : 4 Credits

MCA0036E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Understand Arm Mali GPU architecture, Core OpenGL ES rendering techniques, Game design methodology
- Ability to use different graphics and game design techniques to optimize performance and reduce power consumption on mobile devices
- Ability to create computer graphics on mobile devices using the Open GL ES Library
- Ability to create 3D games from scratch using commercial game design engines.

Syllabus

Graphics Processing Overview, The Fundamentals of 3D Objects, 3D Coordinate Systems, Coordinate Space Conversation, Rendering Pipeline, Open GL and Open GL ES, Graphics Processing Units, A GPU is not a CPU, Example of Mali GPU-T880 GPU, Use of Game Engine, Module Structure-Gaming, GPU Architectures-Hardware Evolution, GPU Hardware Generations 1,2,3,4&5, Geometry Processor, GPU Architecture, GPU Design Principles, GPU Memory Systems, GPU Rendering Approaches, The Mali Family-Mali Graphics, Mali 55,200,300,400,450,T880 Overview, Midgard Family, Mali Rendering Pipeline, Utgard Dataflow, Mali Midgrad Architecture.

Fixed Graphics Pipeline, Programmable shaders / Pipeline, Program Functions, Rendering Pipeline, Vertex Shader, Varyings, Viewport Clipping, Rasterizing, Fragment Shaders, Textures, Test and Blending, 3D Graphics, A 3D Object, Cube – Vertex Array, Types of Matrices- The Model Matrix, The View Matrix, The Projection Matrix, Identity Matrix, Matrix Addition, Matrix Multiplication, Translation, Scaling, Rotation, Texture Mapping – General Idea, UV Mapping, OpenGL ES and Textures, Lighting, Normals, Diffuse Light, Ambient Light, Specular Light, Lighting Strength, Video Games: A Historical Look, Video Games: From Then to Now, Introduction to Game Engines, The Current State of Game Engines, The Flagship Software, Games Development: The Coding Languages, Cocos2d-X: Open Source Development.

Complexity vs Performance, Methods for Increasing Performance and Complexity, Bump Mapping, Normal Mapping, Vertex Buffer Objects (VBO), VBO Functions, Mipmapping, Compressed Textures, Generating ETC Compressed Textures, ASTC Format, Graphical Assets, Loading Assets, Android Application Package – APK, Android File Loading, Extracting to a Private Location, Extracting to a Temporary Location, Software Development Process, Game Development Process: Iterative Development, Grouping Game Objects, Game Objects – 2D Games and Groupings, Breakdown the Design – Identifying

Components, Breakdown the Design - Update/Render Game Objects, Game Objects – 3D games, The Game Loop, Nodes, Scenes, Project Considerations.

Graphics – History of Hardware, Colour Cells – Commodore and NES, NTSC Artefact Colouring – Apple 2 Computers, Sprites, 2D Images – Characteristics, Polygons in Games, 3D Modelling, UV Mapping – Overview, Diffuse Mapping, Static Lighting - Light Mapping, Height Mapping, Normal/Bump/Displacement Mapping, Alpha Mapping, Cubemaps, Importance of external resources, Importance of proper sound design, Advanced 3D Effects, Animations – Production, Particle Effects, Particle Effects in the Game Loop, Bloom, 3D Camera Control, Introduction to Physics, Physics Bodies, AABB - Axis-Aligned Bounding Boxes, OBB – Orientated Bounded Boxes, Performance Optimisation, Introduction to Virtual Reality, Use of Virtual Reality, VR Headset, VR Software, Types of VR Systems, Working with VR , The VR Rendering Pipeline, The Fundamentals of Stereoscopic Rendering, Lenses, Distortion Shaders, Multiview rendering and multi-sampling, Calibrating Headtracking, Clock Locking, Bandwidth, Interaction and Controls, Augmented Reality.

Practical Implementations: Mali VR SDK Lab, Virtual Reality, Cocos2d-X And VR, Implementing VR libraries, Using Gear VR in our game

Text book titles and reference material

- Game Design Theory by Keith Burgun
- OpenGL ES 2 for Android: A Quick-Start Guide (Pragmatic Programmers) by Kevin Brothaler

Introduction to Robotics Systems

MCA0037E

4 - 0 - 0 : 4 Credits

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Demonstrate knowledge of the relationship between mechanical structures of industrial robots and their operational workspace characteristics.
- Demonstrate an ability to apply spatial transformation to obtain forward kinematics equation of robot manipulators, ability to generate joint trajectory for motion planning
- Demonstrate an ability to solve inverse kinematics of simple robot manipulators.
- Demonstrate an ability to obtain the Jacobian matrix and use it to identify singularities, knowledge of robot controllers.

Syllabus

Define the meaning of robotics, properties of robotic systems; List the features and benefits of the Arm Cortex-M7 processor, basic elements of an ARM-based (System on Chip) SoC design, Cortex-M7 processor core registers and their functions, functions of the Cortex-M7 processor components which includes NVIC, WIC, MPU, Bus Interconnect and Debug System, processor memory map and memory region, Endianness and the concepts of Little-endian and Big-endian, the ability to write simple Arm assembly code using the Arm instruction set, Arm instruction sets to write simple Arm assembly code.

Different types of interrupts and their functions, handling of interrupts and exceptions, difference between interrupts and exceptions, function of the Nested Vectored Interrupt Controller (NVIC) in low latency interrupt processing, function of exception mask registers, the concept of interrupt response latency and its importance, power supply requirements for autonomous cars, the functions and properties of a linear

voltage regulator, functions and operating principles of the boost converter, DC/DC converter and linear voltage regulator.

Purpose and function of sensors, distinguish between Op-Amp based inverting and non-inverting amplifier configurations, identify using circuit diagrams inverting and non-inverting amplifier, application of optical rotary encoders in sensing velocity, the key characteristics and elements of Robot Operating Systems(ROS), importance of (ROS) in developing robotics projects, ROS computation graph concepts such as node, topic, message, master, service.

A feedback control system for an autonomous car, effect of friction and drag and how they affect control system design, the concept of a non-holonomic system in relation to autonomous cars' operation, implementation of a closed loop steering control system, the key elements of a PID controller and best practice such as the Ziegler-Nichols method for tuning PID controller, Describe the importance of SLAM operation in autonomous robot's navigation, a generated map for autonomous robot navigation, identify elements that can contribute to uncertainty in robotic systems, Bayes filter algorithm and its application to calculate the robot's posterior probabilities.

Text Books and References:

- Robotics, Mechatronics, and Artificial Intelligence by Newton C. Braga
- Advanced Mechatronics and MEMS Devices by Dan Zhang
- Intelligent Mechatronic Systems: Modeling, Control and Diagnosis by Rochdi Merzouki and Arun Kumar Samantaray
- Robot Modeling and Control by Mark W. Spong, Seth Hutchinson, and M. Vidyasagar

Embedded Systems Design

4 - 0 - 0 : 4 Credits

MCA0038E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Building Blocks of Embedded System
- Educate in Various Embedded Development Strategies, Bus Communication in processors, Input/output interfacing.
- Impart knowledge in various processor scheduling algorithms.
- Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

Syllabus

Introduction to Embedded Systems, CPUs vs. MCUs vs. Embedded Systems, Examples of, Embedded Systems, Options for Building Embedded Systems, Features of Embedded Systems, Introduction to Internet of Things (IoT), Challenges of IoT, Building Embedded Systems , Building Embedded System using MCUs, Introduction to the mbed™ Platform, Introduction to mbed, mbed Software Development Kit (SDK), , Hardware Development Kit (HDK), mbed Development Tools, mbed Worldwide Developer Community, Freedom KL25Z, NXP LPC1768 Hardware Platform, Nordic nRF51822 Hardware Platform, mbed and Internet of Things.

ARM Architectures and Processors, ARM Processor Families, ARM Cortex-M Series, Cortex-M0+ Processor, ARM Processor vs. ARM Architectures, ARM Cortex-M0+ Processor, Cortex-M0+ Block Diagram, Cortex-M0+ Memory Map, Bit-band Operations, ARM Cortex-M0+ Processor Instruction Set, ARM and Thumb Instruction Set, Cortex-M0+ Interrupts, NVIC (Nested Vectored Interrupt Controller),

Port Module and External Interrupts, Cortex Microcontroller Software Interface Standard (CMSIS), Benefits of CMSIS, CMSIS Functions, mbed Software Development Kit (SDK), Features of mbed SDK, mbed SDK Library Structure, Program Code, C Language vs. Assembly Language, Program-Generation Flow, Program Image, Program Data, Data Types, Accessing Data using C and Assembly, Mixed Assembly and C Programming, Embedded Assembly.

Digital Input and Output, Voltages and Logic Values, GPIO Controller, Using Pointer to Access, GPIO, Define Data Structure for Peripherals, Digital IO Examples, Using LED, Using 7-Segment Display, Using Infrared Emitter/ Detector, Analog Input, Digital-to-Analog Converter, Analog Output, Analog-to-Digital Converter, ADC range, Resolution and Quantization, Sampling Frequency, Input/ Output Analog Signals using mbed, mbed Analog Input, mbed Analog Output.

Timer and Pulse-Width Modulation, Timer Overview, Components of a Standard Timer, Compare Mode, Capture Mode, Pulse-Width Modulation Mode, mbed Timer and PWM, mbed Timer, mbed time ticker, mbed PWM, Serial Communication Overview, UART Communication, Operating System Overview, Types and Services of Operating Systems, Real-Time Operating System, RTOS Overview, RTOS Task Scheduling, Keil RTX RTOS, RTOS on mbed platform, mbed RTOS API, Using mbed RTOS API for your Project, Thread, Mutex and Semaphore.

Practical Implementation; Introduction to the Keil Mdk-Arm Tool, C And Assembly Coding - Processing Text In Assembly Language, Square Root Approximation, Digital Input/ Output and GPIO, Interrupt and Low Power Features, Programming using mbed API, Analog Input and Output Timer and PWM, Serial Communication

Text Books and References:

- The Definitive Guide to the ARM Cortex-M0 by Joseph Yiu
- Embedded Systems Fundamentals on Arm Cortex-M based Microcontrollers: A Practical Approach by Alexander G. Dean <https://www.arm.com/resources/education/textbooks/efficient-embedded-systems>
- White Paper: Cortex-M for Beginners - An overview of the Arm Cortex-M processor family and comparison: <https://community.arm.com/developer/ip-products/processors/b/processors-ip-blog/posts/white-paper-cortex-m-for-beginners-an-overview-of-the-arm-cortex-m-processor-family-and-comparison>.

Object Oriented Programming

4 - 0 - 0 : 4 Credits

MCA0039E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- Define the features of C++ supporting object oriented programming. Analyze the relative merits of C++ as an object oriented programming language.
- Derive the major object-oriented concepts like encapsulation, constructor, operator & function overloading.
- Major object-oriented concepts to implement inheritance and polymorphism
- Apply advanced features of C++ specifically stream I/O, and templates.

Syllabus

Introduction to OOP – Overview of C++ - Classes and Object, Structures, Friend Functions , Friend Classes, Inline functions .
 Constructors ad Destructors –Dynamic Initialization of Objects - Static Members – Passing objects to functions – Function returning objects-Arrays of Objects, Object as Function Arguments;
 Arrays, Pointers, this pointer, References, Dynamic memory Allocation;
 Functions Overloading, Default arguments, Overloading Constructors, Pointers to Functions; Operator Overloading, Type Conversion;
 Inheritance: Types, Derived Class Constructors, Issues in Inheritance; Virtual base Class;
 Run-time Polymorphism: Virtual functions,Pure virtual functions
 Class templates and generic classes, Function templates and generic functions;
 Exception Handling: Derived class Exception, Exception handling Functions
 Streams- File I/O, Name spaces –Array based I/O – Error handling during file operations - Formatted I/O;
 STL: Overview-Container Classes Lists-Maps- Algorithms Using Functions and Objects-String Class - Sequence Containers, Iterators-Specialized Iterators - Associative Containers. Storing User- Defined Objects - Function Objects

Text Books:

1. Stephen Prata, "C++ Primer Plus", 6th Edition, Addison-Wesley Professional, 2011
2. Bjarne Stroustrup, "Programming: Principles and Practice Using C++", 1st Edition, Addison-Wesley Professional, 2008
3. Andrew Koenig and Barbara E. Moo, "Accelerated C++: Practical Programming by Example", 1st Edition, Addison-Wesley Professional, 2000
4. Bruce Eckel, "Thinking in C++: Introduction to Standard C++: Volume One" 2nd Edition, Prentice Hall, 2000
5. Andrei Alexandrescu, "Modern C++ Design: Generic Programming and Design Patterns Applied", 1st Edition, Addison-Wesley Professional, 2001

Programming in Python

4 - 0 - 0 : 4 Credits

MCA0040E

Prerequisites: *None*

Course Outcomes

At the end of the Course student will be introduced to

- To understand why Python is a useful scripting language for developers.
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To learn how to identify Python object types.

Syllabus

The Context of Software Development-Software-Learning Programming with Python
 Values and Variables-Integer and String Values-Identifiers-User Input-String Formatting
 Expressions and Arithmetic-Expressions-Arithmetic Examples
 Conditional Statements-Boolean expressions-If/Else statement-Other Conditional Expressions
 Iteration-Loops
 Using Functions-Introduction to Using Functions-Functions and Modules
 Writing Functions- Function Basics -Parameter Passing-Custom Functions vs Standard Functions-
 Refactoring, Global Variables-Making Functions Reusable-Functions as Data
 Objects-Using Objects-String, File Objects
 Lists-Using Lists-Building Lists-List Traversal
 Tuples, Dictionaries, and Sets-Storing Aggregate Data-Enumerating the Elements of a Data Structure

Inheritance and Polymorphism
Advanced Python Applications and Packages

Text Books and References:

1. Fundamentals of Python Programming, Richard L. Halterman
2. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning,
3. Mastering python for data science, Samir Madhavan

TRIPURA UNIVERSITY
Department of Library and Information Science
Syllabus for MLIS Course

Course Code: 901C

Name of the Course: ICT APPLICATION IN LIBRARIES – THEORY

Learning Outcomes:

At the end of the Course student will be able to

1. Understand the concept of Library Automation
2. Get familiarity with library automation software
3. Elaborate the automated services
4. Comprehend the concept of library security and related technologies

Unit 1: Library Automaton

- Purpose, Planning and Implementation
- Library Automation Software: Types and Features
- Open Source Library Software: Koha, Greenstone and DSpace
- Automation of House Keeping Operations: Acquisition, Circulation, Cataloguing, Serial Control

Unit 2: Automated Services

- Electronic Reference Services
- Bibliographic and Database Search Devices
- CAS/SDI in Automated Environment
- Electronic Document Delivery Service
- Web 3.0 and Library 2.0

Unit 3: Library Networks and Consortia

- Objectives, Scope and Characteristics
- Major Library Networks: INFLIBNET, DELNET, OCLC
- Library Consortia: UGC-Infonet, INDEST, CSIR E-Journal Consortia

Unit 4: Library Security Technology

- Barcode
- RFID
- CCTV, Biometrics, Smartcard

Course Code: 902C

Name of the Course: INFORMATION SYSTEMS AND NETWORKS

Learning Outcomes:

At the end of the Course student will be able to

1. Understand concepts of Information Systems
2. Planning and Designing of Information System
3. Be familiar with Information Systems of both national and global importance

Unit 1: Information Systems

- Definition, Types and Characteristics
- Information Organization and Systems
- Planning and Designing of Information System
- Evaluation of Information System

Unit 2: National Information System

- ENVIS
- BIS
- PIS

Unit 3: Global Information System

- AGRIS
- INIS
- INSPEC
- MEDLARS
- WIPO

Course Code: 903C

Name of the Course: RESEARCH METHODS

Learning Outcomes:

At the end of the Course student will be able to

1. learn the basics of research and research methodology in terms of types, forms, formulation research problems
2. formulate objectives, hypotheses, research design, and literature search
3. apply different data collection methods and analyzing the data through different statistical techniques

Unit 1: Research and Research Design

- Concept, Meaning, Need, General Characteristics and Process of Research
- Types of Research: Fundamental and Applied, Other Research Approaches
- Research Design, Types of Research Design, Research Plan
- Formulation of Hypothesis, Testing of Hypothesis
- Literature Search: Print, Non- Print and Electronic Resources

Unit 2: Research Methods

- Scientific Method
- Historical Research
- Survey Research and Case Study Method
- Experimental Research and Delphi Technique

Unit 3: Data Analysis and Interpretation

- Data Collection Tools: Questionnaire, Interview, Observation and Sampling
- Data Presentation: Tables, Charts/Graphs
- Statistical Techniques/Interpretation of Data: Frequency Distribution, Measures of Central Tendency, Time Series Analysis, Measures of Dispersion, Correlation, Regression Analysis and Analysis of Variance
- Statistical Inference
- Use of Statistical Packages

Unit 4: Bibliometric Methods and Report Writing

- Bibliometric Studies: Meaning, Scope and Parameters
- Bibliometric Laws and Their Applications
- Preparation of Writing of Research and Report (Theses and Dissertation)
- Guidelines for Research Reporting

Course Code: 904C

Name of the Course: ICT APPLICATION IN LIBRARIES – PRACTICAL

Learning Outcomes:

At the end of the Course student will be able to

1. Get familiar with library automation software
2. work with KOHA
3. work with SOUL

Unit 1: Hands on Experience of Windows Operating System

Unit 2: Hands on Experience on Application Software:

- Drafting Letters and Issuing Reminders (with MS-Word)
- Preparation of Accession Register (with MS-Excel)
- Preparation of Presentation (with MS-Power Point)

Unit 3: Hands-on Experience on Library Software

- Integrated Library Software: Koha/SOUL

Unit 4: Viva Voce

Course Code: 905E

Name of the Course: INFORMATION LITERACY

Learning Outcomes:

At the end of the Course student will be able to

1. Understand the importance of evaluated information
2. Evaluate any source of information
3. Evaluate any media message
4. Evaluate search engines

Unit 1: Growth and Development of Information Literacy

- Information Society and Information Literacy
- Information Literacy: Definition, Models and Standards
- Information Literacy: Strategic Plan
- Information Literacy and Lifelong Learning

Unit 2: ICT and Media Literacy

- Computer Literacy and E-Literacy
- Digital Literacy
- Information Literacy and Bridging the Digital Divide
- Information Literacy and Media Literacy

Unit 3: Information Literacy and Libraries

- School, College and University Libraries
- Public Libraries
- Special Libraries
- Information Literacy and LIS Education

Unit 4: Policy and Advocacy

- Information Literacy: Initiatives and Forms in USA, UK and Australia
- Policies and Guidelines: UNESCO, IFLA and ALA
- Information Literacy: Skills and Competencies
- Information Literacy: Best Practices

Course Code: 906E

Name of the Course: COMMUNITY INFORMATION SERVICES

Learning Outcomes:

At the end of the Course student will be able to

1. Understand the Need and Sources for Community Information in Society
2. Know Role of Libraries in Community Information
3. Provide Community Information Services to Specific Community
 - a) Rural, Urban and Metropolitan Communities
 - b) Industrial Business Communities
 - c) Academic, Research, Institutional and R & D Communities
 - d) Physically, Mentally Disadvantaged Communities
 - e) Children, Old People and Illiterate

Unit 1: Community Information Services

- Community Information: Definition, Scope and Origin
- Need and Sources for Community Information in Society
- Role of Libraries in Community Information
- Community Information in USA, UK and India

Unit 2: Community Information Services

- Community Information Services: Meaning, Types and Target Users
- Community Information Centres: Planning and Role of Information Services
- Community Information Services to Specific Community
 - a) Rural, Urban and Metropolitan Communities
 - b) Industrial Business Communities
 - c) Academic, Research, Institutional and R & D Communities
 - d) Physically, Mentally Disadvantaged Communities
 - e) Children, Old People and Illiterate

Course Code: 907E

Name of the Course: PUBLIC LIBRARY SYSTEM

Learning Outcomes:

At the end of the Course student will be able to

1. Comprehend the concept of public library, its functions and services.
2. Role of RRRLF for development of public library.
3. Understand the resource and collection development of public libraries.
4. Know the staffing norms and standards of public library.

Unit 1: Public Library Development

- Public Library: Social and National Development
- UNESCO Contribution for Public Library Development
- Administration of Public Libraries
- National Agencies for Public Library Development
- Library Legislation

Unit 2: Public Library Services

- Library Services: Types
- Public Libraries as Knowledge Centres
- Changing Dimensions of Public Library Services
- Evaluation of Public Library Services

Unit 3: Public Library: Resource Development

- Resource Mobilization in Public Library
- Public Library Finance
- Information Resource Development for Public Libraries
- Human Resource Development in Public Libraries

Unit 4: Public Libraries: Trends and Development

- ICT Applications in Public Libraries
- Resource Sharing and Networking
- Changing Scenario of Public Libraries in India, UK & USA
- Web based Public Library Services

Course Code: 908E

Name of the Course: ACADEMIC LIBRARY SYSTEM

Learning Outcomes:

At the end of the Course student will be able to

1. Understand functions and services of academic library
2. Get idea about resource management in academic library
3. Formulate collection development policy in academic library
4. Get familiar with staffing pattern of academic library

Unit 1: Academic Library: Functions and Services

- Role of Academic Library in Higher Education
- Academic Library Services
- Academic Library Management
- Role of UGC for Academic Library Development

Unit 2: Resource Development

- Physical Resources including ICT Infrastructure
- Human Resource Development
- Financial Resource Development

Unit 3: Collection Development

- Collection Development, Write-off and Weeding out policy
- Problems in Collection Development
- Role of Library committee in Collection Development

Unit 4: Staff Development and Continuing Education

- Staffing Norms and Standards
- Continuing Education program for Academic Libraries
- Personnel Management

Course Code: 909E

Name of the Course: PERSONALITY DEVELOPMENT

Learning Outcomes:

At the end of the Course student will be able to

1. Understand their strength and weakness
2. Develop self-acceptance
3. Understand the concept of communication and Communicate more
4. Communicate effectively through writing

Unit –I Self-Awareness

- Tracing the roots
- Building confidence and boosting enthusiasm
- Promoting a zealous outlook towards life
- Imbibing positive thoughts and actions

Unit –II Communication Skills

- The Basic
- Forms of communication
- Understanding body language
- Social skills

Unit – III Workplace Skills

- Presentation skills
- Telephone skills
- Group discussion skills
- Adjustment
- Work ethics

Unit-IV Writing Skills

- Basics of writing
- Internal and External correspondence at the workplace
- Basics of writing proposals
- Writing reports

Course Code: 1001C

Name of the Course: INFORMATION RETRIEVAL

Learning Outcomes

At the end of the Course student will be able to

1. Understand the underlying mechanisms of information searching
2. Use vocabulary control tools
3. Perform subject analysis and indexing

Unit 1: Information Retrieval Systems

- Definition, Types, Components of ISAR Systems
- Elements of File Organization
- Artificial Intelligence and Expert System
- IR Models

Unit 2: Subject Representation and Indexing Languages

- Alphabetical Subject Representation
- Contribution of Cutter, Kaiser, Ranganathan, Farradane and Coates
- Characteristics of Indexing Languages
- Vocabulary Control-List of Subject Headings, Thesaurus and Thesourofacet, Classaurus

Unit 3: Indexing Systems and Techniques

- Pre-Coordinate Indexing System: Chain Indexing, PRECIS, POPSI
- Post-Coordinate Indexing System: Uniterm Indexing System
- Title Derived Indexing System: KWIC, KWOC and KWAC
- Citation Indexing: Science Citation Index, Social Science Citation Index
- Automatic Indexing: COMPass

Unit 4: Information Searching and Evaluation

- Search Methods and Search Strategy, Boolean Search
- Online Search Techniques
- Information Searching in different media: Print Media and Internet
- Need and Parameters of Evaluation
- Retrieval Performances: Recall and Precision Ratio

Course Code: 1002C

Name of the Course: DIGITAL LIBRARY THEORY AND PRACTICE

Learning Outcomes

At the end of the Course student will be able to

1. Understand the concept of Content management
2. Elaborate on process of content creation and organization
3. Understand the concept of Digital Library and Digitization.

(THEORY)

Unit 1: Content Management and Digitization

- Content Development: Concept; Content Creation & Organization
- Content Development & Maintenance using Dreamweaver
- Digitization Tools, Digitization Process, Digitization File Formats

Unit 2: Digital Library Creation

- Digital Library & Institutional Repository: Concepts; Digital Library Initiatives (National & International)
- Digital Library Software (s)

PRACTICAL

Unit 3: Content Management & Digitization Practice

- Hands on Practice of Library Website Designing using Dreamweaver
- Hands on Practice of Scanner, Digital Camera and OCR
- Viva-Voce

Unit 4: Digital Library Practice

- Hands on Practice of Digital Library Creation using DSpace and Greestone
- Creation of Communities & Collection, Submission Process
- Viva-Voce

Course Code: 1003C

Name of the Course: INTERNSHIP/ JOB DIARY

Learning Outcomes

At the end of the Course student will be able to

1. Issue and return books in a library
2. Do accessioning of books
3. Classify and data entry in Koha
4. Upload thesis in Shodhganga

Internship/Job Diary

A student admitted to the course shall have to work in every section of the Central Library of Tripura University or any other library specified by the department in the first/second semester to gain practical and clinical experience under the guidance of a teacher. A diary shall be maintained by the student in the form as prescribed by the department and to be submitted for the purpose, to be signed by the concerned teacher and countersigned by the Head of the Department. The diary is to be evaluated jointly by both the external and internal examiners followed by a viva-voce.

Tour Report

Every Student are required to visit and prepare a report on the working system and management of selected library and information centres of a place outside the state preferably metropolitan city accompanied by teachers for guidance in the beginning of the Second semester. The report shall have to be submitted to the department for evaluation jointly by external and internal examiners followed by a viva-voce. The objective of the practical visit to the library/libraries is/are curriculum stipulated study tour are to:

- To acquaint the students the organization and management of established libraries and information centres at national level.
- Expose themselves to automated and networked libraries on site.
- Understand the functions discharged and the services provided by these library and information centres.
- To make a comparative and critical study and evaluation among the libraries visited, and
- Get an overview of the latest trends and development on library and information services provided in the emerging scenario.

Course Code: 1004C

Name of the Course: DISSERTATION AND VIVA-VOCE

Learning Outcomes

At the end of the Course student will be able to

1. Write research proposal
2. Understand data collection methods
3. Analyse data
4. Face interviews

Dissertation

Every student shall have to choose a topic for the dissertation in the beginning of the first semester and preliminary preparation carried out under the guidance of a teacher. The final prepared dissertation to be submitted to the department/university before the commencement of the second semester for evaluation jointly by the external and internal examiners followed by a Viva-Voce.

Course Code: 1005E

Name of the Course: KNOWLEDGE MANAGEMENT

Learning Outcomes

At the end of the Course student will be able to

1. Understand the concept of Knowledge Management
2. Get idea about Knowledge creation tools and techniques
3. Do Knowledge Mapping

Unit 1: Knowledge Management

- Concept of Knowledge Management
- Scope of Knowledge Management
- Types of Knowledge Management (Explicit Knowledge & Implicit Knowledge)

Unit 2: Knowledge Management: Creation & Tools

- Knowledge Creation, Access, Transfer and Sharing
- Knowledge Tools
- Knowledge Networks
- Decision Making

Unit 3: Pre-requisites of Knowledge Management

- Sharing of Expertise
- Knowledge Mapping
- Knowledge Worker
- Value Added Knowledge

Unit 4: Benefits and Challenges of Knowledge Management

- Benefits and Challenges of Knowledge Management
- Pioneers in Knowledge Management
- KM Initiatives in Indian Organization
- Software for Knowledge Management
- Trends and Challenges in Knowledge Management

Course Code: 1006E

Name of the Course: E-RESOURCE MANAGEMENT

Learning Outcomes

At the end of the Course student will be able to

1. Deal with various E-resources
2. Get an idea about E-resources in different disciplines
3. Understand the importance of open access E-resources

Unit 1: Types of e-Resources

- E-Books
- E-Journals
- Consortia based e-resources
- E-Reports
- ETD
- Internet Resources
- Open Source

Unit 2: Internet Resources

- Science & Technology
- Humanities
- Social Science
- Evaluation of Internet Resources

Course Code: 1007E

Name of the Course: INFORMETRICS AND SCIENTOMETRICS

Learning Outcomes

At the end of the Course student will be able to

1. Understand basics of Bibliometrics, Scientometrics, Webometrics and Informetrics
2. Find out H, G, I index manually
3. Apply Scientometric indicators and formulas
4. Calculate journal impact factor

Unit- 1

- Bibliometrics, Informetrics, Librametrics, Scientometrics, Altmetrics
- Concept, definition, need, Scope & Parameters
- Bibliometric Laws & their Applications

Unit- 2

- Citation analysis, Impact Factor, Online citation index
- Concept of citation analysis, Formulas for measuring Citation
- H-index, I¹⁰- index, G-index
- Impact factor: concept, need, Formulas for measuring impact factor
- Citation Indexing: Citation Databases and Services: Web of Science; Scopus, ICI, Google Scholar

Unit-3

- Hands on Practice using Bibexcel and Pajek Software

Course Code: 1008E Name of the Course: Intellectual Property Rights (IPR)**Learning Outcomes**

At the end of the Course student will be able to

1. Get familiar with concepts of Intellectual Property rights
2. application of copyright
3. understand the laws of IPR
4. know about geographical indicators, Copyleft, Trademark

Unit 1: Intellectual Property Rights

- Concept of IPR
- Different Categories of IPR
- Enforcement of IPR
- IPR Acts and its Application in Electronic Environment

Unit 2: Copyright

- Meaning and Scope
- Copyright Law and Related Issue
- Rights to copyright owner
- Copyrights and Patent Right
- Licensing of Copyright
- Copyright Act and its Application in Electronic Environment

Course Code: 1009E

Name of the Course: PRESERVATION AND CONSERVATION OF LIBRARY MATERIALS

Learning Outcomes

At the end of the Course student will be able to

1. Get familiar with concepts of preservation and conservation of library materials
2. Preserve Non-Print Materials such as Palm leaves and manuscripts
3. Learn about hazards in libraries and how to fix them
4. Learn about binding process

Unit 1: Preservation and Conservation: Overview

- Preservation and Conservation: Historical Development, Need and Purpose
- Preservation of Print Materials: Books, Periodicals, Pamphlets

Unit 2: Preservation of Non-Print Materials

- Palm Leaves
- Manuscripts
- Films
- Floppies and Disks

Unit 3: Hazard to Library Materials and Control Measures

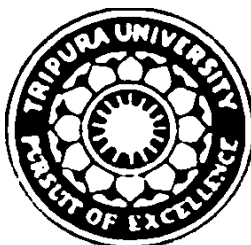
- Environmental Factor (Temperature, Humidity, Water, Light, Air Pollution, Smoke, Dust, etc.)
- Chemical Factors

Unit 4: Binding

- Types of Binding of Library Materials
- Binding Material and Their Varieties
- Binding Process
- Standards for Library Binding

Choice Based Credit System (CBCS)

M.Sc. MICROBIOLOGY CURRICULUM 2020-21



**DEPARTMENT OF MICROBIOLOGY
TRIPURA UNIVERSITY (A Central University) SURYAMANINAGAR,
AGARTALA – 799 022 TRIPURA, INDIA**

DATE OF SYLLABUS REVISION

26th September 2016

16th April 2018

19th July 2019

14th April 2021

30th June 2021

9th September 2021

Program specific Outcomes

The programme will enable the student to

- Develop an insight about the basic concepts, and practices of microbiology and its processes.
- Understand the nature and scope of different basic and applied branches of microbiology like Microscopy, Microbial Technology, Microbial ecology, Environmental microbiology, Microbial Immunology and bioinformatics
- Perform experimental procedures as per established laboratory standards in the areas of culturing, preserving and handling the microbes.
- Gain skill and training to carry out their own research work in the form of M.Sc. Project work in diverse research areas to develop confidence and analytical ability for answering a problem in real time.
- Students will develop understanding about the literature review and Scientific writing required to carry out research work in future studies.

M.Sc MICROBIOLOGY COURSE (CBCS) CURRICULUM (2020-2021)

SEMESTER I				
COURSE CODE	COURSE TITLE	COURSE TYPE	CREDITS	Lecture/ Tutorial/ Practical hrs per week
MI-701-C1	Basic Microbiology and Microscopy	CORE	4	3L/1T
MI-702-C1	Microbial Ecology and Environmental Microbiology	CORE	4	3L/1T
MI-703-C1	Microbial Immunology	CORE	4	3L/1T
MI-704-C	Practicals.	CORE	4	8P
CSK-II	Compulsory Foundation (Soft Skills)	CF	4	3L/1T
Semester wise credits and hours of lectures			20	24
SEMESTER II				
MI-801-C1	Microbial genetics and bacterial recombination	CORE	4	3L/1T
MI-802-C1	Biochemistry and Microbial Physiology	CORE	4	3L/1T
MI-803-C1	Virology	CORE	4	3L/1T
MI-804-C	Practicals	CORE	4	8
MI-805-E2	Biophysical and biochemical methods	ELECTIVE	4	3L/1T
MI-806-E1	Microbial Bioreactors for wastewater Treatment	ELECTIVE	4	3L/1T
MI-808-E	Innovative concept Development	ELECTIVE	4	3L/1T
Semester wise credits and hours of lectures			28	30
SEMESTER III				
MI-901-C1	Tools and Techniques of Molecular Biology and Bioinformatics	CORE	4	3L/1T
MI-902-C	Practicals	CORE	4	8
MI-903E2	Fermentation Technology and Fermented Foods	ELECTIVE	4	3L/1T
MI-904-E1	Microbial Adaptation	ELECTIVE	2	
MI-905-E	Bacterial secretion system and bacterial quorum sensing	ELECTIVE	2	3L/1T
MI-905-C1	Project Work	CORE	4	3T
MI-906 E	Bacteria and Chronic Infections	ELECTIVE	4	3L/1T
Semester wise credits and hours of lectures			20	24
SEMESTER IV				
MI-1001-E1	Recent trends in antimicrobial research	ELECTIVE	4	3L/1T
MI-1004-C1	Project Work	CORE	12	8
Semester wise credits and hours of lectures			16	12
In addition, a 2-credit elective course offered by other departments may be taken by the students				
Grand total of credits and hours of lecture hours			84	
Student have to cover 72 credits for clearing the MSc Course				

BASIC MICROBIOLOGY AND MICROSCOPY PAPER CODE: MI-701-C1

Credit: 4

Course Outcome:

- Students coming from diverse background get introduced to the three branches of microbiology namely Bacteriology, Mycology and Phycology.
- They get to understand the impact of different microscopic techniques in understanding microbial world and beyond.
- This course prepares them for getting into in-depth understanding of the subsequent papers covered in this program.

UNIT-I: BACTERIOLOGY

Bacterial cell structure and appendages: Morphological features and arrangement of bacterial cells; overview of eubacterial cell structure: Gram-positive and Gram-negative bacteria; Extracellular appendages: flagella- arrangement, basic structure and locomotive function; pili- different types, their distribution among bacteria & related functions; fimbriae- occurrence, function and features distinguishing pili and fimbriae; glycocalyx- composition and role in bacteria; and capsule-microcapsule and slime. Bacterial cell wall & cell membrane: Detailed structure of gram negative and gram positive bacterial cell wall, outer membrane lipopolysaccharide (LPS), protoplasts, sphaeroplasts, L-forms, cell wall synthesis and its inhibitors including different antibiotics; periplasm; molecular and chemical structure of cell membrane; cytoskeleton including tubulin and actin structural filaments and their role in bacteria. Bacterial cell division and reproduction: Binary fission and other forms of reproduction in bacteria; assembly, maintenance and disassembly of Z ring; endospore structure and stages involved in endospore development in *Bacillus subtilis* and *Metabacterium polyspora*

UNIT-II: MYCOLOGY

Classification of fungi (Oomycetes, Zygomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes) and Slime molds, morphology, structure, cell differentiation, and reproduction of fungi. Heterokaryosis, Sex hormones in fungi, physiological specialization in fungi, Mycorrhizae-ectomycorrhiza, endomycorrhiza and vesicular arbuscular mycorrhiza (VAM). Economic importance, Secondary metabolites from fungi: Terpenes, Nonribosomal peptides, hydrophobins, peptaibols, indole, alkaloids, detailed emphasis on polyketides.

UNIT- III PHYCOLOGY

Phycology: General account of Diversity, distribution, nutrition, mode of reproduction, Life cycle patterns, recent status of algae (evolutionary perspective), ecological significance, phycotoxins, economic importance including role in human affairs (algal pigments, biofuels, hydrogen production, important bioactive molecules, role of algae in sustainable environment) Distribution and classification of algae, thallus organization in algae, reproduction in algae; Brief account of Chlorophyta, Bacillariophyta, Phaeophyta, Rhodophyta; Algal ecology, Algal toxins, Algal food and algal biotechnology.

UNIT -IV: MICROSCOPY AND STAINING OF MICROORGANISMS

Microscopy: General Principles and components of simple, microscope, compound microscope, bright-field and dark-field microscope, Phase- contrast microscope, fluorescence microscope, Transmission Electron Microscope (TEM), Scanning Electron Microscope (SEM) and Atomic Force Microscope (AFM), Cytophotometry and flow cytometry Fixation and staining: Simple staining, negative staining, gram staining, acid fast staining, structural stains (Endospore, capsule and flagella).

Reference/Text Book:

1. Microbiology by Lansing M Prescott, Donald A Klein, John P Harley, McGrawHill
2. Principles of Microbiology by Ronald M. Atlas (1995), Amy McCullen
3. Microbiology: Principles and Explorations by JacquelynBlack
4. Microbiology by Michael JPelczar
5. Fundamental Principles of Bacteriology A JSalle
6. Foundations in Microbiology by Kathleen park Talaro, McGraw Hill.science
7. Microbiology: An Introduction by Gerard J Tortora, Berdell R Funke, Christine L Case,Dorling Kindersley (india) PvtLtd
8. Microbiology by Stuart Walker, W B Saunders
9. An Introduction to Microbiology by P Tauro, K K Kapoor, KSYadav

MICROBIAL ECOLOGY AND ENVIRONMENTAL MICROBIOLOGY

PAPER CODE: MI-702C1

Credit: 4

Course Outcome:

- Student will have an overview of the till date developments in the field of environmental microbiology with special emphasis on the role of microbes in mitigating environment pollution. Student will have become acquainted with various cultural, biochemical and molecular techniques used in understanding microbial diversity.
- Will be knowledgeable about the diversity, adaptations and biotechnological applications of microbes of extreme environment.
- Will be able to describe the role of soil microbes in nutrient transformation, plant-microbe interactions and biotechnology. Also knows about potability of water and its quality control.
- Understands the role of microbes in management of waste plant biomass and can apply knowledge in designing microbe-based processes for pulp, textile, biofuel and animal feed production industries.
- Is able to describe the role of microbes in solid and liquid waste management, gaining knowledge of various methods employed in sewage treatment and solid waste treatment
- Understands the role of microbes in bioremediation of environmental pollutants like petroleum hydrocarbons, pesticides, plastic and electronic waste; also understands utility of microbes in mineral and oil recovery

Unit 1 Origin diversity and culturability concepts of microbes

Origin of life: A brief history of the physical origin of the Earth, Chemical and Cellular evolution; Microbial Diversification: Consequences for Earth's Biosphere; Endosymbiotic origin of eukaryotes. Significance of Biogeochemical cycles: Carbon, Nitrogen, Phosphorous, Sulphur. Quantitative Ecology: Microbial diversity, OTU, Diversity indices (Shannon, Shimpson), Alpha and beta diversity, Richness and evenness, Samples and samplings, Concept of cultivability: Determination of total and viable microbial number, Molecular analysis of function and diversity of microbial community, Metagenomics and microbiomics.

Unit 2: Concepts of microbial ecology and microbial succession

Microbial Ecology: Basic concept of microbial Ecosystem and Biosphere, Concept of population growth and community dynamics in microbe, Development of microbial communities: r and k strategies. Physiological ecology of microorganisms: Adaptation to environmental condition, Abiotic growth limiting factors-Leibig's law of minimum, Shelford law of tolerance. Microbial community succession-biofilm communities

Unit 3 Biofertilizers

History of bio-fertilizers, sources of nitrogen and the importance of bio-fertilizers, description and characteristics of bio-fertilizers-Rhizobium, Azotobacter, Azospirillum, Blue Green Algae, Azolla, Phosphate solubilizing microorganisms, VAM. Bio-fertilizer production technology-strain selection, sterilization, growth and fermentation, standards and quality control, Bio-fertilizer application technology, constraints in the commercialization of bio-fertilizer technology

Unit 4: pollution management and Bioremediation

Water pollution and its sources: Role of organic pollutants in water, concepts of C-BOD, N-BOD and COD, Oxygen-sag curve. Treatment of waste water by aerobic and anaerobic process. Air pollution and Air borne diseases: Methods for air microflora studies Particulate matters, PAH, Fog and smog, Determination of LD50, Ames test to determine the genotoxicity of toxicants (biological assay to assess the mutagenic potential of chemical compounds) Soil pollution and management: Solid waste types, composting, landfill development, incineration methods, composting and sustainable agriculture, plastic degrading microorganisms as a tool for bioremediation, challenges in waste management Bioremediation of environmental pollutants: bioleaching, biosorption and bioaccumulation of metals from solid and liquid waste. Biodegradation and biotransformation of Xenobiotics including pesticides chlorinated and nitrated aromatic compounds, phenolic compounds, polycyclic aromatic compounds. Enzymes and metabolic pathways of degradation of xenobiotic compounds.

Reference/Text Books:

1. Maier, Pepper, Gerba. Environmental Microbiology. Academic Press.
2. Atlas, RM and Bartha, R. Microbial Ecology: Fundamentals and Applications. Pearson.
3. Schmidt and Schaechter. Topics in Ecological and Environmental Microbiology. Academic Press.
4. Environmental Microbiology by A.H. Varnam and M.G. Evans. Manson Publishing Ltd. 2000.
5. Manual of Environmental Microbiology edited by C.J. Hurst, R.L. Crawford, J.L. Garland, D.A. Lipson, A. L. Mills and L.D. Stetzenbach. 3rd edition. Blackwell Publishing. 2007.
6. Environmental Microbiology by W.D. Grant and P.E. Long. Kluwer Academic Publishers. 1981.
7. Microbiology: An environmental Perspective by P. Edmonds. Macmillan, New York. 1978.
8. Environmental Microbiology by R. Maier, I. Pepper and C. Gerba. 2nd edition. Academic Press. 2009.
9. Environmental Microbiology: Principles and Applications by P.K. Jjemba, Science Publishing Inc. 2004.
10. Advances in Applied Bioremediation by A. Singh, R.C. Kuhad and O.P. Ward. Springer. 2009.

MICROBIAL IMMUNOLOGY

PAPER CODE:MI-703-C1

Credit: 4

Course Outcome:

- Student will be able to understand the fundamental bases of immune system and immune response
- Student will be able to gather information about the structure and organization of various components of the immune system
- Student will be able to understand the genetic organization of the genes meant for expression of immune cell receptors and the bases of the generation of their diversity
- Student will be able to understand the operation and the mechanisms which underlie the immune response.
- Student will be able to apply the knowledge gained to understand the phenomena like
- Understanding host pathogen interactions which is essential in industrial as well academic research, vaccine development and therapeutics development against important human pathogens. Besides, the course is designed to cover some portions of NET exam.

UNIT 1: INTRODUCTION

Concept of Innate and Adaptive immunity, Immune dysfunction and its consequences, Immune cells and Organs: Immune Cells and Organs, Structure, Functions and Properties of Immune Cells - T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Dendritic cell, Structure and Functions of Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT.

UNIT 2: ANTIGENS

Antigens, Antigenicity versus Immunogenicity, Haptens, Characteristics of an antigen - Foreignness, Molecular size and Heterogeneity, T-dependent and T-independent antigens, Adjuvants. Antibodies and Humoral Immune Response: Basic structure of antibody- CDRs, Framework region, Hinge. Primary and secondary immune response, Antibody mediated effector function, Types and properties of antibodies, Monoclonal antibodies – preparation and applications, Antigen-antibody interaction – Precipitation, Agglutination, Immuno-electrophoresis, Immuno-fluorescence, ELISA.

UNIT 3: MAJOR HISTOCOMPATIBILITY COMPLEX AND CELL MEDIATED IMMUNITY

Organization and inheritance of MHC locus in humans, Structure and functions of MHC I & II molecules; Cellular expression of MHC molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways); Killing mechanisms by CTL, NK cells and ADCC. Complement System: Components of the complement system Activation pathways (Classical, Alternative and Lectin pathways) Biological consequences of complement activation.

Unit 4. MEDICAL MICROBIOLOGY

Classification of medically important microbes, Autoimmunity, Hypersensitivity and Immunodeficiency, Different types of antigen-antibody reactions and their utilization in diagnosis in different diseases,

Reference/Text Book:

1. Campbell, N.A. and Reece, J.B. (2008) Biology 8th edition, Pearson Benjamin Cummings, San Francisco.
2. Raven, P.H et al. (2006) Biology 7th edition Tata McGraw Hill Publications, New Delhi.
3. Griffiths, A.J.F et al. (2008) Introduction to Genetic Analysis, 9th edition, W.H. Freeman & Co. NY.
4. Albert, B et al. (2008) Molecular Biology of the Cell, 8th Edition, Garland Science. NY.

PRACTICAL

PAPER CODE:MI-704C

Credit: 4

Course Outcomes:

- A Student is aware of the different sterilization techniques to be used in a microbiology laboratory and the safety procedures/practices to be followed.
- A student would know how to isolate and purify microbes as well as characterize them as per conventional methods.
- A student would learn to quantify protein and microbial cell number in solution, including determining its doubling time.
- Can find out his/her own blood group and find out the donor/recipients amongst their course mates
- Can differentiate lymphocytes, neutrophils, monocytes, eosinophils, and basophils based on morphological and staining characteristics.
- Is able to perform immune-electrophoresis, immunodiffusion assay.
- Is able to perform dot-ELISA and differentiate different types of ELISA.

Section – A Basic Microbiology

1. Laboratory safety rules in Microbiological Laboratory.
2. Preparation of culture media for growth of microorganism (Bacteria and Fungi).
3. Media, Sterilization using the autoclave.
4. Sterilization of equipment's and materials.
5. Pouring a plate and Storage of Media.
6. Inoculation and other aseptic procedure (Using a Wire loop, using a pipette, flaming the neck of bottles and test tubes).
7. Working with bacteria and yeast and obtaining mixed culture from soil (Streak plate, pour plate and Spread plate).
8. Isolation techniques and obtaining pure culture (bacteria and fungi).
9. Microbial Staining (bacteria and fungi).
10. Growth curve, measures of bacterial population by turbidometry.
11. Studying the effect of temperature and pH.
12. Determination of thermal death point and thermal death time of microorganisms.

Section-B Microbial Metabolism

1. Studies on pH titration curves of amino acids/ acetic acid and determination of pKa values and Handerson-Hasselbachequation.
2. Study of UV absorption spectra of Hemoglobin.
3. Estimation of protein by Lowry's method.

Section-C Microbial Immunology

1. Identification of human blood groups.

2. To separate serum/plasm from the bloodsample.
3. To perform total Leukocytes Count (TLC) of the given BloodSample.
4. To perform Differential Leukocytes Count (TLC) of the given BloodSample.
5. To performimmunoprecipitation.
6. To perform immunodiffusion by Ouchterlony method.
7. To demonstrate single radial immunodiffusion (SRID) technique.
8. To perform DotELISA.

MICOBIAL GENETICS AND BACTERIAL RECOMBINATION

PAPER CODE:MI-801C1

Credit: 4

Course Outcomes:

- Basics of microbial genetics and genetic engineering is taught to students so that they are well acquainted with the techniques used in the industry for genetic manipulations for development of different biotechnology products
- Student will be able to describe structure of DNA and RNA
- Student is able to compare and contrast the mechanisms of bacterial and eukaryotic DNA replication, DNA repair, transcription
- Student is able to explain concepts in DNA repair mechanisms, and recombination as a molecular biology tool
- Student will be able to explain various levels of gene regulation in prokaryotic system.
- Student will be familiar with the use of various cloning vectors
- Will be aware of the different bacterial and eukaryotic systems available for over expression of proteins

UNIT-I: INTRODUCTION TO MOLECULAR BIOLOGY

DNA structure, forms of DNA and DNA supercoiling; The law of DNA constancy and c-value paradox; properties of DNA-denaturation, renaturation, melting curve and hyper chromicity; DNA replication in prokaryotes: origin of replication, replication fork, leading and lagging strand, semi conservative replication, rolling circle replication, enzymes involved in prokaryotic replication and DNA proof reading. Restriction endonucleases – types, nomenclature, classification, application; DNA ligases – properties and functions, ligation techniques; DNA modifying enzymes – polymerases, DNase, RNase, polynucleotide kinases, alkaline phosphatases and terminal nucleotidyl transferase. DNA isolation, DNA polymerases

UNITII: MUTAGENESIS

Gene as unit of mutation, molecular basis of spontaneous and induced mutations and their role in evolution; Mutagens, Types of mutations, transposon mutagenesis, site-directed mutagenesis, Ames test; Environmental mutagenesis and toxicity testing.

UNIT-III: GENETIC ASPECTS OF EXTRACHROMOSOMAL ELEMENTS AND VECTORS

Extrachromosomal elements (plasmids and bacteriophages), Plasmids as vectors for gene cloning and plasmid DNA replication; Transposons in prokaryotes and eukaryotes and their uses in genetic analyses; Life cycle of bacteriophages and their uses in microbial genetics. Cloning vehicles: Plasmids (pBR322, pUC-8, pGEM3Z and Ti plasmid), Bacteriophage (λ phage and M13 vectors), cosmids, phagemids, expression vectors, shuttle vectors, excretion vectors and Animal viral vectors; Promoter in expression vectors: Lac Z promoter, Lambda PL/ PR Promoter, T7 Promoter, Sp6 Promoter; SV-40 promoter, Cam V35s promoter and Ribosome binding sites.

UNIT-IV: BACTERIAL RECOMBINATION

Bacterial Gene Transfer: gradual development of the concept, Genetic recombination-Bacteriophages; synopsis of homologous duplexes, breakages and re-union; role of Rec A in recombination; Legitimate and illegitimate recombination gene conversion; Bacterial transformation, Host cell restriction, Transduction, complementation, Conjugation & Transfection.

Reference/ Text Book:

1. Benjamin Lewin, Gene IX, 9th Edition, Jones and Barlett Publishers, 2007.
2. J.D. Watson, N.H. Hopkins, J.W Roberts, J. A. Seitz & A.M. Weiner; Molecular Biology of the Gene, 6th Edition, Benjamin Cummings Publishing Company Inc, 2007.
3. Alberts et al; Molecular Biology of the Cell, 4th edition, Garland, 2002.
4. Molecular Genetics An Introductory Narrative by G S Stent and R Calender, San Francisco, Calif : W.H. Freeman, 1978.

BIOCHEMISTRY AND MICROBIAL PHYSIOLOGY

PAPER CODE:ML-702-C1

Credit: 4

Course Outcomes:

- Student will have gained an in-depth knowledge of primary, secondary and group translocation transport systems existing in bacteria, simultaneously learning membrane transport proteins and kinetics of solute transport.
- Will have learnt central metabolic pathways for carbon metabolism in bacteria enlisting differences with eukaryotic systems and their regulation in diverse physiological conditions.
- This allows students to apply the acquired knowledge in engineering metabolic pathways for developing industrially useful strains.
- Will have gathered understanding of inorganic and organic nitrogen assimilation and its regulation. Also knows role of glutathione in cellular redox regulation and biochemistry of glutamate overproducing strains.
- Will have learnt basic concepts of enzyme biochemistry, its kinetics and regulation.
- Will understand details of lipid and nucleotide metabolism in E. coli and its regulation
- Student will be conversant with intracellular signaling in bacteria in response to various nutritional and physiological stresses.

UNIT-I: BIOCHEMISTRY-I

Carbohydrate- Classification and properties of carbohydrates, Aerobic respiration- Glycolysis (EMP pathway), TCA-cycle with energy production, pentose-phosphate pathway, Oxidation-reduction potential and electromotive force. Photo phosphorylation; Bacterial photosynthesis; Anaerobic respiration - Utilizing NO₂, Sulfur, CO₂ as electron acceptors, Entner-Doudoroff pathway, Fermentation - lactic acid, ethanol and propionic acid.

UNIT-II: BIOCHEMISTRY-II

Amino acids- Structural features, classification Properties and structures of proteins including solubility and denaturation. Lipid –Classification, properties and characterization of lipids, Bacterial lipids, Major steroids and steroid derivatives of microbial origin. Enzymes: Introduction, activation energy, enzyme kinetics, significance of K_m, catalytic efficiency, turnover number. Methods of plotting enzyme kinetics data: Lineweaver – Burk plot, saturation kinetics. Enzyme inhibition, models and type of inhibition.

UNIT-III: GROWTH AND TRANSPORT IN CELL

Introduction to microbial growth and cell division: Measurement of growth, growth physiology, cell division, growth yields, growth kinetics, steady state growth and continuous growth. Solute Transport: Introduction; Primary and Secondary transport; Kinetics; Membrane transport protein- Porins and aquaporins, mechanosensitive channels; ABC transporter; Group translocation PEP-PTS system; catabolite repression; inducer exclusion and inducer expulsion.

UNIT IV: PHYSIOLOGICAL ADAPTATION

Physiological Adaptation and Intracellular signalling: Introduction to two component system; response to physiological stress: aerobic-anaerobic shifts- Arc and Fnr system; osmotic homeostasis; response to nutritional stress: phosphate supply- Pho regulon; and stringent response.

Reference/Text Book:

1. Biochemistry by Geoffrey L. Zubay. 4th Edition. Brown Co, USA. 1999.
 2. Microbial Physiology by A.G. Moat, J. W. Foster and M. P. Spector. 3rd Edition. John Wiley & Sons. 2002
 3. Lehninger Principles of Biochemistry by D. L. Nelson and M. M. Cox. 6th Edition. W. H. Freeman. 2012
 4. The Physiology and Biochemistry of Prokaryotes by D. White, J. Drummond, C. Fuqua. 4th Edition. Oxford University Press. 2011.
 5. Microbial Biochemistry by G. N. Cohen. 2nd Edition. Springer. 2014.
 6. Lippincott's Illustrated Reviews: Biochemistry edited by D. R. Ferrier. 6th Edition. Lippincott Williams & Wilkins. 2013
 7. Biochemical Calculations: by Irwin H. Segel. 2nd Edition. Wiley. 2004.
 8. Understanding Enzymes by T. Palmer, E. Horwood. 3rd Edition. Wiley. 1991.
 9. Voet and J.G. Voet, Biochemistry, 3rd edition, John Wiley, New York, 2004.
 10. A.L. Lehninger, Principles of Biochemistry, 4th edition, W.H Freeman and Company, 2004.
 11. L. Stryer, Biochemistry, 5th edition, W.H. Freeman and Company, 2002.
 12. Benjamin Lewin, Gene IX, 9th Edition, Jones and Barlett Publishers, 2007.
 13. Watson et al., Molecular Biology of the gene 5th Edition, Pearson Prentice Hall. USA, 2003.
 14. Lodish et al., Molecular cell Biology, 4th Edition, W.H. Freeman & Company, 2000.
 15. Smith & Wood, Cell Biology, 2nd Edition, Chapman & Hall, London, 1996.
 16. B. M. Turner, Chromatin & Gene regulation, 1st Edition, Wiley-Blackwell, 2002.
 17. B. Alberts, A. Johnson, J. Lewis. Molecular Biology of Cell. Garland Science, 2014.
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VIROLOGY

PAPER CODE:ML-803C1

Credit: 4

Course Outcome:

- Basics of virus of human importance ranging from plant to animal viruses that may affect daily life are taught. Newly emerging viruses are also discussed. Is able to describe classification of viruses
- Student will be able to describe tools for studying virus structure, process of virus attachment and entry, virus assembly and release
- Student will be able to describe steps in replication of genome of RNA viruses, retroviruses, and DNA viruses
- Student will be able to describe steps in virus infection, transmission, patterns of infection, virus virulence, and host defense against virus infection
- Student will be able to describe methods of making virus vaccines and anti-viral drugs, drivers of virus evolution, and emerging viruses
- Student will be able to describe unusual infectious agents, virus mediated cellular transformation and oncogenesis
- Student will be able to describe evasion strategies used by viruses, and learn to apply their knowledge to investigate virus outbreak

UNIT 1: INTRODUCTION TO VIROLOGY:

The Big Picture of all viruses using a common strategy. Virus classification. The infectious cycle, Studying Virus infection. Koch's Postulates for viruses. Virus Genome and Genetics: Virus genome types. Double stranded DNA (dsDNA). Gapped DNA genomes. Single-stranded (ssDNA) genomes. Double stranded RNA (dsRNA). Single stranded RNA (ssRNA): (+) strand RNA. Single stranded (+) sense RNA with DNA intermediate. Single stranded RNA (-) sense. Ambisense RNA genomes.

Unit II: Virus Structure:

Metastability, The tools for viral structural biology. Helical Symmetry. Icosahedral symmetry. Triangulation number. Quasi-equivalence. Attachment and Entry. Initiation of infection. Affinity. Avidity. Cellular receptor for viruses. Getting into the Nucleus. Disassembly. RNA directed RNA synthesis, Reverse Transcription & Integration, Translation: Identification of RNA polymerase. How RNA synthesis occurs in viruses? Reverse transcriptase. Retrovirus genome organization. Steps of DNA synthesis in Retroviruses. Genomic replication of DNA viruses: Basic rules of genome replication in DNA viruses. Viral origins of DNA replication. Generic steps in Transcription. Host Polymerases. Initiation. Splicing. Alternative splicing. Promoter Structure. Steps in Regulation of transcription. Enhancers. Virus coded transcriptional regulators. Transcriptional cascade. Export. Virus Assembly: Metastable structures. Concentrating components for assembly. Getting things to the right place. How do Virus make Sub-assemblies. Sequential and Concerted assembly. Packaging signals. Packaging of segmented genome. Acquisition of an envelope. Budding strategies.

UNIT III: VIRUS HOST INTERACTIONS AND ANTI VIRAL DRUGS

Virus Infection basics: Fundamental question of viral pathogenesis, Virion defenses to hostile

environment. Viral spread. Viremia. Determinants of tissue tropism. Virus shedding. Transmission of infection. Host defense. Innate Immune response. Virus Virulence. Toxic viral proteins. Virus induced auto-immunity. Acute Persistent Infections: General pattern of infection. Defense against the acute infection. Influenza. Polio. Measles. Rotavirus. Persistent Infection. Chronic vs. Latent Infection. Vaccines & Anti-Viral drugs: Herd Immunity. Requirement of an effective vaccine. Inactivated vaccine. Subunit vaccines. Live attenuated vaccines. Polio eradication. Anti-Viral drugs. Search for antiviral drugs. Antiviral screening. Resistance to antiviral drugs.

UNIT IV: UNUSUAL INFECTIOUS AGENT AND INVESTIGATION OF A VIRUS OUTBREAK:

Unusual Infectious Agent: Viroids. Origin of Viroids. Satellites. Prions. Transmissible spongiform encephalopathy (TSE) caused by prions. Prion hypothesis. Prion Species barrier. Investigation of virus Outbreak: Case study of health risk associated with a virus epidemic. The origin of outbreak, the spread, the intervention strategies, public health response.

Suggested reading:

1. Principles of Virology: Molecular Biology, Pathogenesis and Control of Animal Viruses by S.J. Flint, L.W. Enquist, V.R. Racaniello, and A.M. Skalka. 2nd edition. ASM Press. 2004.
2. Introduction to Modern Virology EPZ by N. Dimmock, A. Easton and K. Leppard. 5th edition. Blackwell Publishing. 2005.
3. Basic Virology by Edward K. Wanger, M. Hewlett, D. Bloom and D. Camerini. 3rd edition. Blackwell Publishing. 2007.
4. Principles of Molecular Virology by A.J. Cann. 3rd edition. Elsevier Academic Press. 2001.

PRACTICAL

PAPER CODE:MI-804C

Credit: 4

Course Outcomes:

- Practical relevant to the theory courses are designed so as to give the students hands on experiential learning.
- The Practical are designed to understand the routine research and industrial processes as far as possible in the purview of the academic laboratory conditions.

1. Separate serum from the blood sample, Separation of serum protein by vertical gelelectrophoresis.
2. Determination of Molecular weight of Protien by Column chromatography.
3. Plasmid isolation.
4. Bacterial Transformation.
5. Genomic DNA isolation, quantification, purity analysis.
6. Study of UV absorbance spectra for Protien and DNA.
7. Polymerase chain reaction using the isolated DNA as template.
8. Agarose gel electrophoresis of PCR product.
9. Gel purification of PCR product.
10. Ligation of PCR product into plasmid Vector.
11. Preparation of competent cells by calcium chloride method.
12. Transformation of ligated product into host by heat shock method.
13. Preparation of competent cells by glycerol method.
14. Transformation of ligated product into host by Gene Pulsar (Electroporation).
15. Demonstration of α -complementation of β -galactosidase through blue white colonies.

Reference/Text Books:

1. Sambrook J, Fritsch Ef, Maniatis T. (1989). In: Molecular cloning: A Laboratory Manual(2nded). CSH Press,USA.
2. R.W.Old& S.B. Primrose (1990) Principles of Gene Manipulation: An Introduction to Genetic Engineering. ClackwellSciencLtd.
3. Protien purification: Principles and Practice by Robert Scopes. Springer Advanced Texts in Chemistry.1993.

BIOPHYSICAL AND BIOCHEMICAL METHOD PAPER CODE: MI-805E2

Credit: 4

Course Outcomes:

- The course is to introduce the student to the variety of biophysical and biochemical techniques currently available to probe the structure and function of the biological macromolecules,
- Make student aware of the physical principles behind each technique and the instrumentation involved; make them familiar with various methods of analyzing the output data.

UNIT-I: CHROMATOGRAPHIC TECHNIQUES

Chromatography: Introduction, Principle of separation/isolation of particular substance, Basic Principle and applications: of gel filtration chromatography, Matrix for of gel filtration chromatography, operation of gel filtration chromatography, ion exchange: principle, types, parameters for choosing right matrix, applications, affinity chromatography: principle, advantages of affinity chromatography, types, choice of matrix, operation and application, gas liquid chromatography: principle, applications, high pressure/ performance liquid chromatography (HPLC).

UNIT-II: ELECTROPHORETIC TECHNIQUES

Basics of electrophoresis: electrophoretic mobility and affecting factors, Biological application and interpretation of different types of electrophoresis: PAGE, gradient gel, Agarose Gel Electrophoresis, 2D Electrophoresis, iso-electric focusing, gradient electrophoresis; pulsed field gel electrophoresis, blotting techniques: southern, northern, western.

UNIT-III: SPECTROSCOPIC TECHNIQUES

Spectroscopy, The nature and properties of electromagnetic radiation, Electromagnetic spectrum, Principle of spectroscopy, interaction of electromagnetic radiation with matter, Energy level, molecular orbital theory, Electronic transition, chromophores, UV/Visible spectroscopy, Beer-Lambert Law, application of UV/Visible spectroscopy, infrared spectroscopy, applications, fluorescence spectroscopy, characteristics of fluorescence, resonance energy transfer, applications.

UNIT-IV: FLOW CYTOMETRY

Optics: Forward Angle Light Scatter, Side Scatter Channel, Properties of FSC & SSC, fluorescence Channels, Optical Design, FSC & SSC Dot Plot, Types of Measurements, Fluorescent Dyes and Antibodies, Fluorescence and Fluorochrome. Principles of Fluorescence, Excitation Spectra of Fluorochromes, Emission spectra, applications.

Reference/Text Book:

1. Instrumental methods of analysis. 6th edition by H.H Willard, L.L. Merrit Jr. and others. 1986. CBS Publishers and distributors.
2. Spectroscopy. Volume 1. Edited by B.B. Straughan and S. Walker. Chapman and hall Ltd.
3. Gel Electrophoresis of proteins – A practical Approach by Hanes.
4. Chromatography: Concepts and Contrasts -1988 by James Miller. Jhon Wiley and Sons. Inc. , New York.
5. Introduction of High performance Liquid chromatography by R.J Hamilton and P.A .Sewell.
6. Spectroscopy by B.P. Straughan and S. Walker.
7. Practical aspects of gas chromatography and Mass Spectrometry 1984 by Gordon M. Message, Jhon Wiley and Sons. New York.
8. Gel chromatography by Tibor Kremmery. Wily Publications.
9. Isotopes and radiations in Biology By C.C. Thornburn, Butterworth and Co. Ltd., London.
10. The Use of Radioactive isotopes in the life sciences by J.M. Chapman and G. Ayrey,

George Allen and Unwin Ltd., London.

11. A.L. Lehninger, Principles of Biochemistry, 4th edition, W.H Freeman and Company, 20014.
12. Alberts, A.Jhonson, J Lewis. Molecular, Biology of cell. Garland Science, 2014.
13. Online Biophysics. V Bloomfield. Pdf. NCBI Website.

MICROBIAL BIOREACTOR FOR WASTE WATER TREATMENT PAPER CODE: MI-806E1

Credit: 4

Course Outcomes:

- After completing this course a student would know the factors that lead to formation of regulations for water quality management.
- The students would know the process for fresh water and wastewater treatment, with an understanding about the point of care in each case.
- The student would be trained to work in water quality assessment/water treatment facilities in industries.
- The student would have idea about the advantages and limitations of the different types of bioreactors used in water treatment.

Unit I:

History of Waste water treatment/management: Regulation of discharges to water: Clean Water Act (CWA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the emergency planning and community right to know act, Pollution Prevention act 1990, an approach to problem solving: a six step method.

Unit II:

Water and Waste water characteristics: Essential Biology Concepts, Ecology, Limnology; Water supply and treatment; Physical, Chemical (inorganic, organic) and biological characteristics of waste water and Collection.

Unit III:

Waste Water Treatment-Conventional Physico Chemical Methods, Biological Methods of Treatment of Waste water; Non-potable applications of treated waste water, Case study of Waste Water Treatment with high as well as low C/N Ratio.

Unit IV:

Reactor types: suspended growth reactors; batch reactor; continuous- Flow stirred Tank Reactor; membrane reactor; rotating drum reactors; biofilm reactors; aerobic granular sludge reactor.

Reference/Text Book:

1. Environmental Engineering Principles and Practice by Richard O Mines, Jr, WileyBlackwell
2. Environmental Pollution Control Microbiology by Ross E McKinney, Marcel Dekker, Inc
3. Handbook of Water and waste water treatment plant operations, 3rd Edition by Frank R. Spellman, CRC Press, Taylor and Francis Group.
4. Sustainable Water Engineering Theory and Practice by Chandrappa and Das, Wiley.

5. Water Resources An integrated approach by Joseph Holden, Routledge, Taylor and Francis Group.
6. Drinking Water Quality Problems and Solutions, 2nd Ed, N F Gray, Cambridge.
7. Waste Water Treatment Technologies: A general Review; Economic and Social Commission for Western Asia. United Nations, New York, 2003, url:
8. Environmental Biotechnology Principles and applications. Bruce E Rittman and Perey L McCarty. TataMcGraw hill Edition (2012) ISBN.10:1-25-900288-8.

INNOVATIVE CONCEPT DEVELOPMENT

PAPER CODE:MI-808E

Credit: 4

Course outcomes:

- This course would teach a student to identify problem and solve it from an entrepreneur's perspective.
- It teaches them to analyze the patentability and the commercial value of a solution.
- It adequately trains them for better communication skills with industry interaction.

UNIT-I

What is innovation, identify customer/societal needs, design thinking skills, environmental sustainability. Identifying a problem, understanding the available solutions, developing an innovative solution.

UNIT-II

Basics of intellectual property rights; patents with reference to Life science. Drafting of patent proposals. Industrial visit/Industry interaction for problem identification, understanding skill requirement and proposing innovative solutions.

UNIT-III

Case study on technology development for i) screening of antimicrobial agents, ii) improved ecofriendly raw material production for textile and other applications, iii) conversion of waste to value added products, iv) wastewater treatment for municipal sewage and aquaculture.

UNIT-IV

Pitching of the idea: The dragonfly effect, wing 1- the single focus goal, wing 2- grab attention, wing 3- engage, wing 4- Enable action. The final story: the power of storytelling, Business Plan Development.

Internal Assessments: As per the course Instructor

Final Assessments: Presentation of the concept developed by the groups/individuals.

Reference:

1. **Purple Cow**, New Edition: Transform your Bussiness by being Remarkable: Seth Godin:Books.
2. **The Pumkin Plan: A simple strategy to grow a remarkable business** by MikeMichalowicz.
3. **Intellectual property the law of copyrights, patents and trademarks**, By Schechter, Rogher E. & Thomas, Jhon R.
4. **Dragonfly effect workbook: The power of stories** by Andy Smith, Barbara McCarthy and Jennifer Aaker

BACTERIA AND CHRONIC INFECTIONS

Paper Code: MICB906E

Credits:4

Course Outcomes:

- Bacterial infections that caused due to biofilms are chronic in nature and are now recognized to a big threat to human health. Understanding biofilms and associated infections, their diagnostics and treatment options gives students an idea about latest in the field of bacteriology and infections.
- Student will be introduced to bacteria and infections in general, including the difference between planktonic and biofilm growing bacteria
- Student will learn about the specific properties of biofilms and chronic infections.
- Student will Learn about Bacteria and biofilms as natural inhabitants of our body and will be discussing their role on our health.
- Student will become aware of several types of chronic infections and how biofilms are related to them

Unit1. Introduction to Infections; Properties of Biofilms and Chronic Infections

- 1.1 Planktonic and biofilm Growing bacteria;
- 1.2 Infection pathogenesis
- 1.3 Bacteria and Biofilms
- 1.4 Biofilm properties
- 1.5 Chronic infections–Host response part1
- 1.6 Chronic infections–Host response part2
- 1.7 Chronic infections–Treatment Failure
- 1.8 Chronic Infections - persistency

Unit 2. Bacteria and biofilms as natural inhabitants of our body; and biofilms in chronic infections

- 2.1 Introduction
- 2.2 Oral biofilms
- 2.3 Skin Microbiology
- 2.4 Commensal Biofilm-gutflora
- 2.5 Bacteria and Biofilms are ubiquitous
- 2.6 Cystic fibrosis
- 2.7 Chronic wounds
- 2.8 Implants
- 2.9 Tissue filler
- 2.10 Otitis Media
- 2.11 Intra vascular catheters

Unit3.Diagnosis and treatment of chronic infections

- 3.1 Diagnosis of chronic infections
- 3.2 Treatment of chronic infections– part1
- 3.3 Treatment of chronic infections – part 23.4Diagnosis in clinical Practices

Unit4.Evolutionaryperspectivesofbiofilms

- 4.1 Adaptation of bacteria to chronic infections
- 4.2 Evolution of biofilms–part1
- 4.3 Evolution of biofilms–part2
- 4.4 Adaptation and evolution in bacteria

Reference/TextBooks/Articles:

1. Tony Romeo. *Bacterial Biofilms*. Current topics in Microbiology and Immunology. Springer
2. Jean F Brisou. *Biofilms: Methods for Enzymatic release of Microorganisms*. Taylor and Francis
3. Pallaval Veera Bramhachari. *Implication of Quorum Sensing System in Biofilm Formation and Virulence*. Springer
4. Jose Luis Del Pozo (2017): *Biofilm-related disease*, Expert Review of Anti-infectiveTherapy,DOI: [10.1080/14787210.2018.1417036](https://doi.org/10.1080/14787210.2018.1417036)
5. Lebeaux D, Chauhan A, Rendueles O, Beloin C. *From in vitro to in vivo Models of Bacterial Biofilm-Related Infections*.Pathogens.2013May13;2(2):288-356.doi:10.3390/pathogens2020288.
6. Lebeaux D, Ghigo JM, Beloin C. *Biofilm-related infections: bridging the gap between clinical management and fundamental aspects of recalcitrance toward antibiotics*. Microbiol Mol BiolRev.2014Sep;78(3):510-43.doi:10.1128/MMBR.00013-14.

TOOLS AND TECHNIQUES OF MOLECULAR BIOLOGY AND BIOINFORMATICS

PAPER CODE:MI-901C1

Credit: 4

Course Outcomes:

- Student will be able to explain the structural principles governing the protein structures and their classification Identify key motifs and domains in protein structures, and their interaction with ligands or substrates;
- Student will be able to explain the basic principles of thermodynamics and their implications in biological reactions,
- Student will be able to discuss the interactions of proteins and other macromolecules along with methods for their identification,
- Student will be able to explain the basics of determination and prediction of three-dimensional structure of proteins,
- Student will be able to describe significance of studying global gene expression profile changes to get insights into and understand response of a living organism to biotic, abiotic, disease, course of development, senescence

UNIT-IIIBASICS OF DNA TECHNOLOGY

Introduction to PCR; primer designing, Types of PCR - multiplex, nested, reverse transcriptase, real time PCR, touchdown PCR, hot start PCR, colony PCR, cloning of PCR products PCR amplification of 16SrDNA,Agarose gel analysis.

UNIT-IV: MOLECULAR TOOLS AND TECHNIQUES

Transformation techniques. Genomic libraries- Isolation of genomic DNA fragments, selection of vectors, cDNA libraries and cDNA cloning, shot gun cloning, Bacterial Artificial libraries.Bacterial Transcriptome Analysis, TA cloning, Artificial chromosome vectors (YACs; BACs); Metagenomics, Primer design, AFIGE, PFGE, ARB for bacterial strain identification. Community analysis: Direct and indirect method, RAPD, RFLP, TDDG, DGGE for communityAnalysis

UNIT III: RETRIEVING INFORMATION THROUGH SEQUENCE ALIGNMENT ANDPHYLOGENETIC TREE

Database indexing and specification of search terms, the archives: nucleic acid sequence database, genome database and genomic browsers, protein sequence database, databases of structures, classification of protein structures, accuracy and precision of protein structure determination. Submission and retrieval of Data in GenBank.Basic principle of genome assembly and annotation. Scoring matrices for nucleic acid and protein sequence analysis: PAM, BLOSSUM. Pairwise and multiple sequence analysis.Database searching using BLAST, Phylogenetic analysis.

UNIT IV: STRUCTURAL BIOINFORMATICS AND DRUG DISCOVERY

Protein stability and folding, Sasisekharan-Ramakrishnan-Ramchandran plot, protein stability and denaturation, superposition of structures and structure alignment DALI & MUSTANG. Evolution of protein structures, protein structure prediction and modelling, prediction of protein function, divergence of function orthologues and prologues; drug discovery and development, lead compound, improving on the lead compound, Quantitative Structure Activity Relationship(QSAR) Molecular modelling in drug discovery.

Reference/ Text Book:

1. S.B. Primrose, R.M. Twyman and R.W.Old; Principles of Gene Manipulation. 6th Edition, S.B.University Press,2001.
2. J. Sambrook and D.W. Russel; Molecular Cloning: A Laboratory Manual, Vols 1-3, CSHL,2001.
3. Brown TA, Genomes, 3rd ed. Garland Science2006
4. Benjamin Lewin, Gene IX, 9th Edition, Jones and Barlett Publishers,2007.
5. J.D. Watson, N.H. Hopkins, J.W Roberts, J. A. Seitz & A.M. Weiner; Molecular Biology ofthe Gene, 6th Edition, Benjamin Cummings Publishing Company Inc,2007.
6. Alberts et al; Molecular Biology of the Cell, 4th edition, Garland,2002.
7. Molecular Genetics An Introductive Narrative by G S Stent and R Calender, San Francisco, Calif.:W.H. Freeman, 1978.
8. Introduction to Bioinformatics Arthur M. Lesk Oxford University Press (2014)ISBN978-0-19- 872467-4
9. An Introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics Version 3.3.1 (2016-06-21) by W. N. Venables, D. M. Smith and the R CoreTeam.

PRACTICALS

PAPER CODE:ML-902C

Credit: 4

Course Outcomes:

- This course covers the advanced techniques of applied microbiology and bioinformatics.
- It trains the students how to design an experiment using the techniques they have learned in the first two semesters and come up with a solution to a applied microbiology problem.
- It gives them exposure to medical microbiology as well as industrial microbiology, making them better equipped for their final semester MSc project as well as to get absorbed in industry/ research after MSc.

Section-A

1. Understanding the cultivable microbes from dental Flora.
2. Standardization of technique for sampling the dental flora
3. Growing the dental micro-flora in the selected media & determination of
 - (a) pre-incubation time&
 - (b) requisite dilution to get the CFU count and diversity estimate.
4. Isolation, purification, Characterization of dental micro-flora, & antibiotic sensitivity test.
5. In-vitro set up for testing antibiotic therapy in case of dentine tissue or teeth.
6. Visualization of the teeth surface using Scanning Electron Microscope.
7. To find out the relative proportion of Lactic Acid Bacteria from natural sources.
8. Isolation of acid producing bacterial from various natural sources like grass, intestine of fish and prawn, curd, fermented fish, bee hive, etc.
9. Characterization of isolates.
10. Testing for biofilm formation by the isolate.
11. Production of Lactic acid from whey in packed bed reactor.

Section-B

1. Gene sequence downloading from genedatabase.
2. NucleotideBLAST.
3. Comparison of gene sequence using alignmenttool.
4. Amino acid sequence of protein downloading fromdatabase.
5. ProtienBLAST.
6. Comparison Amino acid sequence of proteinusingalignmenttool.
7. Computation of instability index ofprotiens.
8. Computation of aliphatic index ofprotiens.
9. Prediction of phosphorylation sites in theprotiens.
10. Computation of hydrophobicity ofprotiens.

FERMENTATION TECHNOLOGY AND FERMENTED FOOD

PAPER CODE:ML-903E2

Credit: 4

Course Outcomes:

- Students will be able to understand the role and potential of fermented foods and the contribution of bacteria and yeast in improving the food quality and self-life after fermentation.
- They will learn how bacteria may help restore the balance of microflora in your gut, support digestive health and alleviate any digestive issues.
- They will develop understanding that when we ferment certain types of food, we help increase their health potential. This includes making the vitamins and minerals and also, they are more available for our bodies to absorb. Additionally, by boosting the beneficial bacteria in your gut, you may promote their ability to manufacture B vitamins and vitamin K.
- Students will be able to have insight about the different types of fermented food of Northeast India and their places of origin and its traditional and cultural aspects.
- Students will learn about the equipment's, fermentation vessels and different tools and techniques of industrial fermentation and fermentation technology.
- Students will learn about the different fermented based industrial and pharmaceutical enzymes, organic acids, Biopolymers, amino acids, and alcohol-based products of market importance produced by fermentation technology.

UNIT I: INTRODUCTION TO FERMENTATION TECHNOLOGY

Origin and History of food fermentation; Basics of fermentation processes; Microbial culture selection for fermentation process. Media formulation, inoculum development and process optimization; Significance of substrates and starter culture; Basic requirements for fermentation and factor affecting fermentation process. Gaden's Fermentation classification, Design and operation of Fermenters, Basic concepts for selection of a reactor, Packed bed reactor, Fluidized bed reactor, Trickle bed reactor, Bubble column reactor, Scale up of Bioreactor.

UNIT II: TYPES OF FERMENTATION AND PRODUCT RECOVERY

Types of fermentation- (sub-merged/solid state, Batch /continuous fermentation);

Downstream processing. Recovery of particular matter, product isolation, distillation, centrifugation, whole booth processing, filtration, aqueous two-phase separation, solvent extraction, chromatography and electrophoresis. Bioprocess economic and Bioproduct regulation.

UNIT III: TRADITIONAL FERMENTED FOOD AND BEVERAGES

Health benefits and other significance of fermented food and beverages; traditional fermentation of Asia and North East India; Food habits and types of their fermented food; Fermented vegetable

(Fermented beans Sauerkraut, Kimchi, Pickle, bamboo shoots); Fermented soyabean products- (Temph, Tofu, Soya sauce); Fermented dairy products (Cheese, Dahi and Yogurt, Butter); Fermented baked product (bread and bakery products) Other fermented food products (Idli, Vada, Dosa, Bhatura, Dhokla); Fermented fish, meat and sausages; Fermented beverages (Sake, Rice beers, Ale, Wines).

UNIT IV: INDUSTRIAL APPLICATION OF FERMENTATION TECHNOLOGY

Fermentation process for Production of SCP; Production of Industrial alcohol (Ethanol and Butanol); Organic acids (Citric acid, Lactic acid, Glutamic acid); Amino acids (Lysine, Phenylalanine, Tryptophan); Biopolymers (Dextran, Xanthan); Antibiotics (cephalosporin's, Tetracycline's, Polyenes); Enzymes (Alpha-amylase, Lipase, Pectinases, Proteases); Vitamins (Vitamin B12 and Riboflavin); Alcoholic beverages (Toddy, Beer, Wine, Champagne, Rum, Brandy, Whisky).

Reference/Text Book:

1. Food Microbiology by William Frazier, Dannise Westhoff, McGraw-Hill, Inc.
2. Microbial Physiology and Metabolism by Caldwell D.R. 1995 Brown Publishers.
3. Microbial Physiology by Moat A.G. and Foster J. W. 1999.. Wiley.
4. Advances in Microbial Physiology. Volumes. Edited by By A.H. Rose. Academic Press, New York.
5. Principles of Fermentation Technology, 3rd Edition by Stanbury & Whitaker & Hall, Butterworth- Heinemann, Elsevier science.
6. The Art of Fermentation by Sandor Ellix Katz, Chelsea Green Publishing (2012).
7. Mastering Fermentation by Kate Williams, Oxford publishing.

MICROBIAL ADAPTATION

PAPER CODE:ML-904E1

Credit: 2

Course Outcomes:

- The course cover all tactics and strategies adopted by bacteria for their survival under stressed conditions and focused on mechanistic insights of pathogenic adaptations to host environments (acidic environment, microaerobic conditions, immune system stress, metal stress etc., modulation of host pathways by pathogens for survival, dormancy, drug tolerance and resistance, proteins for stress survival).
- This course also include different adaptation mechanisms of extremophiles to extreme environment.

UNIT-I: ADAPTATION OF EXTREM ENVIRONMENT

Adaptations to pH, Temperature adaptation, Pressure adaptation, Halophilic adaptations.

UNIT-II: PATHOGENIC ADAPTATION TO HOST ENVIRONMENT

Adaptation to acidic environment, Adaptation to Microaerobic conditions, Adaptation to immune system stress. Adaptation to Metal stress.

UNIT-III: DORMANCY, DRUG TOLERANCE AND RESISTANCE

Growth regulation by microbes, Survival and reactivation strategies of pathogens in stress through heterogeneous population generation, Persisters, antimicrobial resistance.

Reference:

1. Protein adaptation in Extremophiles: January 2008, Publisher: Nova Biomedical, ISBN: 1604560193.
2. Extremophiles and Their Applications in Medical Process: ISBN: 978-3-319-12808-5
3. Tuberculosis and the Tubercle Bacillus, Second Edition, ISBN: 9781555819552
4. Reviews and research articles related to topics will be suggested during course.

BACTERIAL SECRETION SYSTEM AND BACTERIAL QUORUM SENSING

PAPER CODE:MI-905E

Credit: 2

Course outcomes

- Secretion systems are important to understand a very common problem of antibiotic resistance. Quorum sensing helps to understand an important phenomenon of bacterial pathogenesis i.e. biofilms that are recalcitrant to antibiotics.
- Student will be able to understand different secretion systems existing in bacteria for toxins and biomolecules secretion, and their role in bacterial survival and pathogenesis.
- Student will be able to gain in-depth knowledge about density-based signal transduction in bacteria and its significance in competence, sporulation and antibiotic resistance;
- Student would know about quorum quenching and its use in developing antimicrobial tools.

UNIT-I: BACTERIAL SECRETION SYSTEM:

Introduction; Sec secretion pathway; SecB secretion Pathway; SRP pathway; Tat Pathway; Type I, Type II, Type III (T3SS; injectisome, injectosome), Type IV, Type V, Type VI; Sec A2, Sortase and Type VII secretion systems.

UNIT-II: QUORUM SENSING:

Discovery; Role in as illustrated by bioluminescence (vibrio fischeri, Vibrio harveyi); Virulence (Pseudomonas aeruginosa, Staphylococcus); Competence and Sporulation (Bacillus subtilis) and antibiotic resistance in bacteria. Quorum quenching: Impact and mechanism.

Reference/Text Book:

1. Prescott's Microbiology by J. Willey, L. Sherwood and C.J. Woolverton. 10th edition. McGraw Hill Education.2017.
2. Brock Biology of Microorganisms by M. Madigan, K. Bender, D. Buckley, W. Sattley, D. Stahl. 15th Edition. Pearson Education.2018.
3. Alcamo's Fundamentals of Microbiology by J.C. Pommerville. 10th Edition. Jones and Bartlett Learning.2013.
4. General Microbiology By R. Stanier, J.C. Ingraham, M. Wheelis, R. Painter. 5th Edition. Macmillan, Hampshire & London Publishers.1992.
5. Microbiology By M. Pelczar, E. Chan & R. Reid. 4th Edition. McGraw Hill Education.1998.

PROJECT WORK

PAPER CODE:MI-905C1

Credit: 4

Course Outcomes:

- Students are allotted research projects under different faculties in the department.
- Student has to carry out the literature search and propose the objectives along with the material and methods to carry out the research project.
- This course gives student hands on training on designing, planning and execution of research oriented experiments in timely manner, thus, giving them opportunity to learn meeting the deadlines.
- It enhances the critical thinking relevant to the program taught

UNIT-I PREPARATION OF SYNOPSIS

Introduction and Identification of the problem, Review of literature, Definition of the problem and logical development of a working hypothesis.

UNIT-II METHODOLOGY

Formulation of objectives and experimental design for verifying the hypothesis, standardization of methodology and modifications if any in the protocol.

UNIT-III CONDUCTING EXPERIMENTS AND REPORTING THE FINDINGS

Phase wise working for experimental findings and observation, soft copy report with statistical analysis, result and discussion of the findings, Group discussion and rectification, pre-submission through departmental seminar.

NB: Evaluation for part one will be done on:

- 1. Presentation of Synopsis its objectives, expected outcome, and methodology in detail.***
- 2. Assignment for review of literature related to proposed work.***

RECENT TRENDS IN ANTIMICROBIAL RESEARCH

PAPER CODE:MI-1001E1

Credit: 4

➤ Course Outcomes:

- Students will be able to understand why antimicrobial resistance is a global concern.
- Students will also develop the understanding that the emergence and spread of drug-resistant pathogens that have acquired new resistance mechanisms, leading to antimicrobial resistance, continues to threaten our ability to treat common infections.
- Students will develop the insight that the information obtained from antimicrobial surveillance studies is important for establishing trends in pathogen antimicrobial resistance and for identifying emerging pathogens at the national and global levels.
- Students will also have an insight that such information enables the development of targeted approaches to help control antimicrobial resistance.
- Students will be able to know about the recent trends and developments in the field of antimicrobial drugs and resistant microbes.

UNIT I: ANTIMICROBIALS

An outline of the historical development of antimicrobial agents. Reasons for studying the biochemistry and molecular biology of antimicrobial compounds. Uncovering the molecular basis of antimicrobial action. Current trends in the discovery of antimicrobial drugs. Antimicrobial assays in liquid and solid media, susceptibility testing in liquid and solid media.

UNIT II :MODE OF ACTION OF ANTIMICROBIALS

Antibiotics that inhibit peptidoglycan biosynthesis. Drugs that interfere with the biosynthesis of the cell wall of mycobacteria. Fungal cell wall as a target for antimicrobial drugs. Ionophoric antibiotics. Antifungal agents that interfere with the function and biosynthesis of membrane sterols. Inhibitors of nucleic acid biosynthesis. Inhibitors of protein biosynthesis. Nitro-heterocyclic antimicrobial agents. A unique antifungal antibiotic - griseofulvin.

UNIT-III DRUG RESISTANCE

The Concept of Drug resistance, Multi Drug Resistance; Types of antimicrobial drugs and associated problems of drug Resistance. Mechanisms of bacterial resistance to host cellular and humoral defenses.

UNIT IV: MICROBIAL PATHOGENICITY AND EPIDEMIOLOGY

Virulence factors: Mechanism of adhesion, colonization and invasion of host tissues by bacterial pathogens, measurements of virulence. Microbial toxins: Characteristics, purification, Mode of action and assay (in vivo, in vitro) of diphtheria, cholera, tetanus toxins and endotoxins of Gram-negative bacteria.

Reference/Text Book:

1. Burn J. H. (1957) Principles of Therapeutics, Blackwell Scientific Pub. O. Ltd. Oxford.
2. Iyengar M. A. (1974) Pharmacology of Powdered Crude Drugs, Manipal.
3. Kokate C. K., Purohit A. P., Gokhale A. B. (2000) Pharmacology, 4 Ed., Nirali Prakashan.
4. Osol Arther (1975) Remington's Pharmaceutical Sciences, 15 Ed., Mack Pub. Co., Pennsylvania.
5. Goldstein A., Aronow L., and Kalman S. M. (1969) Principles of Drug Action, The Basis of

- Pharmacology, Harper international edition New York.
6. Satoskar R. S. & S. D. Bhandarkar (1991) Pharmacology and Pharmacotherapeutics, 12 Popular Prakashan, Mumbai. Ed., Vol. 1 & 2,
 7. Chatwal G. P. (2003) Biopharmaceutics and Pharmacokinetics, Himalaya Publishing House, Mumbai.
 8. Micheles P. S., Y. L. Khmel'nitsley, J. S. Dordick and D. S. Clark, (1998), Combinatorial Biocatalysis, A Natural Approach to Drug Discovery, Trends in Biotechnol. 16, 197.
 9. Virulence mechanisms of bacterial pathogens (Second edition) by Roth, Bolin, Brogden Minion and Michael.
 10. Medical Microbiology: An Introduction to infectious diseases. Sherris, John C, Ed, Elsevier Publication 2nd II edition.
 11. Multidrug resistance. Annu Rev Biochem. 2009; 78: 119–146. doi: 10.1146/annurev.biochem.78.082907.145923.

PROJECT WORK

PAPER CODE:MI-1004C1

Credit: 8

Course Outcomes:

- Student has to carry to finish the experimental part under the supervision of a mentor faculty from the department.
- Students are also sent to collaborative laboratories/Industries for successful execution of the allotted Project.
- The Projects allotted are designed by the Faculties of the Department based on their research expertise.
- This course gives student hands on training on designing, planning and execution of experiments in timely manner, thus, giving them opportunity to Learn meeting the deadlines.

UNIT-I: CONDUCTING EXPERIMENTS AND REPORTING THE FINDINGS

Phase wise working for experimental findings and observation, soft copy report with statistical analysis, result and discussion of the findings, Group discussion and rectification, pre-submission through departmental seminar.

UNIT-II: PREPARATION OF FINAL DISSERTATION

Preparation of final dissertation under the following heads and submission in hard and soft copy: Preface, Certificate, Contents, Introduction, Review of literature, Materials and methods, Experimental findings or Results, Discussion and References. Appendices- Statistical tables etc.

UNIT-III: PREPARATION OF MANUSCRIPT FOR A RESEARCH PAPER

Preparation of manuscript with reference to an International/ National journal on Science or microbiology or related to specific subject matter for publication.

NB: Evaluation for part two will be done on:

1. ***Preparation of manuscript for a research paper and its communication in a journal***
2. ***Preparation of final dissertation***
1. ***PowerPoint Presentation of overall work of the project***

TRIPURA UNIVERSITY

SURYAMANINAGAR - 799022



DEPARTMENT OF HUMAN PHYSIOLOGY

COURSE AND CURRICULUM



TRIPURA UNIVERSITY
Department of Human Physiology

Name of the Programme : **Ph.D. in Human Physiology**

Programme Specific Objectives :

The primary objective of the programme is to take up research work on various aspects of Human Physiology leading to Ph.D. degree in Human Physiology, offered by Faculty of Science of Tripura University.

The focused areas of research at present in the department are : Molecular Genetics, Cancer Biology, Immunology, Endocrinology, Reproductive Physiology, Nutritional Biochemistry & Toxicology. Students are to take up in-depth studies pertaining to any of these areas and to contribute to the knowledge in the specific field.

The students are trained to conduct original and globally relevant work on the chosen field which will make them competent to take up individual research in the field in future.

The students should become capable of publishing their research findings in both National and Internationally reputed scientific journals and also become capable of presenting and defending their research findings in front of experts from relevant field.

To produce manpower who can easily fit in to the pool of health science scientist and can take up globally competent newer researches in areas of health science thus contribute to the national goal of becoming "Atmanirvar" in health science research.

Basic Structural Framework of Ph.D. Programme :

The minimum duration of Ph.D. programme is three (3) years, including Ph.D. coursework, and the maximum of six (6) years from the date of admission into the Ph.D. programme. However, the women candidates and persons with disabilities (more than 40% disability) may be allowed a relaxation of two (2) years for the Ph.D. in the maximum duration.

In the Ph.D. programme, each six-month duration comprises a semester. Usually, the odd semester starts w.e.f. 1st day of July every year and the even semester from 1st day of January every year.

Credits, Credit Distribution and Semesters in Ph.D. Programme :

Codes	Semester/Particulars	Minimum Credits required to be qualified
	Passing Ph.D. Coursework	16
PHD-9005	Semester-I (1 st progress report)	8
PHD-9006	Semester-II (2 nd progress report)	8
PHD-9007	Semester-III (3 rd progress report)	8
PHD-9008	Semester-IV (4 th progress report)	8
PHD-9009	Semester-V (5 th progress report)	8
PHD-9010	Successful submission of synopsis	8
PHD-9011	Successful submission of summary (5000 words)	16
PHD-9012	Successful submission of a thesis (positive comments of all adjudicators)	16
PHD-9013	Defense of a thesis through Viva- Voce examination	8
PHD-9014	Preparation /evaluation of answer scripts	2 + 2 = 4
Total credits required for awarding Ph.D. degree		100

Programme Outcomes

- 1. Research:** The ability to conceptualize, design, and enforce research for the genesis of the novel knowledge, applications, and accommodation of research methodologies considering unanticipated problems. The ability to make effective judgments on complicated issues in specialized fields and produce original research to value publications.
- 2. Methods:** An understanding of methods of research or creative activities, or both, in the area of study enables the students to measure distinct approaches for problem-solving using well-demonstrated techniques, invent, affirm statements, and remarks on current research.
- 3. Communication:** Distinctly and effectively communicate the scientific activities to peers and the general public, both written and orally. Pursue effectively with the scientific community through conferences, meetings, and workshops engagement.

4. Professionalism: Building characters and skills necessary for employment, such as personal responsibility, self-reliant initiatives under challenging situations, ethical behavior with academic integrity, and appropriate guidelines for responsible conduction of research.

Ph.D. Coursework :

Paper Code	Paper Name	Credit Distribution			Total Credits	Marks	Remarks
		L	T	P			
PHD-HP 9001	Research Methodology-I	4	0	0	4	100	Common course for all science and engineering Ph.D. students offered by the university
HD-HP 9002 (Paper-II)	Research Methodology- II	4	0	0	4	100	
PHD-HP 9003 (Paper-III)	Recent Advances in Human Physiology Research	4	0	0	4	100	
HD-HP 9004 (Paper-IV)	Seminar/practical/project and assignments	0	0	4	4	100	
Total		12	4		16	400	

* L - Lecture; T – Tutorial, P – Practical/Projects



TRIPURA UNIVERSITY
Department of Human Physiology

Name of the programme : M.Sc. in Human Physiology

Programme Specific Objectives :

The primary objective of the programme is to impart knowledge on basic and applied aspect of normal functions of various systems of human body and to train students on basic techniques used in human health research. At the end of the programme students should be able to :

To understand the basic biochemical and biophysical principles applicable to human physiology and to understand how these principles can be applied to explain abnormalities that may occur during different conditions.

To explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system

To discuss the molecular basis of different body functions and the disease conditions that may arise due to changes in the molecular mechanisms.

To know about human diseases and modern tools and techniques including molecular techniques used in human health research.

To become equipped with all modern knowledge of human health and disease and capable of using acquired knowledge for future carrier development and development of mankind as a whole.

Basic Structural Framework of the Syllabus :

CORE COURSES :

Course Code	Subject Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
1ST SEMESTER						
HP 701 C	Biomembrane Physiology, cell-cell communication & Enzyme Kinetics (Theory)	4	1	0	04	100
HP 702 C	Metabolic Biochemistry & Bioenergetics (Theory),	4	1	0	04	100
HP 703 C	Cell Biology (Theory)	4	1	0	04	100
HP 704 C	Basic Biophysical principles, Cardiovascular, & Respiratory Homeostasis (Theory)	4	1	0	04	100
HP 705 C	Lab work I (Biochemistry, Cell Biology, Enzymology) (Practical)	0	0	12	04	100
	TOTAL	16	4	12	20	500
2ND SEMESTER						
HP 801 C	Blood, body fluid and Immunology (Theory)	4	1	0	4	100
HP 802 C	Molecular genetics & Molecular Biological Techniques (Theory)	4	1	0	4	100
HP 803 C	Neurophysiology, Neuroanatomy, Neurochemistry, Behavioral & Special sensory physiology (Theory)	4	1	0	4	100
HP 804 C	Lab work II (Haematology, Histology, Molecular Biology, Human experiments) (Practical)	0	0	12	4	100
	TOTAL	12	3	12	16	400
3RD SEMESTER						
HP 901 C	Reproductive Physiology & Developmental Biology (Theory)	4	1	0	4	100
HP 902 C	Nutrition & Microbial Physiology (Theory)	4	1	0	4	100
HP 903 C	Lab Work III (Lab work on Advances in Human Physiology) (Practical/Review)	0	0	12	4	100
	TOTAL	8	2	12	12	300
4th SEMESTER						
HP 1001 C	Endocrinology & Stress Physiology (Theory)	4	1	0	4	100
HP 1002 C	Project (including review) on Advances in Human Physiology	0	0	16	4	100
	TOTAL	4	1	16	8	200

ELECTIVE COURSES (TO BE OFFERED BY THE DEPARTMENT) :

Course Code	Subject Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
	1ST SEMESTER	No course offered				
	2ND SEMESTER					
HP 801 E	Pharmacological and Toxicological Principles (Theory)	4	0	0	4	100
HP 802 E.	Sports & Exercise Physiology (Theory)	4	0	0	4	100
	Required Credit (For Departmental students)				4	04
	3RD SEMESTER					
HP 901 E.	Advances in Molecular Cell Physiology, Cell signaling (Theory)	4	0	0	4	100
HP 902 E.	Advances in Microbiology (Theory)	4	0	0	4	100
HP 903 E	Advances in Molecular Endocrinology (Theory)	4	0	0	4	100
HP 904 E	Advances in Nutrition and Metabolism (Theory)	4	0	0	4	100
HP 905 E	Excretory Physiology(Theory)	4	0	0	4	100
HP 906 E	Research Methodology & Ethical Issues in Biomedical Research (Theory)	4	0	0	4	100
HP 907 E	Molecular Physiology of Human Diseases (Theory)	4	0	0	4	
	Required Credit (For Departmental students)				8	
	4TH SEMESTER					
10.	Molecular Cancer Biology & Onco-immunology (Theory)					04
11.	Advances in Immunology (Theory)					04
12.	Advances in Reproductive Physiology (Theory)					04
13.	Nutrition and Community Health (Theory)					04
	Required Credit (For Departmental students)					04

COMPULSORY FOUNDATION COURSE (DURING 1ST SEMESTER):

01.	Computer Application – To be offered by Dept. of Computer Science & IT.	04
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ELECTIVE FOUNDATION COURSE (DURING 3RD SEMESTER) :

01.	Biostatistics- To be offered by Dept. of Statistics	04
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OTHER ELECTIVE COURSES TO BE DONE BY THE STUDENTS OF M.Sc. IN HUMAN PHYSIOLOGY:

- 01. Elective Courses offered by other Departments of the University (Required credit – 04)- To be completed during 2nd Semester of the Course.**
- 02. Compulsory Online PG Course of minimum 2 credit to be completed within the course period (any semester, preferably during 2nd semester).**

M.Sc. Human Physiology

Programme Specific Outcomes :

PO1: Knowledge: Students will be equipped with an in-depth knowledge in the area of basic and applied Human Physiology including systemic physiology, cell biology, biochemistry, molecular biology, genetics, neurology, endocrine and reproductive physiology, developmental biology, sports, exercise and environmental physiology.

PO2: Planning abilities: Develop skills for planning with time management, analyse the outcome and capable of taking decisions to reach achievable goals.

PO3: Problem analysis: To develop skills for logical thinking to tackle detailed problem-solving and analytical tasks associated with questions in core and applied areas of human physiology.

PO4: Modern tool usage: Learn to select and use modern techniques associated with research in human physiology including cellular, immunological, molecular, histological, histochemical and biochemical techniques.

PO5: Leadership skill: Develop leadership skills to work in a team and take initiative for fulfillment of professional and societal responsibilities.

PO6: Professional Identity: Understand, analyze and communicate the value of their professional roles in different health science research environment including research on nutrition, toxicology, modern molecular and cell culture laboratories including cancer research and research with medicinal plants for human benefit.

PO7: Ethics in research: To develop knowledge of ethical issues associated with modern biological research including both animal and human ethical issues and their implications in developing research protocols and gather knowledge on different biosafety measures.

PO8: Communication: Develop skills used in reasoning and communication with scientific community and society. To synthesize information from literature and its communication in form of scientific papers, reports, poster and oral presentations.

PO9: Benefits to the society: Contribute to society, in the realms of different health issues concerning the local indigenous population and human as a whole.

PO10: Life-long learning: Develop independent, critical and creative thinker who has a self-motivated passion for life-long learning.

DETAIL COURSES (CORE COURSES)

1st Semester :

**SL. NO. – 1: Biomembrane Physiology , cell-cell communication & Enzyme Kinetics
(Theory)**

Paper Code : HP 701 C

Credit : 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand membrane transport and cell signalling mechanisms.
- Develop comprehensive understanding of endo-membrane system.
- Understand enzyme systems and their kinetics.
- Molecular mechanisms of enzyme actions..

SECTION – A

Molecular composition and arrangement of biomembrane. Transport across the cell membrane-channels and carriers, ion transport. Molecular structure, signalling process of K^+ , Na^+ , Ca^{2+} & Cl^- channels. Membrane potential – ionic basis, derivation and application Nernst equation, concept of Donnan membrane equilibrium.

Water transport, selective transport, molecular organization and role of aquaporins in water transport. Glucose transport and transporters – Glut proteins types- distribution and specific functions.

Membrane targeting proteins – signal sequences, translocon, co-translational and post-translational translocation, chaperones and their functions. Cell signaling: Cell surface Receptors, Second Messenger, positive & Negative Feedback in Signal System. Signaling through Enzyme-Linked Cell-Surface Receptors, Activated Receptor Tyrosine Kinases Phosphorylate Themselves, Ras Activates a Downstream Serine/Threonine Phosphorylation Cascade That Includes a MAP-Kinase, PI 3-Kinase Produces Inositol Phospholipid Docking Sites in the Plasma Membrane, The PI 3-Kinase/Protein Kinase B Signaling Pathway Can Stimulate Cells to Survive and Grow, Signaling proteins are frequently expressed as separate and independently controlled, Nuclear receptors regulate transcription, G-proteins regulate wide variety of receptors and are controlled by regulatory GTPase cycle. Wnt signaling regulates cell fate during development and other processes

Junction and non-junctions – basal lamina, cell cell adhesion and communication, gap junctions and connexions, integrins, focal adhesion, collagen, non-collagen components, fibronectins, elastin, laminin, vitronectin, paxillin, desmosomes and hemidesmosomes, adhesion molecules, pectin, Ca²⁺ dependent and independent adhesions.

Cell-cell signalling, cell surface receptors, second messenger system, MAP kinase pathways, signalling from plasmamembrane to nucleus involving extracellular matrix and integrins.

SECTION – B

Nature of enzymes- Review of unisubstrate enzyme kinetics and factors affecting the rates of enzyme catalyzed reactions. Classification of multisubstrate reactions with examples of each class. Ordered Bi-Bi reaction mechanism. Concept of Convergent and Divergent evolution of enzymes, Methods of examining enzyme-substrate complexes, Flexibility and conformational mobility of enzymes, methods of measuring kinetic and rate constants of enzymic reactions and their magnitudes, Enzymes turnover and methods employed to measure turnover of enzymes, Significance of enzyme turnover.

Behaviour of proteins, enzymes and their mechanism and control-protein-ligand binding. Hill and Scatchard plots. Allosteric enzymes, Sigmoidal kinetics and their physiological significance. Symmetric and sequential modes for action of allosteric enzymes and their significance. Immobilized enzymes and their industrial applications. Effect of partition on kinetics and performance with particular emphasis on changes in pH and hydrophobicity.

Multienzyme system: Occurrence, isolation and their properties. Polygenic nature of multienzyme systems. Mechanism of action and regulation of pyruvate dehydrogenase and fatty acid synthetase complexes.

Immobilized multienzyme systems and their applications. Concerted and sequential method of allosteric behaviour.

Coenzymes and cofactors, Metalloenzymes. Detailed mechanisms of catalysis of serine proteases, Ribonucleases and triose phosphate isomerases.

Enzyme regulation-General mechanism of enzyme regulation: Feedback inhibition and feed forward stimulation; Enzyme repression, induction and degradation, control of enzymic activity by products and substrate; Reversible and irreversible covalent modification of enzymes; Mono-cyclic and multi cyclic cascade systems with specific examples. Regulation of enzyme activity by phosphorylation, methylation and acetylation.

SL. NO. – 2: Metabolic Biochemistry & Bioenergetics (Theory),

Paper Code : HP 702 C

Credit : 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the basic biochemical principles working in the body..
- Develop comprehensive understanding of energy transformation and thermodynamics.
- Understand the metabolism of major metabolites of the body.
- Nucleic acid and its metabolism.

SECTION – A

Thermodynamic principles and steady-state conditions of living organisms, organization of methods to study metabolism

Energy transformation, laws of thermodynamics, biological oxidations, oxygenase, hydroxylases, dehydrogenases & energy transducing membranes, Gibbs energy, free energy changes and redox potentials

Energy metabolism and high energy compounds – The mitochondrial respiratory chain, orders and organisation of carriers, proton gradient, iron sulphur proteins, cytochromes and their characterisation, the Q cycle and stoichiometry of proton extraction and uptake, P/O and H/P ratios. Reversed electron transfer, respiratory controls and oxidative phosphorylation, uncouplers and inhibitors of energy transfer. Fractionation and reconstitution of respiratory chain complexes, ATP synthetase complex, microsomal electron transport, partial reduction of oxygen. Comparison with mitochondrial E.T. C & photo systems, photorespiration, C3, C4 pathway.

SECTION – B

Carbohydrate metabolism – Glycolysis, citric acid cycle – its function in energy generation and biosynthesis of energy rich bonds, Pentose phosphate pathway and its regulation. Alternate pathways of carbohydrate metabolism.

Gluconeogenesis, interconversions of sugars, Biosynthesis of glycogen, starch and oligosaccharides, regulation of blood glucose homeostasis, hormonal regulation of carbohydrate metabolism

Lipid metabolism – fatty acid biosynthesis, acetyl CoA carboxylase, fatty acid synthase, desaturase and elongase. Fatty acid oxidation: α , β , ω oxidation and lipoxidation. Lipid biosynthesis: biosynthesis of triacylglycerols, phosphoglycerides and sphingolipids.

Biosynthetic pathway of terpenes, steroids and prostaglandins. Ketone bodies formation and utilisation. Metabolism of circulating lipids, chylomicrons, LDL, HDL & VLDL. Free fatty acids, lipid levels in pathological conditions.

Amino acid metabolism – biosynthesis and degradation of amino acids and their regulation, specific aspect of amino acid metabolism, urea cycle and its regulation, inborn errors of amino acid metabolism.

Nucleic acid metabolism – biosynthesis of purines and pyrimidines, degradation of purine and pyrimidine biosynthesis. Structure and regulation of ribonucleotide reductase biosynthesis of ribonucleotides, deoxyribonucleotides & polynucleotide, inhibitors of nucleic acid biosynthesis.

SL. NO. – 3: Cell Biology (Theory)

Paper Code : HP 703 C

Credit : 04.

Learning outcomes :

After successful completion of the course, students should be able to understand

- Ultrastructure of the organelles and their specific functions
- Cooperation between the organelles and execute the function
- The mechanism of cell growth and division and apoptosis
- The condition when uncontrolled cell division starts and develops cancer

SECTION – A :

Cell size, shape, complexity, functions Structural organization of prokaryotic and eukaryotic cells, Cell cycle, check points of cell cycle, regulations of cell cycle. Cyclin and cyclin dependent kinases (Cdks), Activation and deactivation CDKs, G1-CDK , G1 S-CDK, G1 cyclins, E2F, Rb, G2- M transition, DNA damage and cell cycle regulation, withdrawal of cell from cell cycle, growth factors and cell proliferation

The ultra structure of nucleus, mitochondria; Endoplasmic reticulum (rough & smooth); Golgi apparatus, lysosomes & peroxisomes and their functions. Molecular organization and mechanism of transport through nuclear pores, models.

The cytoskeleton- microtubules and microfilaments. General function of microtubules, α and β tubulin, micro tubal assembly and disassembly, stability of microtubules, microtubule based

motor protein, interaction between microtubule and actin filament, myosin structure and function.

Types of tissues; Epithelium-types, epithelial apices- glycocalyx, microvilli. Cell movement-intracellular transport, role of kinesin, cilia and flagella molecular structure and role in cell movement. Genomic organization- hierarchy in organization; Chromosomal organization of genes and non-coding DNA ; Mobile DNA, morphological and functional elements of eukaryotic Chromosomes.

SECTION – B :

Nerve cells- excitation and conduction, ionic basis of excitation and conduction, action potential, channels, properties of mixed nerve, nerve fiber types and function, regeneration of nerves, growth cones, nerve growth factors, axoplasmic flow, molecular mechanism of transport in axon, degenerative and regenerative changes in nerve fibers synapse and its properties, release of neurotransmitters. Cellular growth, development, elongation, telomerase

Apoptosis: Evolutionary origin of apoptosis, Morphological features of apoptosis, molecular and biochemical markers of apoptosis, Apoptosis eliminates unwanted cells, Apoptosis triggering mechanisms : extrinsic pathway depends on cell surface death receptors, Intrinsic pathway depends on mitochondria. Role of BCL₂ and IAPs in apoptosis.

Cancer biology: Cancer cell origin, derive from a single abnormal cell, cancer cells contain somatic mutation, cancer growth depends on defective control of cell death, cell differentiation or both, cancer cells may achieve immortality, metastasis, angiogenesis, causes of cancer, treatment.

SL. NO. – 4: Basic Biophysical principles, Cardiovascular, & Respiratory

Homeostasis (Theory)

Paper Code : HP 704 C

Credit : 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the basic biophysical principles working in the body for regulation of cardiovascular and respiratory homeostasis.
- Develop comprehensive understanding of cardiovascular regulatory mechanisms.
- Understand the mechanism and regulation of respiration in human.
- Pathophysiology of cardiovascular and respiratory disorders and physiological basis of treatment

SECTION – A :

Physiological anatomy of cardiac muscle, cardiac contraction, function of ventricles as pumps, the chemical energy of cardiac contraction, intrinsic regulation of heart pumping, role of sympathetic and parasympathetic nerve on control of heart.

Specialized excitatory and conducting system of heart, rhythmical excitation of heart, cardiac potentials, pacemakers, control of excitation and conduction in the heart.

Characteristics of normal electrocardiogram, principles of vectorial analysis of normal electrocardiograms, the mean electrical axis of heart, cardiac arrhythmias and their electrocardiographic interpretations.

Physical characteristics and basic theory of circulation, relationship between blood pressure and flow, resistance to flow, vascular distensibility and functions of arterial and venous systems, laminar and turbulent flow, the Reynolds' number, models for flows of liquids: Bernoulli and Poiseuille's equations and their applications.

The microcirculation and lymphatic system, capillary fluid exchange, interstitial fluid and lymph flow, endothelium in regulation and transcapillary exchange, lymphatic return, local control of blood flow by tissue and humoral regulation, development of collateral circulation.

Nervous regulation of circulation, arterial blood pressure and role of nervous system for rapid control of arterial pressure, role of vasomotor centre in regulation of blood pressure, role of kidney in long term regulation of blood pressure, renal body fluid and rennin angiotensin system.

Control of cardiac output and venous return, Frank-Starling mechanism of heart, coronary circulation and its regulation, special features of cardiac muscle metabolism, muscle blood flow and cardiac output during exercise

Integrated system of blood pressure control, hypertension - types causes, benign and malignant hypertension, experimental hypertension, ischemic heart disease, cardiac failure.

SECTION – B :

Mechanisms of pulmonary ventilation, pulmonary volumes and capacities – clinical significance, alveolar ventilation, functions of respiratory passageways, pulmonary circulation, ventilation perfusion ratio, pulmonary edema and pleural fluid, pulmonary capillary dynamics.

Physical principles of gas exchange, composition of alveolar air, diffusion of gases through respiratory membrane, transport of oxygen and carbon dioxide in blood and body fluids, respiratory exchange ratio.

Regulation of respiration: respiratory center, peripheral chemoreceptor system, central chemoreceptor system and their regulatory function, regulation of respiration during exercise.

Respiratory insufficiency, hypoxia, asphyxia, emphysema, asthma, cyanosis, dyspnea, atelectasis, Cheyne-Stokes breathing, periodic breathing, hyperbaric oxygen therapy.

SL. NO. – 5: Lab work I: Biochemistry, Cell Biology and Enzymology (Practical)

Paper Code: HP 705 C

Credit: 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the basic principles of biochemical analysis of biological samples and use relevant instruments for the purpose of analysis.
- Develop comprehensive understanding of electrophoresis techniques and able to use of the techniques for analysis.
- To perform assay of different enzymes and metabolites from blood and tissue samples.
- To do Gram staining of different bacterial cultures.

1. Demonstration of Beer's law.
2. Standardisation of secondary standard solution by primary standard solution.
3. Spectrophotometric estimation of nucleic acids.
4. Estimation of protein.
5. Electrophoretic separation of DNA.
6. Electrophoretic separation of protein.
7. Determination of pK_a value.
8. Effect of temperature on enzyme action.
9. Effect of pH on enzyme action.
10. Determination of K_m value of enzyme.
11. Assay of enzymes- acid phosphatase.
12. Assay of enzyme- Alkaline phosphatase.
13. Assay of enzyme Amylase.
14. Estimation of Glucose.
15. Gram staining of bacteria.
16. Paper chromatography- separation of amino acids.

2nd Semester:

SL. NO. – 6: Blood, Body Fluid & Immunology (Theory)

Paper Code: HP 801 C

Credit: 04

Learning outcomes :

After completion of the course student should understand the following:

- The composition and function of blood and body fluid
- Individual function of immune cells in terms of humoral and cell mediated immunity.
- Development of antibody against pathogen and determination techniques of antigen and antibody in the body
- Hypersensitive reaction in the body and autoimmune disease development.

SECTION – A :

Erythropoiesis, regulation of erythropoiesis, pathological condition related to erythrocyte, fate of erythrocyte. Life span and destruction of RBC, Platelets, Reticulocytes. haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis.

Body fluid balance, body fluid compartments, Blood volume, Regulation of body fluid exchange and osmotic equilibria. Homeostasis.

General characteristics of WBC, Genesis of WBC and their life span General principles of immunology, kinds of immunity, antigens, immunogens, haptens, Adjuvants, antigenicity and immunogenicity

Major histocompatibility complex (MHC), types, structure and functions. Role in immune response, mechanism of MHC – restrictions of T-cells for endogenous antigens (class I), for exogenous antigens(class – II), Syngenic and congenic, MHC haplotypes

Cells and organs of the immune system – cells, primary and secondary lymphoid organs, MALT, CALT.

SECTION – B:

Humoral immunity, primary response, secondary response, Role of Th in hapten carrier conjugate, Class switching. Regulation of immune effector response. Cell mediated immunity – mechanisms, Effector molecules, Cytotoxic T cell, destruction of target cell by CTL, , NK cell, Mechanism of NK cell killing, ADCC, Cell mediated lympholysis, MLR, Graft vs Host reaction.

B-Cell receptor, maturation and structure, T – cell receptor, selection of T – cell repertoire, positive and negative selection, thymic education, Activations of T and B cells by antigens. Clonal selection theory, Generation of effector and memory T cell, T and B cell cooperation in antibody production

Immunoglobulins – structure, functions, classifications, properties, isotypic, allotypic, idiotypic determinants, immunoglobulin superfamily, production of monoclonal antibodies and their applications.

Antigen antibody interactions, affinity, avidity, cross reaction, precipitation, agglutination, radio-immunoassay, Enzyme Linked Immuno Sorbant Assay (ELISA), Western blotting and their practical applications,

Complement – components, classical and alternative pathways of complement activation, biological consequences of complement activation, complement deficiencies.

Hypersensitivity – classification of hypersensitive reactions, Type –I, Type II, Type III and Type IV hypersensitivity reactions, mediators, consequences and therapy.

Autoimmunity – organ specific and systemic autoimmune disorders, mechanisms and treatment of autoimmune diseases.

SL. NO. -7: Molecular Genetics and Modern Molecular Biological Techniques (Theory)

Paper Code : HP 802 C

Credit : 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the molecular basis of genetics.
- Develop comprehensive understanding of various components of DNA and RNA and their functions.
- Understand the structure of gene and genome.
- Concept of gene expression and its regulation.

SECTION – A :

DNA: Chemical composition of DNA, DNA structure, single stranded DNA, detailed account of double stranded DNA, B-DNA, Z-DNA, and other structural forms, triple stranded DNA and quadruplex DNAs, curved DNA, rod shaped DNA, and their importance, types of topoisomerase and their function in adding or removing superhelical structures.

Prokaryotic DNA replication, replication origin and site and structure and DNA Ter regions and structure. DNA polymerases, composition and features, replication factors and the mechanism of replication, leading strand and lagging strand synthesis, processivity, fidelity and regulation of replication. Replication of single stranded DNA, M13 viral DNA, Eukaryotic replication origins, replication initiation complexes and their assembly, licensing factors, DNA polymerases and their composition, telomerase and mode of action.

DNA damages, types and their repair mechanism, mechanism of DNA repair and the regulation of it, direct repair, excision repair, transcriptional excision repair, glycosylase pathway, mismatch repair, UVr A,B and C mechanism, broken end repair, recombination repair and SOS repair system

RNAs: coding and non-coding RNAs, tRNAs: structural features, their anticodon features, mRNAs, prokaryotic and eukaryotic mRNAs, structural features,

SECTION – B :

Concept of gene, genome sizes, kinds of genes, gene numbers, functional genes, cryptic genes, pseudogenes, processed genes, overlapping genes, family of genes, Gene structure: structural organization of prokaryotic and eukaryotic genes, regulatory elements of genes, (proximal or internal including promoter, operator, activator and enhancers), coding region and terminal region of genes, prokaryotic gene expression: transcriptional apparatus, RNA polymerase structure, subunits and their function: sigma factor, their character, and role, mechanism of transcription, initiation, elongation and termination (rho dependent and rho independent mechanism). Regulation prokaryotic genes expression and operons, regulation of Lac operon, Tryptophan operon, and arabinose operon, concept of regulons, stimulons, global regulators.

Lambda phage: regulation lytic and lysogenic pathway in lambda phage, cI-repressors, cro-repressors, transcriptional terminators, and antiterminator, early and late genes, their expression and regulation, eukaryotic gene expression, DNA binding proteins, concise account of helix turn helix proteins, helix loop helix proteins, helix turn beta, zinc finger proteins, leucine zipper proteins, homeodomain proteins, beta barrels, bZIP and bZLH domains, and proteins with combination of the above and how they bind and bring about regulation of gene expression. Transcription factors (TFs), concept of activators, activator domains, coactivators, and mediator complex, enhancer proteins, and their binding factors, characterisation of TATA box, upstream elements to TATA box, InR elements, Downstream promoter elements(DPE), enhancer elements activator elements, response elements, silencer elements/repressor elements, insulators:

Promoters with TATA, InR and DPE, promoters without TATA, promoters without TATA and InR elements, their structure and function. gene expression and chromosome remodelling, effect of histone modification on transcription of class I genes, changes in nuclear positioning, histone acetylation and deacetylation, methylation and demethylation, phosphorylation and dephosphorylation. Post-transcriptional processing of RNA: processing of rRNA, precursor rRNAs of prokaryotic and eukaryotic types, structural and functional features of U3RNA RNPs. snoRNAs and snoRNPs, scaRNAs and their role in modification and splicing of rRNAs and some snRNA

SL. NO. -8: Neurophysiology, Neuroanatomy, Neurochemistry, Behavioral & Special sensory physiology (Theory)

Paper Code: HP 803 C

Credit: 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the neurophysiological and neuroanatomical basis of human nervous system
- Develop comprehensive understanding about different neural structures in human and their functional relevance
- Understand the behavioral aspect of human brain.
- Different special sensory organs and their structure function relationship..

SECTION - A :

Structure of the nervous tissue- neurone, nerve fiber, neuroglia, myelination, structure of spinal cord, spinal segment, spinal and cranial nerves, nerve supply to the body wall, upper and lower limbs, dermatomes of the upper and lower limbs, segmental innervation of muscles regulating joint movements, applied anatomy of spinal nerve roots, organisation of autonomic nervous system, morphology of synapse and neuromuscular junction, motor end plate, sensory receptors and their organization.

The brain – subdivisions and coverings of brain, the telencephalon, gross anatomy of cerebral hemisphere, ventricles of the brain (third & lateral), base of the brain, structure of neocortex, functional areas of cerebral cortex, nerve fibers of cerebrum, internal capsule, corpus callosum, basal ganglia and related structures, gross anatomy of corpus striatum, the limbic system structure, the diencephalon- the thalamus, epithalamus, hypothalamus and circumventricular organs.

The brain stem and cerebellum – general consideration, the medulla oblongata, the pons, the mid brain, the reticular formation, subdivisions of cerebellum, cerebellar nuclei, cerebellar connections, extrinsic cerebellar circuitry.

Synaptic and junctional transmission- presynaptic grid, chemical transmission of synaptic activity, principal neurotransmitter systems, molecular mechanism of presynaptic release of neurotransmitter, electrical events in postsynaptic neurones, inhibition and facilitation at synapse, integrative functions of synapse , neuronal pool, neuromodulation at synapse, synaptic plasticity and learning , neuromuscular transmission, active zone, quantal release, nerve endings in smooth and cardiac muscle, neuromuscular blockers, molecular basis of autoimmune neuromuscular disorders, denervation hypersensitivity.

Initiation of impulses in sense organs- sense organs and receptors- types and properties, receptor potential, tonic and phasic receptors, coding of sensory information, cutaneous, deep and visceral sensations, pathways for touch, pain and temperature sensation, proprioception, kinesthetic sensation, CNS modulation of pain sensation, gate control theory, indigenous analgesic system.

Reflexes- general properties, monosynaptic and polysynaptic reflexes, stretch reflex and withdrawal reflex, muscle spindle and golgi tendon organ, deep and superficial reflexes, pathological reflex, spinal reflex, effect of transection of spinal cord at various levels.

Control of posture of and movement- pyramidal and extrapyramidal system, corticospinal and corticobulbar pathway, regulation of posture and equilibrium, vestibular apparatus, spinal integration, medullary components, midbrain components, cortical components, , cerebellar circuit and its role, basal ganglia circuit and its role, effect of transection of spinal cord at various levels effect of UMN and LMN lesion, effect of pyramidal and extra pyramidal lesion, effect of lesion of cerebellum and basal ganglia.

Thalamocortical and corticothalamic projection and consciousness- functions of thalamus, basis of electrical waves of the cortex (EEG & EKG), synchronizing and desynchronizing mechanism, ascending and descending reticular activating system, neurophysiology of sleep and wakefulness cycle, sleep disorders.

The autonomic nervous system and central regulation of visceral function- functional organisation of autonomic outflow, chemical transmission at autonomic junctions, response of effector organs to autonomic nerve impulse, medulla oblongata and its role, hypothalamic control of visceral function – cyclic phenomena, hunger, thirst and temperature regulation.

Higher functions of nervous system – learning and memory, molecular basis of memory, conditioned reflex, encoding of memory, functions of neocortex, complementary specialization of hemispheres, concept of dominance, physiology of language and speech , speech disorders

Neuroscience methods – neuroimaging, noninvasive electrophysiology, classical electrophysiology, neuroanatomy imaging technology, optogenetics.

SECTION – B :

Behaviour: Basic idea and its types (passive, aggressive, assertive, passive-aggressive and alternator), factors affecting (genetic, social norms, creativity, core faith and culture, attitude), emotion, learning, motivation, perception, personality development, Emotion: Limbic system control on emotion and behaviour: neural circuitry of limbic system, amygdala septum hippocampus, fear and rage, septal rage, Kluver-Bucy syndrome. Brain chemistry and behaviour: role of aminergic systems, acetylcholine, opioid peptides on brain functions.

The Sensory System: Types of sensation, Special and general senses, Sensation and perception, coding of sensory modality, intensity

The Visual System: Retinal morphology, retinal neural circuitry, visual pathway, primary visual cortex-topographic map, organization and function, Chromatic properties of retina, colour blindness, accommodation of eye, binocular and stereoscopic perception.

The Auditory System: Sound transmission in auditory system, Organ of Corti-structure and function relationship, central auditory pathway, descending auditory pathway, primary and

secondary auditory cortical areas, auditory system-frequency analysis of sound by cochlea and central auditory pathway. Intensity coding of auditory system, cochlear potentials.

Gustatory System: Receptor organs-distribution, ultramicroscopic structure and innervations, taste modalities, neural circuitry of gustation, sensory processing, abnormalities of taste.

Olfactory System: Organization of receptors in olfactoepithelium, olfactory receptor potential, olfactory pathways-olfactory bulb and central olfactory connections, coding of olfactory information, abnormalities of smell sensation.

Neurochemistry: Principles of neurotransmitters, acetylcholine, norepinephrine, epinephrine, dopamine, serotonin, histamine, inhibitory amino acid - GABA, glycine, substance P and other tachykinins, excitatory amino acid -glutamate, aspartate, opioid peptides- enkephalins, met-enkephalin, leu-enkephalin, proopiomelanocortin, prodynorphin, other polypeptides-calcitonin gene related peptides, neuropeptide Y.

**SL. NO. -9: Lab work II : Haematology, Human Physiology, Histology, Molecular Biology
(Practical)**

Paper Code : HP 804 C

Credit: 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Undertake analysis of different hematological parameters using human blood samples.
- Develop skills to perform clinical examination of cardiovascular system, respiratory and central nervous system..
- Learn steps in of staining the tissues for histological study.
- Learn the method for protein electrophoresis and use of the method for hemoglobin analysis.

➤

01. Haematology Experiments — TC,DC, Platelet, Absolute Eosinophil Count, Reticulocyte Count, Determination of CT/BT and Prothrombin Time.

02. Human Experiments:

Study of Respiratory System- Recording of Lung volumes and capacities.

Study of cardiovascular system- Recording of Blood Pressure & Pulse Rate

Effect of variation in posture on & Effect of exercise on BP/P

Recording of ECG and Determination of Cardiac Axis

Study of Central Nervous System- Study of Sensory System:

Pain/ Touch/ Temperature/ Smell/ Taste Senses

Study of Motor System- Study of Deep Reflexes --Tendon jerk/Biceps/Triceps jerk/Knee jerk/Ankle jerk/ Study of Superficial Reflexes- Planter Reflex/ Corneal/ Abdominal Light Reflex.

Anthropometric Study--- Recording of Height/Body Weight and Head Circumference /

Calculation of BMI and Waist and hip circumference/Recording of Skin fold thickness-

Determination of TBF content

Exercise Physiology— Physical Fitness Index by Harverd Step Test.

Calculation of VO_2 max by Queen's college step Test and Trademill Test.

03. Histology- Study of stained Histological Slides .

04. Protein electrophoresis , Identification of abnormal hemoglobins by electrophoretic method.

3rd Semester:

SL. NO. -10: Reproductive Physiology & Developmental Biology (Theory)

Paper Code : HP 901 C

Credit : 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the function of reproductive organs in both male and female.
- Develop comprehensive understanding of modern methods of contraception and assisted reproductive techniques.
- Understand the basic concept of developmental biology in human.
- Human embryology and development of organ system in human..

SECTION – A :

Male and female reproductive system Sex differentiation–disorders of sex, gonadal differentiation, female and male pseudohermaphroditism, sexual infantilism, folliculogenesis, ovulation, spermatogenesis, hormonal control, menstrual cycle; steroidogenesis - steroidogenesis and its hormonal regulation;

Physiology of pregnancy and lactation: Physiology of implantation, pregnancy maintenance, sex biorhythm, role of endocrine, autocrine, paracrine factors in pregnancy regulation, ectopic pregnancy, endometriosis, foeto-placental unit, role of blastocyst in pregnancy maintenance. maternal adaption to pregnancy endocrinology of parturition physiology of lactation and physiological importance of lactation, application of molecular biology to reproduction

Contraception: Principle of contraception, male and female contraceptives, hormonal contraceptive and their molecular action, IUD and their molecular action, emergency contraception.

SECTION – B :

Introduction to Developmental Biology., Details of Mitotic and Meiotic cell division.

Ultra structure of egg and sperm, Spermatogenesis in mammals and its regulation.

Oogenesis in mammals and its regulation., Molecular gene expression and regulation of different genes related to development, different embryological pathways regulating the embryonic development of fetus, Fertilization, different proteins involved in fertilization,

Cleavage, gastrulation and axis formation, Derivatives of ectoderm layer, formation of neural tube, neural crest and epidermis, Derivatives of mesoderm, paraxial mesoderm, somites, myogenesis, osteogenesis, intermediate mesoderm and urogenital system., Lateral mesoderm and endoderm- their derivatives, Development of limb, Molecular basis of sex determination, Molecular basis of aging and senescence, Medical aspects of developmental biology, Comparative development.

SL. NO. -11: Nutrition & Microbial Physiology (Theory)

Paper Code : HP 902 C

Credit : 04

Learning outcomes :

After completion of the course student should understand the following:

- The total digestion and absorption process of different kinds of food.
- Nutritional requirement in normal and different pathological conditions of human being and in pregnant mother.
- Concept of disease development by different microorganisms and their different virulent factors
- The mechanism of development of antibiotic resistance in bacteria.

SECTION – A :

Digestion, absorption and related disorders: Secretory function of elementary tract, secretion of saliva, gastric juice, pancreatic enzyme, bile, mucous, digestion of carbohydrates, protein, fats, gastrointestinal absorption of carbohydrates, proteins and fats, physiology of gastrointestinal disorders (peptic ulcer, pancreatic failure, sprue, constipation, diarrhoea, vomiting, nausea).

Different food groups and nutrients, Dietary fibres, antioxidant nutraceuticals

Short-term regulation of hunger and food intake, Neural signals from the GI tract, Nutrient signals, Hormone signals, Psychological factors, Long-term regulation of hunger and food intake, Physiological factors, Set-point theories of hunger and eating

Nutrition during normal life: Nutrition in infancy: Nutritional requirements during infancy, breast feeding, nutritional and other factors affecting growth and development, colostrum, infant milk substitute (IMS) act, formula feeding, Nutritional requirement of pre-term babies, feeding problems, food allergies, cow's milk protein allergy, lactose intolerance, diarrhoea, vegetarianism. Nutrition in childhood, adolescence and adults: nutritional requirement of pre-

school and school children, nutritional related problems of children, childhood obesity, dental caries, allergies, PEM symptoms, Nutritional requirement in adults

Nutrition in pregnancy: Physiological changes during pregnancy, factors affecting pregnancy outcome, maternal age, pre-pregnant weight gain during pregnancy, life style factors, birth weight standards, requirements during pregnancy, problems in pregnancy, nausea and vomiting, constipation, oedema and leg cramps, heart burn, excessive weight gain.

Nutrition in lactating woman: Nutritional requirements, factors affecting the volume and concentration of breast milk

SECTION – B :

General Characteristics of Microbes, brief introduction to pathogenic microbes: viruses, rickettsiae, spirochaetes and bacteria, important human pathogens.

Modes of cell division, Normal growth cycle of bacteria, Continuous culture, Quantitative measurement bacterial growth, plate count method, Turbidimetric method, Importance of quantitative measurement of growth.

Natural microbial population, Selective methods, Pure culture, Methods of isolating pure culture, Maintenance and preservation of pure culture

Host parasite relationship, normal microbial flora of humans, transmission of microorganisms, microbial pathogenicity and virulence, determining etiology and host factors.

Antimicrobial chemotherapy, Antibiotics and their mode of action, Inhibition of cell wall synthesis, Penicillin, Damage to cytoplasmic membrane, Inhibition of nucleic acid and protein synthesis, Streptomycin, Inhibition of specific enzyme synthesis, Antifungal antibiotics, Antiviral chemotherapeutic agents, Antitumor antibiotics, Development of resistance to Antibiotics, microbiological susceptibility to therapeutic agents

Identification of microorganisms from specimen, Infectious disease cycle, virulence and mode of transmission.

Human diseases caused by bacteria, Airborne, food borne, water borne arthropod borne and zoonotic diseases.

Eukaryotic viruses; RNA DNA viruses, retrovirus and hepatitis B virus

Viral bacterial protozoal and fungal human diseases; Antibiotics and antiviral agents and their mode of action; development of antibiotic resistance mechanism

SL. NO. -12: Lab work III: Techniques in Physiology_ (Practical)

Paper Code: HP 903 C

Credit: 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Use the modern molecular biology techniques for analysis of tissue samples..
- Develop comprehensive understanding of different experimental procedures using animal.
- Understand the mechanism of complete tissue processing for histological analysis..
- Biochemical analysis of different tissue samples and use of immunological techniques..

1. Isolation of Nucleic Acids (RNA & DNA) and Proteins from Liver Tissue
2. Estimation of Nucleic Acids (RNA & DNA) and Proteins Isolated from Liver Tissue
3. Isolation of Plasmid DNA & Gel Electrophoresis
4. Total Histological Process-
 - i) Tissue Processing
 - ii) Sectioning
 - iii) Staining
5. Biochemical Analysis-
 - i) Cholesterol Estimation from Reproductive Organs of Male and Female
 - ii) Estimation of Steroidogenic Enzymes
6. Experimental Procedure-
 - i) Study of Oestrus Cycle
 - ii) Sperm Count and Sperm Mortality
7. Ash Content of Food
8. Estimation of Mineral Content of Food-
 - i) Calcium/Iron/Phosphorus
9. Estimation of Vitamin-C
10. Single Colony Isolation by Streak Method
11. Ouchterlony Double Diffusion Method of Antigen-Antibody Interaction
12. Antibiotic Susceptibility Assay

4th Semester:

SL. NO. -13: Endocrinology & Stress Physiology (Theory)

Paper Code: HP 1001 C

Credits: 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the structure and function of different endocrine glands.
- Develop comprehensive understanding of neuroendocrine control of body functions.
- Understand the basic concept of different stress and stressors.
- Stress at cellular level and environmental stress.

SECTION – A :

General concepts of Endocrinology: Endocrine, paracrine and autocrine secretion. Hormone chemistry, synthesis, storage, release and transport of hormones; Feedback regulation of hormone secretion. Hormone receptors-types, properties, synthesis and life cycle, up and down regulation of receptors; Mechanism of hormones action – hormone that act on nuclear receptors and the hormones act at the cell surface.

Neuroendocrinology: Neural control of glandular secretion – neurosecretion; hypothalamus-pituitary unit, hypophyseotropic hormones and neuroendocrine axes –TRH, CRH, GHRH somatostatin, prolactin regulatory factors, Endocrine functions of Hypothalamus and Pituitary - Hypothalamo-hypophysial axis and anterior pituitary hormones : Functional significance, pituitary transcription factors and anterior pituitary control, Growth hormone and physiology of growth, physiology and disorders of different pituitary (anterior) axes: Neurohypophyseal hormones: Synthesis, release and regulation of neurohypophyseal hormones.

Thyroid hormones – synthesis, plasma transport, intracellular binding, mechanism of action; regulation of thyroid function; role of thyroid hormones in growth, differentiation and metabolism, calorogenic action of thyroid hormone, thyroid functions in pregnancy, and in the fetus and newborn; thyrotoxicosis endemic and exophthalmicgoiter and autoimmune.

Endocrine function of pancreas and carbohydrate metabolism- Islet cell structure, structure, biosynthesis and secretion of insulin, fate of secreted insulin, effects of insulin, insulin receptors, mechanism of insulin action, consequences of insulin deficiency and insulin excess, glucagon and other islet cell hormones, hypo and hyperglycaemic hormones and their role in carbohydrate metabolism, hypoglycaemia and diabetes mellitus.

Parathyroid gland and Hormonal control of calcium metabolism and the physiology of bone – parathyroid hormone, calcitonin, Vitamin D3 and Hydrocholecalciferols, role of hormones in calcium and phosphorous metabolism, bone physiology and bone disorders, effect of other hormones and humoral agents in calcium metabolism.

Adrenal cortical and medullary hormones - action of corticoids and catecholamines Roles in metabolic, vascular, physical and emotional stress ,anti inflammatory role; mineralocorticoids in sodium and potassium metabolism, general idea about cushing syndrome, pheochromocytoma – diagnosis and management.

SECTION – B :

Stress Physiology: Basic concept, Types: Chronic and Acute Stress, Eustress, Distress, Stressor, Basic concept of homeostasis, Fight or flight response, Strain.

Neurophysiological basis of Stress: Neuroanatomy of Stress: Brain, hypothalamus, Amygdala, Hippocampus, Prefrontal cortex, Locus Raphe nucleus, The spinal Cord, Adrenal Gland.

Neurochemistry of Stress: Corticotrophin releasing hormone, Adrenocorticotropic hormone, Cortisol, Norepinephrine, Serotonin, Neuropeptide Y

Effects of Stress on Biological system: Effects on nervous system, Pain stress, (Anxiety, Depression, Eustress, Distress, Cognitive, Emotional and behavioural symptoms), Endocrine system, Hypothalamus pituitary Adrenal Axis, Immune System.

Environmental Stress: Thermal Stress: Heat Stress (Causative factors, Types Physiological effects and Prevention), Cold Stress (Causative factors, Effects of human Body and Prevention).

Stress at High Altitude: Effects on Physiological Systems, Prevention, Chronic Mountain Sickness. Stress at Deep Sea Diving: Effects on Physiological Systems, Prevention,

Positive and Negative G Forces: Stress Responses, Precautions.

Noise: Adverse Health Effects and Prevention

Radiation: Hazardous effects and Preventive measures.

Stress at Cellular Level: Oxidative Stress (Basic Concept: Pro-oxidant Metals, Pro-oxidant Vitamins and Anti-Cancer Drugs Oxidant: Electron Acceptor), Basic Mechanism of generation of free radicals and Oxidative Stress, Basic idea of Stress Proteins, Antioxidant: Exogenous and Endogenous, Metabolites (Uric acid, Vitamin C, Vitamin E, Melatonin, Glutathione), Antioxidant Enzymes: Catalase, Superoxide dismutase (SOD), glutathione Stranferase (GST), glutathione peroxidise (GPx), glutathione reductase (GR).

SL. NO. -14: Project on Advances in Human Physiology

Paper Code: HP1002C

Credit: 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the method of literature survey and identification of problem for investigation.
- Develop comprehensive understanding of protocol writing.
- To take up individual study on a problem based on literature survey using the available methodologies.
- Analyse the obtained results, prepare a report and use power point to present the report in front of a select audience.

Project and Review work will be conducted by the student under the assigned faculty members (special paper).

DETAIL SYLLABUS (ELECTIVE COURSES)

1st Semester : NIL

2nd Semester:

SL. NO. -1: Pharmacological & Toxicological Principles (Theory)

Paper Code : HP 801 E

Credit : 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the basic pharmacological principles applicable for drug development.
- Develop comprehensive understanding of drugs acting against different pathological conditions.
- Understand mechanism of action of different toxic components.
- Xenobiotics and their action, concept of genetic toxicology.

General pharmacology: Introduction regarding drugs, sources, routes of administration, drug absorption, bioavailability, bioequivalent, bioconversion, mechanism of drug action, factors modifying drug action, dose response relationship, adverse drug reaction, autonomic pharmacology, cholinergic drugs, anti cholinergic drugs, adrenergic drugs, anti adrenergic drugs, examples: antacids, histamines, anti histamines, serotonin, agonists and antagonists, prostaglandins and bradykinins; Hematopoietic system, Haematinics, iron vit- B12 and Folic acid, erythropoietin, coagulants and anticoagulants, Anti platelets. Fibrinolytic and antifibrinolytic, Renal system, diuretics, antidiuretics, Nephrotoxic drugs, drugs for acid base balance, Respiratory; cough suppressants and mucolytic agents, pharmacotherapy of bronchial asthma.

Toxicity- Measurements, toxic reactions, toxins. Mechanism of different toxic compounds, Introduction and different areas (mechanistic, descriptive, regulatory, forensic, clinical, environmental, developmental toxicology), classification of toxic agents, different toxic responses (allergic reaction, idiosyncratic reactions, immediate and delayed toxicity, reversal and irreversible toxicities, local and systemic toxicities), Characteristics of exposure (route and site of exposure, duration and frequency of exposure), variation in toxic responses (selective toxicity, species difference, individual difference, acute lethality, sub acute, sub chronic and chronic toxicity) Mechanism of toxicity (absorption, distribution, excretion, and detoxification, reaction of the toxicant with target molecules), Mechanism of toxic cell death, Biotransformation, and

concept of xenobiotics, Mechanism of xenobiotic transformation (hydrolysis, reduction, oxidation and conjugation). Basic concept of genetic toxicology, toxic responses of immune system, toxic responses of blood, renal toxicity, hepatotoxicity, respiratory toxicity, and cardiovascular toxicity, reproductive toxicity. Toxic effects of arsenic, lead, fluoride and chromium on human health

SL. NO. -2: Sports and Exercise Physiology (Theory)

Paper Code : HP 802 E

Credit : 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand various tools used to measure the physical fitness.
- Develop comprehensive understanding on changes in various physiological parameters in response to physical exercise.
- Understand role of yoga in physical fitness and sports performances.
- Molecular mechanisms of enzyme actions

Ergometry- Bicycle ergometer, Trademill and Telemetry- their principles and uses in sports and Exercise Physiology. Circulatory, respiratory and haematological responses during exercise.

Biochemical responses during exercise; Physical fitness test—methods for evaluation and significance of anaerobic power, O_2 -- debt, anaerobic threshold, aerobic power, (VO_2 max) , strength, flexibility, endurance and agility. Nutrition in sports performance—diet for different sports events, pregame meal, spacing of meals, glycogen loading, fluid replacement.

Sports anthropometry—methods of assessment of body composition, desired body weight and weight control, somatotyping. Importance of physical condition, principle and methods of physical conditioning, aerobic and anaerobic training. Physiological adaptation due to training.

Age and sex differences in sports performance, Women in athletics and sports. Pregnancy and menstruation in relation to exercise.

Importance of hormones in exercise and sports. Oxidative stress-its management.

Yoga and its therapeutic application.

Ergogenic aids in sports. Doping agents—types, tolerance limits, blood doping, Physiological problems associated with doping IOC guidelines.

3rd Semester:

SL. NO. -3: Advances in Molecular Cell Biology and Cell Signalling (Theory)

Paper Code : HP 901 E

Credit:04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the molecular organization of cell membrane structure.
- Develop comprehensive understanding of cell signaling mechanisms
- Understand the regulation of gene expression
- Immunophysiology and various molecular techniques.

Biomembrane, organization and composition of bio membrane, fluidity & asymmetry of lipid bi-layer, cortical cytoskeleton, restriction of membrane protein diffusion, transport across the membrane pump, channels, ion channels, voltage and transmitter gated ion channels, protein sorting within the cells, NPCs, Mitochondrial protein transport, Membrane and Secretory proteins, Transport vesicle and Intra cellular Membrane Traffic, Role of Clathrin.

Signaling Through G-Protein Coupled Receptors, GPCRs, cAMP & phospholipid G-Protein signaling, Calcium Ion Signals, Channels control by G-Protein, NO mediated signals, Enzyme coupled receptor and signaling, RTKs, Ras, MAP Kinase, Rho family GTPase, PI-3-Akt signaling, Cytokine Receptors & JAK-STAT signaling, TGF-Beta super family mediated signal and Smads, Protein degradation & signaling, Notch signaling, Wnt signaling, β catenin, Hedgehog pathway, NF-kB dependent pathway, Nuclear receptors & steroid Hormones, Cell polarization & migration, Integrins mediated cell signaling. Epithelial- mesenchymal Transitions, Mesenchymal –epithelial Transitions.

Regulation of Gene Expression, Active & repressed Chromatin. Histone as an activation of Switch, Histone Acetylation, Methylation, DNA methylation & control of transcriptions, Inheritance and Stabilization of DNA methylation pattern, Differential RNA processing, Control of Expression at the level of Transmission, Differential mRNA longevity, selective inhibition of mRNA translation, Micro RNAs as specific regulator of gene expression, stored mRNA in brain cells, Brain derived neurotrophic factor, Post translational Regulation of Gene Expression. Gene polymorphism, SNPs, Multiple alleles, Linkage and Genetic Mapping, Physical Mapping.

Molecular basis of oxidative stress, cellular response in stress, stress proteins, metabolic integration, energy metabolism.

Immunophysiology: T & B cell Biology, Thymic Education, Class-I & Class-II MHC molecules, Antigen processing and presentation, HLA, Activation of CD4+ T-cell, CD-8+ T-cells, Functions of NK T-cells and γ δ T cells, Cytokines, Functional integrins of Cytokines, Cytokine Receptor mediated signal transduction, Therapeutic exploitation of cytokines, Flow cytometry, cell cycle analysis, Fluorescence microscopy, TEM, SEM, AFLP, RFLP, FISH

SL. NO. -4: Advances in Microbiology (Theory)

Paper Code : HP 902 E

Credit : 04

Learning outcomes :

After completion of the course student should understand the following:

- How the genetic material recombine in microorganism
- How different types of mutation occurs in prokaryotes.
- How different microorganism used in industry.
- Microorganism present in soil and how they decompose different compounds in soil.

Microbial Growth yield and characteristics, strategies of cell division, stress response
Transcription and translation of genetic information, The process of protein synthesis
Study of microbial genetics; The inheritance of characteristics and variability, Phenotypic changes due to environmental alterations. Mutation : Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis.

Regulation and expression of gene activity, Genetic engineering

Organization, alteration and expression of the genetic information, Genotypic changes;

Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.

Bacterial Recombination; Bacterial conjugation; Transduction; Bacterial transformation

Homologous and non-homologous recombination including transposition

Bacteriophage: Discovery and significance, General characteristics, Morphology and structure, The classification and nomenclature of bacteriophage, Some bacteriophages of E. Coli, Replication of bacterial viruses, The viral multiplication (replication) cycle, Lysogeny and transducing bacteriophage

Microbial flora of fresh foods; Microbial spoilage of foods; Microbiological examination of foods; Preservation of foods; Fermented foods

Microbial flora of soil; Biogeochemical role of soil microorganisms; Biochemical transformation of carbon and carbon compounds; Biodegradation of herbicides and pesticides
Microbial fermentation and production of small and macromolecules

Microorganisms and industry; Industrial uses of bacteria; industrial uses of yeast; Industrial uses of molds; Deterioration of materials; Analytical microbiology

Host parasite interaction: Recognition and entry processes of different pathogens like bacteria, viruses into animal host cells, alteration of host cell behaviour by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals, cell-cell fusion in both normal and abnormal cells.

SL. NO. -5: Advances in Molecular Endocrinology (Theory)

Paper Code: HP 903 E

Credit: 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the techniques for quantification of different hormones..
- Develop comprehensive understanding on genetic control of hormone formation.
- Understand the neuroendocrinological principles.
- Role of hormones in pathophysiology of different diseases.

Discovery of hormones as chemical signals for control and regulation of physiology processes . Techniques for quantitation of hormones ; RIA , immunoradiometric assays (IRNA) , immunochemilumetric assays (ICMAS) , radioreceptor assays , functional hormonal bioassays ; statistical procedure for immunoassay data-reduction , origin and development of hormone assay.

Structure of peptide and protein hormones ; purification of peptide hormones . Characterization , structural and functional relationship and pharmacokinetics of peptide hormones . Phylogenic analysis of pheromone structure and function of pheromones , kinetics of hormones .

Genetic control of hormone formation : subcellular structure of cells that secrete protein hormones , storage and secretion of hormones – molecular mechanism of regulation , structure of a gene encoding a polypeptide hormone ; regulation of gene expression , transcriptional and post transcriptional mechanisms of hormone biosynthesis and secretion .

Hormonal genes and hormone regulated genes in the context of biosynthesis . Inhibitors of biosynthesis and their use. Metabolism of hormones by target and non-target tissues.

Discovery of receptors in target tissues ; biochemistry and molecular biology of steroid receptors , hormones , control of gene expression , RNA synthesis , RNA stability and steroid hormone action . Hormones that act at the cell surface ; mechanism of hormonal action and signal attenuation . Signal discrimination , signal transduction and signal amplification in hormone regulated physiological processes . Receptor antagonists and their applications .

Neuroendocrinology – neuronal control of glandular secretion ; hypothalamic-pituitary unit ; regulation of secretion of tuberohypophysial hormones ; feedback concept in neuroendocrinology , neuroendocrine control of pituitary hormones ; pineal gland ; circumventricular organs , neuroendocrino-diagnosis , neuro-endocrine-immuno interaction , neurone as target cells for hormone action , neuronal modification of hormone metabolism and regulation of neuronal function – effect of ion channel , electrical events.

Autoimmunity and endocrine disorders – generation of specificity , recognition of antigens , tolerance of self antigens , mechanism of autoimmunity , genetics of autoimmunity , non-endocrine function of endocrine molecules , nonconventional endocrine molecules in health and disease . Endocrine disruption .

Endocrinology of growth and development, normal and aberrant growth, growth factors, adolescent growth, obesity and metabolic syndrome, endocrine control of energy stores, disorders of lipid metabolism, complications of diabetes mellitus, endocrine responsive cancer, immunoendocrinopathy syndrome.

SL. NO. -6: Advances in Nutrition and Metabolism (Theory)

Paper Code : HP 904 E

Credit : 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand basic mechanism of energy metabolism and energy expenditure.
- Develop comprehensive understanding of nutrient requirements.
- Understand food technology, preservation and processing of food materials..
- Food adulteration, food toxins and detoxification.

Energy Metabolism: Energy content of food, Measurement of energy expenditure (direct and indirect methods) and energy requirement of an individual at rest and work

Nutritional Aspects of Dietary proteins, fats and carbohydrates, their role in energy metabolism, Metabolic disorders in relation to over or less intake of carbohydrates, proteins and fats

Hormonal control of nutrient metabolism: Post-absorptive nutrient metabolism and role of pancreatic hormones, role and corticoids in nutrient metabolism

Nutrient Requirement, RDA, Balanced Diet, Food habits and dietary patterns: Role of social, cultural, economic and psychological factors

Vitamins, their sources, importance, toxicity, nutritional value and implementation (Vit. A, B complex, vit. C, vit. D, vit. E, vit. K) and minerals (sodium, potassium, calcium, zinc, chromium, fluoride, magnesium)

Food Technology, Food preservation and processing, Food fortification, Food quality control
Food additives, DNA technology, Food faddism, Food adulteration, Food toxins-Natural and artificial

Role of nutrients in detoxification and nutrient-drug interaction, food allergy and food intolerance, Food microbiology Nutrition and Immunity, Role of microbes in nutrition (gut micro flora) .

SL. NO. -7: Excretory Physiology (Theory)

Paper Code: HP 905 E

Credit: 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand basic principles of renal function.
- Develop comprehensive understanding of structure function relationship of kidney.
- Understand the effect of disorders in kidney function..
- Mechanism of use of artificial kidney and related technologies.

Functional anatomy of kidneys, renal blood flow & its autoregulation, Glomerular filtration & its regulation, Tubular reabsorption & secretion . Concentration & dilution of urine, Mechanism of regulation of urine volume and osmolality,. Acidification of urine & bicarbonate excretion regulation of Na⁺ & Cl⁻ Excretion, Regulation of K⁺ Excretion, Body fluid compartments, Control of body fluid osmolality, Regulation of extracellular fluid volume and composition,

Diuretics, Renal function tests, Effects disordered renal function. Filling of Bladder, Emptying of bladder, Physiology of micurition, abnormalities of micturition,. Dialysis & renal transplantation.

SL. NO. -8: Research Methodology & Ethical Issues in Biomedical Research (Theory)

Paper Code : HP 906 E

Credit : 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand concept of different types of research.
- Develop comprehensive understanding On steps to be followed before undertaking a research activity.
- Understand the method for literature survey and protocol writing.
- Ethical issues in research involving animal and human subjects.

Research methodology: Formulation and testing of hypothesis, selecting the level of significance, making decision regarding hypothesis, research design, concepts relation to research design,

Experimental group, control group, treatment schedule, control, mechanism experimental units, Experimental errors, validity of research design, internal and external validity, threats to the validity of research design, Exploratory or formulating research design, descriptive or diagnostic research design, experimental research design,

Principle of experiment design, Principle of replication, Principle of randomisation, principle of local control, pilot study, selecting matching groups, Concept of experimental research, requirement for experimental research, characteristics of scientific methods, objectivity, generality, verifiability, predictability,

Steps in conducting research, formulating the research problem, survey and review of literature, Developing hypothesis and verifying concepts, deciding on research design, defining the population & selecting the sample, choice of methods,

Types of research, fundamental or basic research, applied or practical research, Experimental research, Lab experiments and field experiments,

Reporting: Preparation & submission of research report.

Research Ethics: Approved Guidelines by CPCSEA on the norms and practices for regulation of Animal Experimentation, CPCSEA Guidelines for Laboratory Animal Facility. Quarantine,

stabilization and separation, surveillance, diagnosis, treatment and control of disease, Personal hygiene, Animal experimentation involving hazardous agents, Physical restraint, Caging or housing system, Activity, food, bedding, water, sanitation & cleanliness, waste disposal, pest control, record keeping, Standard Operating Procedures, anaesthesia and euthanasia, Transgenic animal, Ethical Guidelines for biomedical Research on Human Participants (2006). Informed consent process, compensation for participation, Selection of special groups as research participants, essential information of confidentiality for prospective research participants, compensation for accidental injury, Statement of Specific Principles for Clinical Evaluation of Drugs/Devices/Diagnostics/Vaccines/Herbal Remedies

SL. NO. -9: Molecular Physiology of Human Diseases (Theory)

Paper Code : HP 907 E

Credit : 04.

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand mechanism of origin of cancer cells.
- Develop comprehensive understanding of cancers of different organs.
- Understand pathophysiology of disease associated with molecular and metabolic pathways..
- Molecular mechanisms of different neural disorders.

Cancer Metabolism and Possible Outcomes

Cancer biology: Cancer cell origin, derive from a single abnormal cell, cancer cells contain somatic mutation, cancer growth depends on defective control of cell death, cell differentiation or both, cancer cells may achieve immortality, metastasis, angiogenesis, causes of cancer, treatment.

Cell signaling: Cell surface Receptors, Second Messenger, positive & Negative Feedback in Signal System. Signaling through Enzyme-Linked Cell-Surface Receptors, Activated Receptor Tyrosine Kinases Phosphorylate Themselves, Ras Activates a Downstream Serine/Threonine Phosphorylation Cascade That Includes a MAP-Kinase, PI 3-Kinase Produces Inositol Phospholipid Docking Sites in the Plasma Membrane, The PI 3-Kinase/Protein Kinase B Signaling Pathway Can Stimulate Cells to Survive and Grow, Signaling proteins are frequently expressed as separate and independently controlled, Nuclear receptors regulate transcription, G-proteins regulate wide variety of receptors and are controlled by regulatory GTPase cycle. Wnt signaling regulates cell fate during development and other processes

Cancer Metabolism and Possible Outcomes, Breast and prostate cancer
Anatomy and Physiology of the Liver, Liver-Specific Metabolic Pathways and Processes, Inside-Out: Metabolites of the Liver Affecting Other Tissues, Outside-In: Metabolites of Other Tissues Affecting the Liver, Pathophysiology of Cirrhosis and Metabolic Alterations
Anatomy and Physiology of Fat Tissue
Fat Tissue-Specific Metabolic/ Molecular Pathways and Processes
Inside-In: Metabolites of Fat Tissue Affecting Itself, Inside-Out: Metabolites of Fat Tissue Affecting Other Tissues, Outside-In: Metabolites of Other Tissues Affecting Fat Tissue
Pathophysiology of the Metabolic Syndrome
Heart-Specific Metabolic/Molecular Pathways and Processes, Atherosclerotic Plaque Formation and Myocardial Metabolic Changes, Anatomy and Physiology of Blood Vessels
Pathological Changes in Metabolism Following Stroke Onset, Pathophysiology of Varicose Veins and Metabolic Alterations, Pathophysiology of Sickle Cell Disease and Metabolic Alterations
Physiological Lipoprotein Metabolism
Kidney-Specific Metabolic and Molecular Pathways and Processes
Kidney and hypertension, Chronic kidney disease and kidney stone
Brain-Specific Metabolic/Molecular Pathways and Processes, Inside-In: Metabolites of the Brain Affecting Itself, Inside-Out: Metabolites of the Brain Affecting Other Tissues
Outside-In: Metabolites of Other Tissues Affecting the Brain, Molecular physiology of Depressive Disorders and Metabolic Alterations
Monoamine Systems, Molecular physiology of Schizophrenia and Metabolic Alterations
Molecular physiology of Parkinson's Disease , Alzheimer's Disease and Metabolic Alterations
Anatomy and Physiology of Joints, Inside-In and Outside-In Signaling: Metabolites Affecting the Joints, Pathophysiology of Osteoarthritis
Molecular physiology of Rheumatoid Arthritis and Metabolic Alterations, Gout
Pancreas-Specific Metabolic Pathways and Processes, Pathophysiology of Diabetes Mellitus and Metabolic Alterations

4th Semester:

SL. NO. -10: Molecular Cancer Biology & Onco-immunology (Theory)

Paper Code: HP1001E

Credit: 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the mechanism and regulation of cell cycles..
- Develop comprehensive understanding of oncogenes and their function.
- Understand abnormalities in cell signaling pathways leading to cancer development..
- Understand the molecular mechanisms of tumor immunology and animal cell culture.

Cell cycle and its regulation, check points of cell cycle, different length of cell cycle of different types, cyclin dependent kinases (Cdks), cyclin dependent kinases cyclin complexes, G1-Cdk , G1 S-Cdk, G1 cyclins, E2F, Rb, G2- M transition, DNA damage and cell cycle regulation, withdrawal of cell from cell cycle, growth factors and cell proliferation. Apoptosis – death and mitochondrial pathway, caspases – executioner and intrinsic, Bcl-2 family proteins, activation of Bax & Bak, BH3 only protein, cytochrome C, inhibition of apoptosis by extracellular survival factors, Autophagy- induction and mechanism,

Phenotypic characters of cancer cells, types and derivation of cancer cells, protooncogenes and oncogenes, conversion of protooncogenes into oncogenes, tumor suppressor genes, oncogenes and their proteins – classification and characteristics, Role of cellular oncogenes in carcinogenesis, multicausal, multistep nature of carcinogenesis, telomere length and cancer cell survival, DNA viruses as transforming agents, RNA containing retro viruses as trans forming agents, Human tumor viruses, HPV and cancer, E6 and E7 onco-proteins, their mechanism of action.

Abnormalities in signaling pathways, cell cycle and apoptosis in cancer, mutations in pathways common to majority of cancers, PI3 K/AKT/mTOR pathway, mutation in P53 pathway, cancer cells survival in stress, angiogenesis, HIF, VEGF expression regulation, epigenetic changes in cancer, abnormal acetylation and methylation of histones and DNA in cancer.

Cancer stem cells, markers, stem cells signaling pathways, cancer diagnostic markers, diagnosis, therapy, phytochemicals.

Tumor Immunology, Tumor Antigens, Tumor antigen encoded by Oncogenes, Effector mechanism in Tumor Immunity, B-Cell response to Tumor, Cell mediated Response to Tumors,

cytokines, Limitation of effectiveness of Immune Response against Tumors, Tumor Immuno Prophylaxis, Immuno diagnosis.

Animal tissue culture, culture media and conditions, cancer and non cancer cell lines, cell migration assay, proliferation assay, FACS, Sanger's, chemical and next generation DNA (NGS) sequencing, RT PCR, Q PCR, DNA micro array, Reporter assay, Proteomics, Bioinformatics, protein and DNA data bank, sequence BLAST, DNA data submission, data mining.

SL. NO. -11: Advances in Immunology (Theory)

Paper Code: HP 1002 E

Credit: 04

Learning outcomes :

After completion of the course student should understand the following:

- Different immunological techniques used in diagnosis of disease.
- Concept about vaccine development.
- How genetically modified rodents is developed for research purpose.
- Determination of tumor antigen and how immune cells protect the body from tumor.

Antigenic determinants on immunoglobulins; B-cell receptor; B-cell maturation; B-cell activation and proliferation; Regulation of B-cell development; regulation of complement system; Complement deficiencies; Monoclonal antibody, Antibody generation, detection of molecules using ELISA, RIA, Immunoprecipitation

T-cell receptor, T-cell maturation, development and proliferation, T-cell activation.

Inflammation; Mediators of inflammation; The inflammatory process; Anti-inflammatory agents
Vaccines: Active and passive immunization; designing vaccines for passive immunization; Whole organism vaccines; purified recombinant vaccine; recombinant vector vaccines; multivalent subunit vaccines

Gene transfer into mammalian cell; Transgenic mice; gene targeted knockout mice; Inducible gene targeting-the Cre/lox system

Immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired immunodeficiencies. Toll-like receptor, antibody engineering

Tumor Immunology, Tumor Antigens, Tumor antigen encoded by Oncogenes, Effector mechanism in Tumor Immunity, B-Cell response to Tumor, Cell mediated Response to Tumors, cytokines, Limitation of effectiveness of Immune Response against Tumors, Tumor Immuno Prophylaxis, Immuno diagnosis.

Introduction to cell culture; choice of materials for cell culture; Procedures of cell culture
General methods and culture parameter; monolayer culture; suspension culture; immobilized culture, Cell line freezing and quantitation of recovery; cell line authentication, Cytotoxicity assay and viability assay. Fluorescence In Situ Hybridization (FISH), and GISH, Transfection
Basic principles for identification and purification of stem cells, Methods for the separation of different cell population

SL. NO. -12: Advances in Reproductive Physiology (Theory)

Paper Code: HP 1003E

Credit : 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the basic mechanism of sex determination and development of gonads in human.
- Develop comprehensive understanding of male and female reproductive organs and their functions.
- Understand the mechanism of actions of various contraceptive methods sexual dysfunction in male and female.
- Principles of use of different tools used in research on reproduction.

Sex determination and differentiation – mechanism of determination and sexual differentiation, chromosomal and gonadal sex, psychosexual development differentiation of gonads and differentiation of genital tract, disorders of sex development, neuroendocrinology of puberty.

Male reproductive system: overview of male reproductive physiology. Sex steroid production, transport and metabolism, germ cell development in testis, control of germ cell production, role of Y chromosome, Male sterility, azoospermia, oligozoospermia, asthenozoospermia, varicocele, genetic basis of male infertility, androgen deficiency syndrome .

Female reproductive system: overview of female reproductive physiology; ovarian differentiation and folliculogenesis, ovarian steroidogenesis, , ovulation, luteinization, luteolysis, follicular atresia, endometrium and regulation of endometrial cycle, menopause and menopausal changes, management of menopause, hormone replacement therapy, disorders of female reproductive system, anovulation, polycystic ovary syndrome.

Fertilization, capacitation, acrosomic reaction, sperm-egg fusion, activation of egg, prevention of polyspermy, implantation, placental development, placental hormone production, maternal adaptations to pregnancy, fetal growth and fetal endocrine system, intrauterine growth retardation, parturition and lactation.

Contraception leading to prevention of fertilization – surgical, hormonal and immuno-methods, emergency contraceptive measures, contraceptives from natural products. Assisted reproductive techniques, IVF.

Sexual dysfunction in men and women, erectile dysfunction, women's sexual dysfunctions, reproductive senescence in male and female, effect of endocrine disrupters on reproductive system, effect of heavy metals on reproductive system,

Designing experiments for the study of breeding and fertility – breeding of laboratory animals., principle and techniques of animal cloning

SL. NO. -13: Nutrition and Community Health (Theory)

Paper Code: HP 1004 E

Credit: 04

Learning outcomes :

After successful completion of the course, students should be able to:

- Understand the nutrition during different stages of life..
- Develop comprehensive understanding on nutrition related health defects..
- Understand the national and international policies on nutrition
- Current trends in nutrition research and its advancement.

Nutrition during life: Infancy, Childhood, Adolescent and youth, Aged, Adults and geriatric nutrition

Nutrition in special physiological need: Pregnancy, Lactation, geriatric nutrition, Exercise and sports, Menstruation, Space travel

Nutrition related health problems: Nutritional anaemia, prevalence, iron deficiency, megaloblastic, prevention over weight and obesity, complication of obesity and its management, Protein calorie malnutrition, Osteomalacia, Xerophthalmia, Endemic goitre

Dietary Management in: Diabetes mellitus, Hypertension, Gastro-intestinal disorders (Inflammatory Bowel Syndrome and diarrhoea), Pancreatic and Hepatic disorders, Renal diseases, Coronary Heart Diseases

Nutritional Survey: Dietary survey, Anthropometric and Biochemical evaluations Assessment of nutritional and growth status, Growth study: growth rate, maturation, growth during childhood, adolescence period, and adult stage, growth stunting.

National Nutritional Policy and Intervention Programmes: Role of National and International Organizations and NGOs in community nutrition, Food Standard and Consumer Protection

Current Trends in Nutritional Research and Development (sustainable and environmentally friendly nutrition, vegan and plant based nutrition, alternative proteins, ketogenic nutrition, sugar free nutrition, nutrition confusion and nutrition education).



TRIPURA UNIVERSITY
Department of Geography and Disaster Management

M.Sc. in Geography and Disaster Management

Programme Specific Outcome

At the end of the Programme student-

- Acquire knowledge in quantitative techniques and Cartography.
- Expertise to analyse Remote Sensing data (Satellite images) and GIS mapping.
- Expertise in small research project, field survey, and report writing etc.
- Acquire the knowledge on physical, human and applied fields of geography.
- Prepare for facing competitive exams like UPSC, TPSC, TET, SSC, PGT, TGT, etc.

SEMESTER I- 21Credits (Core Course (C): 13 Credits; Foundation Course (F): 4 Credits, Elective (E): 4 Credit)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 701C	Geomorphology	4			4	100

At the end of the course student-

- Acquire knowledge on the relationship between geomorphic processes and resultant landforms on the earth's surface.
- Could explain the mechanism of plate movement and related tectonic activities.
- Could assess the denudation processes and relate them in the real field.
- Well versed with evolutionary concepts of various landforms from different climatic regions.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 702C	Population & Settlement Geography	4			4	100

At the end of the course student-

- will be able to learn about population data sources
- have an idea about the population composition of the world and India.
- Understand the trends and patterns of the components of population change in India and the world.
- Learn the concepts of the population theories and the population policies and link with population characteristics.
- Get an idea about the settlement system both for rural and urban regions.
- Understand the spatial distribution of rural settlements and can recognize their shape, size and patterns.
- Can correlate environmental impact on house types in different parts of India
- Can identify different urbanized regions, can categorize settlement hierarchy and size-class distribution of towns.

- Acquire knowledge about new internal structure of towns and various models of development of urban areas.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 703C	Statistical Techniques and Cartography (Practical)			5	5	100

At the end of the course student-

- Are able to apply various statistical and cartographic techniques to deal with the available data in resolving geographical issues.
- Can understand the techniques of sampling.
- Knew how to correlate two or more variables.
- Acquire knowledge about spatial measurements of network analysis.
- Gets knowledge how to solve geographical data matrix.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 704E	Agricultural Geography	4			4	100

At the end of the course student-

- will be able to understand about the determinants of agricultural land use.
- Have an idea on the concepts, trends and patterns of land holdings
- Will know about the agricultural regions in the world and in India.
- Will have knowledge about different models in agricultural geography.
- Will know about different agricultural revolution and use of technology in agriculture.
- Will know about the importance of sustainable agriculture.
- Will learn about the agricultural developments and regional imbalances in India and the agricultural problems in India.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 705E	Regional Geography of India	4			4	100

At the end of the course student-

- To get Knowledge of regions and regionalization of India with changing time scale.
- To understand the regional issues, conflicts and regional disparities.
- To comprehend the concept of Regional Cooperation.
- To get the Policy Framework in Regional Development.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 706E	Environment & Ecosystem	4			4	100

At the end of the course student-

- Students will be able to recognize the physical and socio-cultural components of environment.
- Students will learn the various approaches of studying man-environment relation.

- Students will get knowledge of various ecosystems of the earth.
- Students will get updated with the various International and National acts, conventions and treatise for the protection of environment.

SEMESTER II- 25 Credits (Core Course (C): 17 Credits; Elective Paper from other department (E): 4 Credits, Elective (E): 4 Credit)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 801C	Climatology	4			4	100

At the end of the course student-

- Acquire knowledge about the Earth's atmosphere.
- Apply knowledge about atmospheric pressure and winds influences on climate.
- Understand the role of atmospheric moisture,
- Apply the learned knowledge in day-to-day life role of weather and climatic changes.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 802C	Fundamentals of Remote Sensing and GIS	4			4	100

At the end of the course student-

- Acquire knowledge about analyze and interpretation of aerial photographs and understand the principles of remote sensing, sensor resolutions etc.
- Acquire knowledge about image interpretation, image classification, and major satellite sensor and utilizations.
- Know to use Geographic Information System (GIS) software for contemporary mapping skills.
- Apply GIS to the preparation of different thematic maps.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 803C	Remote Sensing and GIS (Practical)			5	5	100

At the end of the course student-

- Apply Aerial Photographs for preparation of LULC map.
- Apply knowledge to prepare density slicing, supervised and unsupervised classification maps through satellite images in ILWIS software.
- Apply knowledge to digitize satellite images for prepare the maps through QGIS.
- Apply knowledge for preparation and analyzing maps like e the DEM, DTM, TIN etc through QGIS software.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 804C	Social and Political Geography	4			4	100

At the end of the course student-

- will be able to learn and understand about the nature and scope of social geography and its relationship with other disciplines.
- Will get an idea about the development of social geography in India.
- Will be able to identify the patterns of geographical distribution of tribes, caste, languages and religions.
- Will be able to identify the socio-cultural regions of India.
- will be able to learn and understand nature and scope of political geography and its relationship with other disciplines.
- Will understand the theories of political geography.
- Will understand the concepts and classification of state, nation, frontiers, boundaries, territory etc.
- Will get an idea about electoral geography.
- Will understand the geostrategic views.
- Will have an idea about the conflicts and disputes based on religion, language, resources and the conflict resolution through global and regional association and organizations.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 805E	Geography of North-East India & Tripura	4			4	100

At the end of the course student-

- Acquire knowledge on physical environment of North-east India in general and Tripura in particular.
- Develop ideas on natural resource bases and their management for regional development.
- Know demographic pattern of the region with the history of abnormal growth of population in Tripura.
- Idea on potentialities and prospects for economic development of the northeastern region with particular reference to Tripura.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 806E	Soil & Biogeography	4			4	100

At the end of the course student-

- Understand the soil structure and formation of soils.
- Understand soil classification and major soil groups in India.
- Awareness about causes of soil pollution and environmental degradation.
- Acquire knowledge about the role of biodiversity and conservation of forest and wildlife.
- Know the wildlife acts and policies.

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Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 807E	Geography of Tourism	4			4	100

At the end of the course student-

- To understand the significance of Tourist resources, related factors and philosophy, problem.
- To discuss the significance of Conservation of tourist spots.
- To corelate tourism management and economic development.
- To review the Tourism planning, strategy

SEMESTER II- 21 Credits (Core Course (C): 17 Credits; Elective (E): 4 Credit)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 901C	Hazard and Disaster Management	4			4	100

At the end of the course student-

- Will be able to understand the concepts of hazards and disasters.
- Will know the different types of hazards and disasters.
- Will understand the causes and consequences of hazards and disasters.
- Will have an idea disaster management of hazards and disasters.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 902C	Geographical Thought	4			4	100

At the end of the course student-

- To identify historical evolution of the progress of geographical knowledge
- To gather knowledge about the philosophical contribution of philosophers and relate with different philosophical theorization
- To understand gradual Changing world and its geographical analysis, philosophical debate
- To discuss evolution of thought process the Indian geography

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 903C	Research Methods and Techniques in Geography	4			4	100

At the end of the course student-

- Get to learn how to prepare a research work starting from identifying the problem, preparing the hypothesis and deriving the objectives to understanding the problem.

- learn to resolve the issues both quantitatively and qualitatively and finally how to present it as a report.
- Understand formulate research based on specific problems in Geography and Disaster Management.
- Know how to prepare hypothesis and ask research questions.
- Know how to review literature from a specific field of research.
- Know how to devise methodology based on different studies.
- Know how to carry out research based on suitable statistical methods.
- Know how to analyse the data.
- Know how to write the results of the study and discuss w.r.t similar studies.
- Know how to write the final report in the form of dissertation.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 904C	Surveying & Field Report			5	5	100

At the end of the course student-

- Students get to physically verify the problems and issues related to urban and rural areas by visiting the spot and interacting with the various stakeholders of the region.
- To Measure a physical object/ area of a geographical space with survey instrument; Mathematical Calculation and drawing of a map/ plan.
- Process of primary data collection through different methods, interaction and knowledge of analysis of real society, identification of physio-socio-economic issues, connect social issues and geographical knowledge.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 905E	Natural Resource Management	4			4	100

At the end of the course student-

- Students will learn the various types and distribution of natural resources.
- Students will understand the importance of conservation and management of natural resources.
- Students will get update with the Know the major resource region in India and North-East India.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 906E	Hydrology & Water Resource Management	4			4	100

At the end of the course student-

- Acquire the knowledge on hydrological parameters.
- Know the importance of surface water hydrology and surface water resources in India.
- Apply the knowledge for estimation of groundwater resources and flow.

<ul style="list-style-type: none"> • Apply the knowledge when society facing challenges like drought, floods, water conflicts, water contamination etc. • Suggest to public importance of water harvesting and conservation. 						
Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 907E	Urban Geography	4			4	100
At the end of the course student- <ul style="list-style-type: none"> • To get information and Evolution of urban geography and urbanization in terms of spatio-temporal context . • To corelate the urban infrastructure associated with urban issues and environment. • To Symbiotic relationship between Urban economy and urban population. • To analyse critically the urban environmental problem. 						

SEMESTER IV- 19 Credits (Core Course (C): 15 Credits; Elective (E): 4 Credit)

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1001C	1- Fluvial Geomorphology	4			4	100
At the end of the course student- <ul style="list-style-type: none"> • Understand the mechanism of stream hydraulics. • Acquire knowledge on river morphology. • Could identify structural and lithological controls upon the stream channels and different drainage patterns. • Gain analytical efficiency to highlight the impact of human being on river. 						
Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1001C	2- Regional Planning & Development	4			4	100
At the end of the course student- <ul style="list-style-type: none"> • To make a detailed analysis of region and regionalization area-bases planning. • To get information about theories and models of regional Planning. • To analyse the issues related to Urban issues and development. • To analyse the issues related to Rural Planning and development. 						
Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		

GEDM 1001C	3- Transport Geography	4			4	100
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At the end of the course student-

- Understand the concepts of transportation in relation spatial interconnection and the recent trends in transportation.
- Get an idea about demand and supply and transport economics.
- Acquire knowledge about trade, its global and local patterns
- Understand the dynamics of different transport modes
- Obtain an idea about various transport policies and its implications
- Will be able to relate with the real-life issues of transport, particularly in an urban landscape.
- The students will be able to understand the concepts of transportation and will be able to relate with the real-life issues of transport, particularly in an urban landscape.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1001C	4- Applied Studies in Resources & Environmental Management	4			4	100

At the end of the course student-

- Know the major resources in India and Tripura.
- Understand the effects of flash floods, droughts, cloudburst and cyclones.
- Know the effectiveness of land-induced disaster.
- Acquire knowledge on forest fire, man-wildlife conflict, nuclear hazard etc.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1001C	5- Population & Resource	4			4	100

At the end of the course student-

- will be able to understand the components of population change, their trends and geographical patterns and its implications.
- Will be able to correlate the relationship between population and resource.
- Will understand the trends, patterns and implications of different population groups.
- Will know about the distribution and access to resources based on gender, location, caste, tribe, ethnicity and religion.
- Will understand the conflicts on access and distribution to resource.
- Will have an idea about the trends and patterns of resource consumption and its effect on the environment.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		

GEDM 1001C	6- Watershed Management	4			4	100
At the end of the course student-						
<ul style="list-style-type: none"> • Know watershed concepts, character sic and significance of watershed • Acquire knowledge relation between water and soil. • Acquire knowledge on water resource appraisal. • Acquire knowledge importance of soil and water conservation, and watershed management and planning. 						
Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1002C	1- Fluvial Geomorphology (Practical)			5	5	100
At the end of the course student-						
<ul style="list-style-type: none"> • Could analyse drainage basin through various morphometric techniques. • Acquire practical knowledge to analyse spatial-temporal changes in river morphology. • Could generate hydrological data through field investigation. • Develop skill to represent cartographic data using MS excel and to prepare vector layers from raster maps using GIS technique. 						
Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1002C	2- Regional Planning & Development (Practical)			5	5	100
At the end of the course student-						
<ul style="list-style-type: none"> • To analyse the regional concentration and disparity • To analyse the correlation of transport and Regional Development • To analyse Regional Growth. • To make Dissertation oriented on real regional Problems/issues. 						
Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1002C	3- Transport Geography (Practical)			5	5	100
At the end of the course student-						
<ul style="list-style-type: none"> • Will get an idea about how the transportation network of an area can be estimated and how to identify the lacunae therein. • Gets a hand-on experience on the use of instruments and GIS in transportation analysis • Get to learn how to identify and resolve problems related to transport through their dissertation work. 						
Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		

GEDM 1002 C	4- Applied Studies in Resources & Environmental Management (Practical)			5	5	100
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At the end of the course student-

- Get knowledge about soil testing parameters.
- Gets knowledge about water quality parameters.
- understand the use of climograph, hythergraph, ergograph etc.
- SWOT analysis.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1002 C	5- Population & Resource (Practical)			5	5	100

At the end of the course student-

- Will be able to measure and apply the components of population change
- Will be able to measure and apply the components of population distribution.
- Will be able to measure and apply the components of population composition.
- Will be able to measure and apply the components of inequality.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1002 C	Watershed Management (6) (Practical)			5	5	100

At the end of the course student-

- Apply knowledge to morphometric analysis.
- Apply to know water surplus and deficit areas.
- Apply to know the water quality for the purpose of domestic and agricultural use.
- Apply knowledge to know land capability and suitability of crops.
- Apply to prepare maps of land capability, NDWI, MNDWI, SWAT etc through GIS environment.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1003C	Dissertation			6	6	100

At the end of the course student-

- Acquire knowledge for preparation of research problem.
- Know the frame objectives and research questions.
- Know the collection of primary and secondary data.
- Know the application of suitable statistical methods according to research problem.
- Acquire knowledge analysis of data on objectives oriented.
- Acquire knowledge to delineate the results and conclusion.

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1004 E	Industrial Geography	4			4	100

At the end of the course student-

- To understand the classification, evolution of Industry.
- To get knowledge about Industrial Theory with present day relevance
- To know about Industrial policy of India, Industrial labour class, labour law.
- To identify the Problems and issues of related to industry, resources, market

Course Code	Name of the Course	Credit Distribution			Total Credit	Marks (Scaled)
		L	T	P		
GEDM 1005 E	Historical and Cultural Geography	4			4	100

At the end of the course student-

- Understand the concepts of culture, cultural landscapes and cultural ecology.
- Gets to know how cultural diffusion occurs and can distinguish ideas related to acculturation, assimilation etc.
- Enhance knowledge about global culture, culture and technological development and hybridization of world culture.
- Will be able to understand the nature and scope of historical geography.
- Identify the sources of historical geography.
- Have knowledge about the territorial organisations and the socio-economic condition of India during the ancient, medieval and colonial period.

**Curriculum Structure & Syllabus
(CBCS Pattern)**

**Master of Technology
(Information Technology)**



**TRIPURA UNIVERSITY
(A Central University)
Suryamaninagar, Tripura(W)
PIN: 799022, India**

M.Tech in Information Technology

Features:

1. Advanced study through Core subjects, flexible and diverse program specific electives.
2. Open Electives to widen knowledge
3. Foundation compulsory course
4. Engagement of Industry in developing innovations and problem solutions.
5. Collaborative learning
6. Ensured competency development of learner.

Students going for Industrial Project/ Thesis will complete these courses through MOOCs.

*Students to be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.

Program Outcomes (PO) of M.Tech (IT) program:

At the end of the program a student is expected to have:

1. An understanding of the theoretical foundations and the limits of computing.
2. An ability to adapt existing models, techniques, algorithms, data structures, etc. for efficiently solving problems.
3. An ability to design, develop and evaluate new computer-based systems for novel applications which meet the desired needs of industry and society.
4. Understanding and ability to use advanced computing techniques and tools.
5. An ability to undertake original research at the cutting edge of computer science & its related areas.
6. An ability to function effectively individually or as a part of a team to accomplish a stated goal.
7. An understanding of professional and ethical responsibility.
8. An ability to communicate effectively with a wide range of audience.
9. An ability to learn independently and engage in lifelong learning.
10. An understanding of the impact of IT related solutions in an economic, social and environment context.

Program Specific Outcomes (PSO) of M.Tech (IT) program:

The programme will enable the student to:

1. Design, develop, implement, integrate and administer IT-based solutions of real-life computing problems using current and emerging, contemporary technologies.
2. Synthesize and evaluate models for IT management, demonstrate data analysis skills, manage the various aspects of an IT organization, for effective interpretation and decision making to solve real life problems.
3. Show expertise to communicate in both oral and written forms, demonstrating the practice of professional ethics and the concerns for social welfare using accepted standards and best practices.
4. To engage in research and development activities to ideate, innovate and carry out research and education in the fields of Information Technology.

Examination Schedule:

1. First Semester Examination, December- Every year
2. Second Semester Examination, April/May- Every year
3. Third Semester Examination, December- Every year
4. Fourth Semester Examination, April/May- Every year

CURRICULUM & SYLLABUS (CBCS PATTERN)

M.Tech in Information Technology

M.TECH (IT) SEMESTER 1

Course Code	Course Title	L-T-P	Credits	Mark	MOOC
IT0901C	Probability and Random Process	3-1-0	4	100	Yes
IT0902C	Computer Networks and Internet Protocol	3-1-0	4	100	
IT0903C	Research Methodology and IPR	2-0-0	2	100	
IT0904C	Laboratory I (Based on Cores)	0-0-4	2	100	
IT0905C	Laboratory II (Based on Electives)	0-0-4	2	100	
IT00XXE	Elective I	4-0-0	4	100	
IT00XXE	Elective II	4-0-0	4	100	
Total Credits	<i>5 Theory, 2 Laboratories</i>	<i>16-2-8</i>	22	700	

M.TECH (IT) SEMESTER 2

Course Code:	Course Title	L-T-P	Credits	Mark	MOOC
CSK-III	Computer Skill- III (As per CBCS)	4-0-0	4	100	Yes
IT1001C	Data Structures and Algorithm	3-1-0	4	100	Yes
IT1002C	Laboratory III (Based on Cores)	0-0-4	2	100	
IT1003C	Laboratory IV (Based on Electives)	0-0-4	2	100	
IT1004C	Mini Project with Seminar	0-0-4	2	100	
IT00XXE	Elective III	4-0-0	4	100	
IT00XXE	Elective IV	4-0-0	4	100	
Total Credits	<i>4 Theory, 3 Laboratories</i>	<i>15-1-12</i>	22	700	

M.TECH (IT) SEMESTER 3

Course Code:	Course Title	L-T-P	Credits	Mark	MOOC
IT1101C	Thesis Report Interim I	0-0-12	6	100	
IT1102C	Thesis Seminar Interim I (Presentation and Viva)	0-0-12	6	100	
IT00XXE	Elective V	4-0-0	4	100	
	Open Elective (Other Department)	4-0-0	4	100	
Total Credits	<i>2 Theory, 2 Laboratories</i>	8-0-24	20	400	

M.TECH (IT) SEMESTER 4

Course Code:	Course Title	L-T-P	Credits	Mark	MOOC
IT1201C	Thesis Report Interim II	0-0-16	8	400	
IT1202C	Thesis Seminar Interim II (Presentation and Viva)	0-0-16	8	400	
IT00XXE	Elective VI	4-0-0	4	100	
Total Credits	<i>2 Laboratories</i>	0-0-40	20	800	

Note.: C –Core, E- Elective, P – Practical, L- Lectures, T- Tutorial

CREDIT CALCULATION

Course Type →	Foundation	Theory	Practical	Departmental Elective	Open Elective
Semester I	-	10	04	08	-
Semester 2	04	04	06	08	-
Semester 3	-	-	12	04	04*
Semester 4	-	-	16	04	-
Credit →	04	14	38	24	04*
	Foundation: 04	Core Credit: 52		Elective Credit: 28	
	Total Credit: 84				

* Open Elective: As offered by other departments of Tripura University in respective semester under CBCS

DETAIL SYLLABUS

M.Tech in Information Technology

Probability and Random Process	IT0901C
3-1-0: 4 Credits	Prerequisites: <i>None</i>

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understands the basics of probability, sample space, events, statistics and apply them to real life problems.

CO2: Distinguish probability density and distribution functions for single and multiple random variables.

CO3: Calculate the statistical parameters for random variables.

CO4: Analyze the concept of random process along with its parameters.

Course Content:

Introduction to probability and Random Processes, Infinite sequence of events

Convergence of a sequence of random variables

Laws of large numbers, central limit theorem

Discrete time Markov chains: Markov property, state transition, Chapman Kolmogorov Equations, classes and recurrence properties

Continuous time Markov Chain: Forward and backward equations; Birth-death Processes.

References:

1. H. Kobayashi, B. L. Mark, and W. Turin, Probability, Random Processes, and Statistical Analysis, Cambridge, 2012.
2. R. Gallager, Stochastic Processes: Theory for Applications, Cambridge, 2014.
3. Papoulis, Probability, Random Variables, and Stochastic Processes, Mc-Graw Hill, 2005.
4. Leon-Garcia, Probability, Statistics, and Random Processes for Electrical Engineering, Third Edition, Prentice-Hall, 2008.

Computer Networks and Internet Protocol	IT0902C
3-1-0 : 4 Credits	Prerequisites: <i>None</i>

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Acquire knowledge on data communication and basic concept of networking.

CO2: Understand the concept of transmission media and Ethernet.

CO3: Design a network for a particular application.

CO4: Understand to Analyse the performance of the networks with applications

Course Content:

Introduction to Computer Networks – History, Circuit Switching and Packet Switching

TCP/IP Protocol Stack – Basic Overview

Application Layer Services (HTTP, FTP, Email, DNS)

Transport Layer Primitives – Connection Establishment and Closure

Flow Control and Congestion Control at the Transport Layer

Transmission Control Protocol – Basic Features, TCP Congestion Control

Network Layer Primitives – IP Addressing

IP Routing – Intra Domain Routing Protocols, Inter Domain Routing Protocols (BGP)

IP Services – SNMP, ARP

Data Link Layer Service Primitives – Forwarding, Flow Control, Error Control

Media Access Control - Channel Access Protocols, Framing

End to End Principles of Computer Networks

References:

1. B. A. Forouzan – “Data Communications and Networking (3rd Ed.) “ – TMH
2. A. S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI
3. W. Stallings – “Data and Computer Communications (5th Ed.)” – PHI/ Pearson Education
4. Kurose and Rose – “Computer Networking -A top down approach featuring the internet” – Pearson Education
5. Computer Networks: A Systems Approach Book by Bruce S. Davie and Larry L. Peterson
6. TCP/IP Tutorial and Technical Overview, (IBM Redbook) - Download From <http://www.redbooks.ibm.com/abstracts/gg243376.html>
7. TCP/IP Guide, Charles M. Kozierok, Available Online - <http://www.tcpipguide.com>
8. Request for Comments (RFC) - IETF - <http://www.ietf.org/rfc.html>
9. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP
10. Black, Data & Computer Communication, PHI
11. Miller, Data Communication & Network, Vikas
12. Miller, Digital & Data Communication, Jaico
13. Shay, Understanding Data Communication & Network, Vikas
14. Leon, Garica, Widjaja – “Communication Networks” – TMH
15. Walrand – “Communication Networks” – TMH.
16. Comer – “Internetworking with TCP/IP, vol. 1, 2, 3 (4th Ed.)” – Pearson Education/PHI

Research Methodology and IPR	IT0903C
2-0-0 : 2 Credits	Prerequisites: <i>None</i>

Course Outcomes:

At the end of the course, students will be able to:

- CO1: Formulate a research problem for a given engineering domain.
- CO2: Analyze the available literature for given research problem.
- CO3. Develop technical writing and presentation skills.
- CO4. Comprehend concepts related to patents, trademark and copyright.

Course Content:

Research Formulation and Design: Research methods *vs.* Methodology. Types of research – Descriptive *vs.* Analytical, Applied *vs.* Fundamental, Quantitative *vs.* Qualitative, Conceptual *vs.* Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.

Data Collection and Analysis: Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statically package, hypothesis testing.

Research Ethics, IPR and Scholarly Publishing: Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights ; scholarly publishing- concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability.

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions.

References:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.

2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, EssEss Publications. 2 volumes.
4. Wadehra, B.L. 2000. Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.
5. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
6. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.
7. Day, R.A., 1992. How to Write and Publish a Scientific Paper, Cambridge University Press.
8. Fink, A., 2009. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications
9. Satarkar, S.V., 2000. Intellectual property rights and Copy right. EssEss Publications.

Laboratory I (Based on Cores)	IT0904C
0 - 0 - 4 : 2 Credits	Prerequisites: <i>None</i>

Course Outcomes:

- CO1: To understand fundamental underlying principles of computer networking, understand details and functionality of layered network architecture.
- CO2: To understand the working principle, analyze performance and compare various communication/ MAC protocols.
- CO3: To understand the working principle, analyze performance and compare various routing protocols.
- CO4: To know the concept and practice data transmission between nodes/ transport layer protocols

Course Contents:

Course contents is based on core course IT0902C.

References:

Reference is based on core course IT0902C.

Laboratory II (Based on Elective)	IT0905C
0 - 0 - 4 : 2 Credits	Prerequisites: <i>None</i>

Course Outcomes:

Course outcomes are same as Elective I or/and Elective II courses.

Course contents:

Course contents are based on Elective I or/and Elective II courses.

Reference:

References are based on the Elective I or/and Elective II courses.

M.TECH (IT) SEMESTER 2

Computer Skill III	CSK-III
3 - 1 - 0 : 4 Credits	Prerequisites: <i>None</i>

Course Outcomes:

- On successful completion of the course students will be able to:
- CO1: Understand basic concepts of Java such as Operators, Classes, Objects, Interface, Inheritance, Packages, Enumeration and various keywords
- CO2: Understand the concept of Exception Handling, Collections, Input/output operations, Socket Programming, Database Connectivity
- CO3: Design the applications of Java, Swing, Applet and JSP
- CO4: Analyze and Design the concept of Event Handling and Abstract Window Toolkit (AWT)

Course Content:

1. Fundamentals of Object-Oriented Programming, Java Evolution, Java History

2. Java Features: Overview of Java Language, Constants, Variables and Data Types, Operators and Expressions, Decision making, branching and looping.
3. Classes, Objects and Methods, Arrays, String and Collections, Interfaces, Packages, Managing Errors and Exceptions
4. Multithreading, Applet Programming, Java AWT, Event Handling
5. Java I/O Handling, Java Database Connectivity,

References:

1. Programming in Java by Sachin Malhotra and Saurabh Choudhary, Oxford Higher education.
2. Java: The Complete Reference by Herbert Schildt, McGraw-Hill Education.
3. Java:A Premier by E. Balaguruswami, Tata Mcgraw Hill Education Private Limited.

Data Structures and Algorithm	IT1001C
3- 0 - 0 : 3 Credits	Prerequisites: <i>None</i>

Course Outcomes:

CO1: Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.

CO2: Master a variety of advanced abstract data type (ADT) and data structures and their implementations.

CO3: Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc.)

CO4: Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

Course Content:

Introduction to Computers and Programming

Pointers; Functions; Running time of a program; Computing time complexity

Polynomial evaluation and multiplication

Arrays and Multidimensional arrays

Searching: Binary Search, Linear;

Sorting: Insertion Sort, Merge Sort, Quick Sort, Heap Sort, Counting, Radix

Structures and User-defined data types

Links Lists: Operation – Creations, insertion, Deletion; Circular Lists; Doubly Linked List

Stacks: Operations and Applications; Queues: Operations and Applications; Circular Queues:

Operations and Applications;

Tree: Binary Trees - Operations: Insert, Delete ; Traversal: Preorder, Inorder, Postorder; Search Trees - AVI-trees , B-tree , External Search;

Graphs: Representation: Matrix, Adjacency list; Traversal: Depth First Search, Breadth First Search;

Minimum Spanning Tree , Shortest Path , All pairs Shortest Path, Transitive Closer;

Hashing Techniques; Sets : Representation , Operations: Union and Find;

String Algorithms : Pattern Matching , Text Editor;

Greedy algorithms; Dynamic programming; Matrix Chain Multiplication; Dijkstra's Algorithm

Boyer-Moore String Matching Algorithm.

References:

1. S.Lipschutz, “Theory and Problem of Data Structure”, Schaum’s Outline Series, Tata McGraw-Hill
2. Tannenbaum, “Fundamentals of Data Structures”, PHI
3. R.L. Kruse, B.P. Leary, C.L. Tondo, “Data structure and program design in C” , PHI
4. Horowitz and Sahani, “Fundamentals of Data structures”, Galgotia publications
5. “Data Structures Using C” - ReemaThareja
6. “Introduction to Data Structures in C” – Ashok N. Kamthane
7. Classic Data Structures - D Samanta

Laboratory III (Based on Cores)	IT1002C
0 - 0 - 4 : 2 Credits	Prerequisites: <i>None</i>

Course Outcomes:

CO1: Professional/academic knowledge and skills, Understand the properties of various data structures.

CO2: Identify the strengths and weaknesses of different data structures.

CO3: Design and employ appropriate data structures for solving computing problems.

CO4: Possess the knowledge of various existing algorithms; Analyze and compare the efficiency of algorithms.

Course contents:

Course contents are based on core course of CSK-III or/and IT1001C.

References:

Reference is based on core course of CSK-III or/and IT1001C.

Laboratory IV (Based on Electives)	IT1003C
0 - 0 - 4 : 2 Credits	Prerequisites: <i>None</i>

Course Outcomes:

Course outcomes are based on Elective III or/and Elective IV courses.

Course contents:

Course contents are based on Elective III or/and Elective IV courses.

References:

Reference are based on the Elective III or/and Elective IV courses.

Mini Project and Seminar	IT1004C
0 - 0 - 4 : 2 Credits	Prerequisites: Core courses of M.Tech IT program

Course Outcomes:

Because the curriculum is about individuals, there are no specific course level learning outcomes. Nevertheless, after completion of the course, students would be able to:

CO1: Explain factual knowledge (terminology, classifications, methods, trends) of current areas of research.

CO2: State and explain some fundamental principles, generalizations, or theories the student has learned in this course.

CO3: To apply gained knowledge in thinking, problem solving, or decisions making process. To achieve specific skills, competencies, and points of view needed by computing professionals.

CO4: to judge the value of different contributions and to identify promising new directions.

Course Contents:

Student presentations: Each student will present papers (current areas of research) during the term.

Class evaluations: Each week each student is asked to write a short evaluation of one of the papers being presented.

Class Discussion: Discuss the papers – expose the flaws, analyse the writing, what was the impact?. Communicate the research ideas in SCI Journals.

Course Objectives:

1. to create an environment to engage students in delivering and listening to interesting talks that promotes discussion
2. to provide students with opportunity to learn new concepts and skills acquired in core courses and further extend these ideas to solve research/industry related problems
3. know how to read research papers critically and efficiently
4. to learn fundamental principles, generalizations and important theories of Computer Science
5. to enable students to find their own field of interest in academia, industry or entrepreneurship
6. to help students develop their own learning and teaching styles and communication skills

References:

A list of works will be posted by mentors/teachers at the start of the course. The students also have the option of choosing works according to his/her own areas of interest.

M.TECH (IT) SEMESTER 3

Thesis Report Interim I	IT1101C
0 - 0 - 4 : 2 Credits	Prerequisites: <i>None</i>

Course Outcomes:

CO1: Demonstrate sound fundamentals in a chosen area of computing. Identify and formulate a problem of research interest in the chosen area of computing.

CO2: Analyze the computing problem and propose solutions.

CO3: Apply the emerging technologies like – Blockchain, IoT, Robotics, ML, AI, Datamining, Big Data Analytics in solving some challenging problem in chosen area.

CO4: Effectively communicate the work at all stages of the project.

Course contents:

The student is expected to carry out supervised research in this course. An intensive literature in the chosen area, should result in sound knowledge in the area and result in the identification of a suitable research problem, and its formulation and analysis. Study of relevant supplementary literature, such as mastering useful programming languages and tools for the problem, are also expected at this stage of the project. The student is expected to present two or more reports at different evaluation points during the semester, with clearly defined achievements and plans for further steps. Communicate the research ideas in SCI Journals.

References:

Relevant literature and software tools for the chosen problem.

Thesis Seminar Interim I (Presentation and Viva)	IT1102C
0 - 0 - 4 : 2 Credits	Prerequisites: <i>None</i>

Course Outcomes:

CO1: Collaborate to learn new content and gain diverse perspectives.

CO2: Understand concept of any particular research area and survey it.

CO4: Acquire knowledge of a different field and to discuss ideas and information so as to apply these skills to a technical research paper and communicate the ideas in SCI Journals.

CO4: Acquire the ability to develop skills in presentation and discussion of research topics in a public forum.

Course contents:

Course contents are based on course “Thesis Report Interim I (IT1101C)”.

References:

Relevant literature and software tools for the chosen problem.

Open Elective (Other Department)	
0 - 0 - 4 : 2 Credits	Prerequisites: <i>None</i>

Course Outcomes:

Course outcomes are based on open elective courses offered by other departments of Tripura University.

Course contents:

Course contents are based on open elective courses offered by other departments.

References:

Reference are based on open elective courses offered by other departments

M.TECH (IT) SEMSTER 4

Thesis Report Interim II	IT1201C
0 - 0 - 16 : 8 Credits	Prerequisites: <i>None</i>

Course Outcomes:

- CO1: Identify a suitable problem to be solved computationally.
- CO2: Reflectively analyze proposed solutions to the identified computing problem.
- CO3: Design and develop solutions to the problem and analyze results.
- CO4: Prepare a thesis and defend the thesis on the work done. Augment the knowledge base in the chosen area of computing, adhering to ethical practices at every stage.

Course contents:

The students are expected to demonstrate the core competency in the development of enhancements to the knowledge base in the area of interest in computing. The secondary competencies include the management of time bound projects involving research, analysis of problem complexities, design and development of effective solutions and communication of the project's progress, adhering to ethical practices at every stage. This stage of the project evaluates the state of maturity of these competencies. The students are expected to present two reports at intermediate stages, as well as prepare and defend a thesis on their research work.

The students will usually continue the project work in "Thesis Report Interim I (IT1101C)" or optionally can take a new research-oriented project in consultation with the assigned project supervisor.

References:

Relevant literature and software tools for the computing problem.

Thesis Seminar Interim II (Presentation and Viva)	IT1202C
0 - 0 - 16 : 8 Credits	Prerequisites: <i>None</i>

Course Outcomes:

- CO1 Ability to develop skills in presentation and discussion of research topics in a public forum.
- CO2 Able to get exposure to a variety of research projects and activities in order to enrich their academic experience
- CO3 Ability to develop and enhance leadership skills.
- CO4 Able to improving communication skills, presentation skills and other soft skills.

Course contents:

Course contents are based on course "Thesis Report Interim II (IT1202C)".

References:

Relevant literature and software tools for the computing problem.

ELECTIVE SUBJECTS
M.Tech in Information Technology

Course Code	Course Title	L-T-P	Credits	MOOC
IT0001E	Adhoc and Sensor Networks	4-0-0	4	Yes
IT0002E	Advanced Graph Theory	4-0-0	4	Yes
IT0003E	Advanced Microprocessor	4-0-0	4	No
IT004E	Artificial Intelligence	4-0-0	4	Yes
IT0005E	Bioinformatics	4-0-0	4	Yes
IT0006E	Cloud Computing	4-0-0	4	Yes
IT0007E	Compiler Design	4-0-0	4	Yes
IT0008E	Computational Geometry	4-0-0	4	Yes
IT0009E	Computational Systems Biology	4-0-0	4	Yes
IT0010E	Computer Architecture	4-0-0	4	Yes
IT0011E	Cryptography and Network Security	4-0-0	4	Yes
IT0012E	Data Mining	4-0-0	4	Yes
IT0013E	Data Science	4-0-0	4	Yes
IT0014E	Deep Learning	4-0-0	4	Yes
IT0015E	Digital Signal Processing	4-0-0	4	Yes
IT0016E	Distributed System	4-0-0	4	Yes
IT0017E	Embedded Systems	4-0-0	4	Yes
IT0018E	Image Processing	4-0-0	4	Yes
IT0019E	Information Theory and Coding Techniques	4-0-0	4	Yes
IT0020E	Internet of Things	4-0-0	4	Yes
IT0021E	Knowledge Representation and Reasoning	4-0-0	4	Yes
IT0022E	Machine Learning	4-0-0	4	Yes
IT0023E	Medical Electronics	4-0-0	4	No
IT0024E	Mobile Computing	4-0-0	4	Yes
IT0025E	Modern Digital Communication Techniques	4-0-0	4	Yes
IT0026E	Modern Digital System Design	4-0-0	4	No
IT0027E	Multimedia processing	4-0-0	4	Yes
IT0028E	Natural Language Processing	4-0-0	4	Yes
IT0029E	Pattern Recognition	4-0-0	4	Yes
IT0030E	Social Network	4-0-0	4	Yes
IT0031E	Soft Computing	4-0-0	4	Yes
IT0032E	Software Engineering	4-0-0	4	Yes
IT0033E	Switching Circuits and Logic Design	4-0-0	4	Yes
IT0034E	Theory of Computation	4-0-0	4	Yes
IT0035E	Web Technology	4-0-0	4	No

DETAIL SYLLABUS OF ELECTIVE SUBJECTS

M.Tech in Information Technology

Adhoc and Sensor Networks	IT0001E
Prerequisites: Basic concepts on Data Communications and Networking	4 - 0 - 0

Course Outcomes:

At the end of the course the student will be able to

CO1: Identify the major issues associated with ad-hoc/sensor networks.

CO2: Explore current ad-hoc/sensor technologies by researching key areas such as algorithms, protocols, hardware, and applications.

CO3: Gain hands-on experience through real-world programming projects on ad-hoc/sensor hardware.

CO4: Implement or develop algorithms involved in MAC/ Routing/ Transport Layers of ad-hoc/sensor systems.

Course Content:

MANET - Introduction, Self-organizing behavior, Co-operation, MAC, Routing;

Multicast routing, Mobility model, Transport layer,

Opportunistic Mobile Networks, UAV networks, Wireless Sensor;

Networks (Introduction)- WSN (Coverage, Topology management), Mobile Sensor Networks;

MAC, Congestion control, Routing; Underwater WSN;

Security, Structure of sensor nodes;

References:

1. Carlos D Corderio and Dharma P. Aggarwal, "Ad Hoc and Sensor Networks: Theory and Applications", 2nd Edition, World Scientific Publications, 2011.
2. I. C. Siva Rama Murthy and B.S. Manoj , "Ad Hoc Wireless Networks: Architecture and Protocols", 2nd Edition , Pearson Education, 2009.
3. 2. Sudip Misra, Isaac Woungang and Subhas Chandra Misra, "Guide to Wireless Ad Hoc Networks" , 1st Edition, SpringerVerlag London Limited, 2009.

Advanced Graph Theory	IT0002E
Prerequisites: Discrete Mathematics	4 - 0 - 0

Course Outcomes:

Students by the end of the course will be able to

CO1: Describe common graph algorithms including graph traversals, pathfinding, greedy algorithms, recursion, and dynamic programming.

CO2: Model and solve real world problems using graph algorithms.

CO3: Implement graph algorithms in code.

CO4: Develop algorithmic thinking skills to expand on common graph algorithms and improve problem solving approaches.

Course Content:

Introduction to Graphs & its Applications, Basics of Paths, Cycles, and Trails, Connection, Bipartite Graphs, Eulerian Circuits, Vertex Degrees and Counting, Degree-sum formula, The Chinese Postman Problem and Graphic Sequences.

Trees and Distance, Properties of Trees, Spanning Trees and Enumeration, Matrix-tree computation, Cayley's Formula, Prufer code.

Matchings and Covers, Hall's Condition, Min-Max Theorem, Independent Sets, Covers and Maximum Bipartite Matching, Augmenting Path Algorithm, Weighted Bipartite Matching, Hungarian Algorithm;

Stable Matchings and Faster Bipartite Matching, Factors & Perfect Matching in General Graphs, Matching in General Graphs: Edmonds' Blossom Algorithm

Connectivity and Paths: Cuts and Connectivity, k-Connected Graphs, Network Flow Ford-Fulkerson Labeling Algorithm, Max-Flow Min-cut Theorem, Menger's Proof using Max-Flow Min-Cut Theorem.

Vertex Coloring and Upper Bounds, Brooks' Theorem and Color-Critical Graphs, Counting Proper Colorings.
 Planar Graphs, Characterization of Planar Graphs, Kuratowski's Theorem, Wagner's Theorem.
 Line Graphs and Edge-coloring, Hamiltonian Graph, Traveling Salesman Problem and NP-Completeness, Dominating Sets.

References:

1. D.B. West, Introduction to Graph Theory, Prentice Hall, 2001
2. Jon Kleinberg and Eva Tardos, Algorithm Design, Addison-Wesley, 2005
3. J.A.Bondy and U.S.R.Murty: Graph Theory, Springer, 2008.
4. R.Diestel: Graph Theory, Springer(low price edition) 2000.
5. F.Harary: Graph Theory, Narosa, (1988)
6. C. Berge: Graphs and Hypergraphs, North Holland/Elsevier, (1973)

Advanced Microprocessor	IT0003E
Prerequisites: Basic 8085 or any 8 bit microprocessor	4 - 0 - 0

Course Outcomes:

- At the end of the course, the students should be able to
- CO1. Understand the necessity, features and architecture of 8086.
 - CO2. Analyse the addressing modes and understand the functions of 8086 instructions.
 - CO3. Write simple assembly language programs.
 - CO4. Understand the need and handling of interrupts in 8086 and features of peripheral ICs.

Course Content:

Evolution of 16 bit 32 bit microprocessors from the 8 bit 8085. Introduction to Intel 8086/8088 microprocessor architecture. Concepts of pipelining, parallel and co-processing. Concept of segmentation and computation of physical addresses. The maximum and minimum mode of operation of 8086 processor.

Architecture, Addressing Modes, Data Movement, Arithmetic and Logic operations, Program control, hardware specifications, memory and basic I/O interfaces, Interrupts, Direct memory access and DMA controlled I/O, Bus Interface, Arithmetic Co-processor, MMX and SIMD technologies of x86 family

The Protected mode operation via selectors and descriptors of 16 bit 80286 and its up gradation for 32 bit of 80386 and 80486 processors

The Pentium, Pentium Pro, P-II and P-III micro-processors

Overview of the new 64 bit architecture and Multi core operations along with the multi-threading technologies; Other high end microprocessors, Motorola, AMD, Power PC, etc

References:

1. Intel Microprocessors (8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium-II, Pentium-III, and Pentium 4) Architecture, Programming and Interfacing, 7th Edition, Barry B Bray, PHI, New Delhi 2006
2. Introduction to Microprocessors, 3rd Ed., A.P. Mathur, Tata McGraw Hill, New Delhi.
3. Microprocessors and Programmed Logic, 2nd Ed., Kenneth L.Short, Prentice Hall of India, New Delhi, 1988.
4. Microprocessor Architecture Programming Applications with the 8085/8080A – R.S. Gaonkar, 3rd Ed., PHI.
5. Intel Microprocessors (8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium-II, Pentium-III, and Pentium 4) Architecture, Programming and Interfacing, 7th Edition, Barry B Bray, PHI, New Delhi 2006
6. Introduction to Microprocessors, 3rd Ed., A.P. Mathur, Tata McGraw Hill, New Delhi.
7. Microprocessors and Programmed Logic, 2nd Ed., Kenneth L.Short, Prentice Hall of India, New Delhi, 1988.
8. Microprocessor Architecture Programming Applications with the 8085/8080A – R.S. Gaonkar, 3rd Ed., PHI.

Artificial Intelligence	IT004E
Prerequisites: Data structures, Programming and an ability to discuss algorithms.	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1: Understand the basics of artificial intelligence and neural networks.
 - CO2: Develop algorithms based on search, knowledge representation.
 - CO3: Develop applications based on NLP Concepts, to develop a Cognitive Agent
 - CO4: Understand and perform numerical analysis for various model networks to solve various optimization problems.

Course Content:

Introduction: Overview and Historical Perspective, Turing Test, Physical Symbol Systems and the scope of Symbolic AI, Agents; State Space Search: Depth First Search, Breadth First Search, DFID; Heuristic Search: Best First Search, Hill Climbing, Beam Search; Traveling Salesman Problem, Tabu Search, Simulated Annealing;

Population Based Search: Genetic Algorithms, Ant Colony Optimization; Branch & Bound, Algorithm A*, Admissibility of A*;

Monotone Condition, IDA*, RBFS, Pruning OPEN and CLOSED in A*; Problem Decomposition, Algorithm AO*;

Game Playing: Algorithms Minimax, AlphaBeta, SSS*; Rule Based Expert Systems, Inference Engine, Rete Algorithm; Planning: Forward/Backward Search, Goal Stack Planning, Sussman's Anomaly; Plan Space Planning, Algorithm Graph plan.

References:

1. Russell, S. J., & Norvig, P. (2013). Artificial Intelligence: A Modern Approach (3rd ed.). PHI Learning.
2. Vernon, D. (2014). Artificial Cognitive Systems: A Primer. MIT Press.60
3. Rich, E., & Knight, K. (2011). Artificial Intelligence (3rd ed.). TataMcGraw-Hill.
4. Patterson, D. W. (1990). Introduction to Artificial Intelligence and Expert Systems. PHI Learning.
5. Barr, A., Cohen, P. R., & Feigenbaum, E. A. (1982). The Handbook of Artificial Intelligence. Addison-Wesley.
6. Allen, J. (1995). Natural Language Understanding (2nd ed.). Pearson Education India.
7. Nilsson N.J., (1991). Principles of Artificial Intelligence. Narosa Publishing.
8. Nilsson, N. J. (1998). Artificial intelligence: A New Synthesis. Morgan Kaufmann Inc.
9. Luger, G. F. (2002). Artificial intelligence: Structures and Strategies for Complex Problem Solving. Addison-Wesley.
10. Charniak E., & McDermott D. (1985). Introduction to Artificial Intelligence. Addison-Wesley.

Suggested E-Resources:

1. Artificial Intelligence, <https://nptel.ac.in/courses/106105077/>
2. Artificial Intelligence: Principles and Techniques, <https://web.stanford.edu/class/cs221/>

Bioinformatics	IT0005E
Prerequisites: Basic knowledge of Biology and any computer language.	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1: To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis.
 - CO2: Describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics.
 - CO3: Explain about the methods to characterise and manage the different types of Biological data.
 - CO4: Classify different types of Biological Databases.

Course Content:

Introduction, DNA sequence analysis, DNA Databases
 Protein structure and function, protein sequence databases, sequence alignment

PAM matrix, Global and local alignment, BLAST: features and scores
 Multiple sequence alignment, Conservation score, phylogenetic trees
 Protein sequence analysis, hydrophobicity profiles, non-redundant datasets
 Protein secondary structures, Ramachandran plot, propensity, secondary structure prediction
 Protein tertiary structure, Protein Data Bank, visualization tools, structural classification, contact maps
 Protein structural analysis, protein structure prediction
 Protein stability, energetic contributions, database, stabilizing residues, stability upon mutations
 Protein folding rates, proteins interactions, binding site residues
 Computer aided drug design, docking, screening, QSAR
 Development of algorithms, awk programming, machine learning techniques, applications using WEKA.

References:

1. M. Michael Gromiha, Protein Bioinformatics: From Sequence to Function, Academic Press,
2. D.E. Krane and M.L. Raymer, Fundamental concepts of bioinformatics, Pearson Education Inc. 2006

Cloud Computing	IT0006E
Prerequisites: Basics of Computer Architecture and Organization and Networking	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1: Apply cloud computing model in real application.
 - CO2: Use programming paradigms like MapReduce to create applications.
 - CO3: Operate cloud by installing virtual machines and apply migration.
 - CO4: Understand of challenges of cloud

Course Content:

- Introduction to Cloud Computing
- Cloud Computing Architecture
- Service Management in Cloud Computing
- Data Management in Cloud Computing
- Resource Management in Cloud
- Cloud Security
- Open Source and Commercial Clouds, Cloud Simulator
- Research trend in Cloud Computing, Fog Computing

References:

1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley,2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010

Compiler Design	IT0007E
Prerequisites: Automata theory basics	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1: Specify and analyze the lexical, syntactic and semantic structures of advanced language features.
 - CO2: Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation.
 - CO3: Write a scanner, parser, and semantic analyzer without the aid of automatic generators.
 - CO4: Turn fully processed source code for a novel language into machine code for a novel computer.

Course Content:

Overview of compilation, Run-Time Environments, Local Optimizations, Machine code generation
 Global Register Allocation
 Implementing Object-Oriented Languages, Introduction to Machine-Independent Optimizations
 Data-Flow Analysis, Control-Flow Analysis, Machine-Independent Optimizations, Data-Flow
 Analysis: Theoretical Foundations
 Partial Redundancy Elimination, The Static Single Assignment Form, Automatic Parallelization
 Instruction Scheduling, Software Pipelining, Energy-Aware Software Systems
 Just-In-Time Compilation, Garbage Collection
 Inter-procedural Data-Flow Analysis, Worst Case Execution Time Estimation

References:

1. A.V. Aho, M.S. Lam, R. Sethi, and J.D. Ullman, Compilers: Principles, Techniques, and Tools, Pearson Education, 2007 (second ed.).
2. K.D. Cooper, and L. Torczon, Engineering a Compiler, Elsevier, 2004.

Computational Geometry	IT0008E
Prerequisites: Null	4 - 0 - 0

Course Outcomes:

Upon completion of the course students will be able to:

- CO1: Apply computational analysis techniques to solve practical computer aided design and drafting scenarios.
 CO2: Understand and utilize measurement systems, precision and conversions as used in the computer aided design and drafting industry.
 CO3: Perform tolerance study analysis for computer aided design and drafting scenarios.
 CO4: Recognize manufacturing tolerances and their effect on a mechanical design.

Course Content:

Introduction using Basic Visibility Problems , The Maximal Points Problem , The Plane Sweep Technique and applications ,Convex Hull Different Paradigms and Quickhull , Dual Transformation and Applications , Lower Bounds on Algebraic tree model , Point Location and Triangulation , Voronoi Diagram and Delaunay Triangulation , Randomized Incremental Construction and Random Sampling , Arrangements and Levels , Range Searching , Clustering Point Sets using Quadtrees and Applications , Epsilon-Nets VC Dimension and Applications , Shape Analysis and Shape Comparison.

References:

3. Adobe Systems Inc., PostScript Language Tutorial and Cookbook, Addison-Wesley, 1985. (<http://Www-cdf.fnal.gov/offline/PostScript/BLUEBOOK.PDF>)
4. B. Casselman, Mathematical Illustrations: A Manual of Geometry and PostScript, Springer-Verlag, 2005. (<http://www.math.ubc.ca/~cass/graphics/manual>)
5. CGAL User and Reference Manual (<http://www.cgal.org/Manual>) T. Cormen, et.al., Introduction to Algorithms, 3rd ed., MIT Press, 2009.
6. E.D. Demaine and J. O'Rourke, Geometric Folding Algorithms: Linkages, Origami, Polyhedra, Cambridge University Press, 2007. (occasionally)
7. J. O'Rourke, Art Gallery Theorems and Algorithms, Oxford Univ. Press, 1987. (<http://maven.smith.edu/~orourke/books/ArtGalleryTheorems/art.html>, occasionally)
8. J. O'Rourke, Computational Geometry in C, 2nd ed., Cambridge Univ. Press, 1998. (definitely)
9. K. Mehlhorn and S. Näher, The LEDA Platform of Combinatorial and Geometric Computing, Cambridge University Press, 1999. (<http://www.mpi-inf.mpg.de/~mehlhorn/LEDAbook.html>, definitely)
10. R. Motwani and P. Raghavan, Randomized Algorithms, Cambridge Univ. Press, 1995. K. Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice Hall, 1994. (occasionally)
11. F.P. Preparata and M.I. Shamos, Computational Geometry: An Introduction, SpringerVerlag, 1985. (occasionally)

Computational Systems Biology	IT0009E
Prerequisites: Basic knowledge of Biology and any computer language.	4 - 0 - 0

Course Outcomes:

On successful completion of the course, the student will:

CO1: To introduce key concepts of mathematical modelling, in the context of different types of biological networks.

CO2: To cover important concepts from network biology, modelling of dynamic systems.

CO3: To cover important concepts from parameter estimation, as well as constraint-based metabolic modelling.

CO4: Hands-on component, emphasizing various software tools and computational methods for systems biology.

Course Content:

Introduction to Mathematical Modelling; Introduction to Static Networks

Network Biology and Applications; Reconstruction of Biological Networks

Dynamic Modelling of Biological Systems: Introduction, Solving ODEs & Estimation

Evolutionary Algorithms, Guest Lectures on Modelling in Drug Development

Constraint-based approaches to Modelling Metabolic Networks

Perturbations to Metabolic Networks; Elementary Modes, Applications of Constraint-based Modelling;

Constraint-based Modelling Recap, 13C Metabolic Flux Analysis

Modelling Regulation, Host-pathogen interactions, Robustness of Biological Systems

Advanced topics: Robustness and Evolvability, Introduction to Synthetic Biology, Perspectives & Challenges.

References:

1. Voit E (2012) A First Course in Systems Biology. Garland Science, 1/e. ISBN 0815344678
2. Klipp E (2009) Systems biology: a textbook. Wiley-VCH, 1/e. ISBN 9783527318742
3. Newman MEJ (2011) Networks: an introduction. Oxford Univ. Press.

Computer Architecture	IT0010E
Prerequisites: Computer Organization, Digital Circuits and Systems.	4 - 0 - 0

Course Outcomes:

On successful completion of the course students will be able to

CO1: Perform computer arithmetic operations.

CO2: Use the concepts and design of all type of sequential and combinational circuits.

CO3: Design and conduct experiments, as well as to analyze of the hardware of a computer system and its components such as control unit, arithmetic and logical (ALU) unit, input/output, and memory unit.

CO4: Be able to design techniques such as pipelining and microprogramming in the design of the central processing unit of a computer system.

Course Content:

Introduction, Instruction Set Principles

Memory Hierarchy Design – Cache Memory Hierarchy, Main Memory Design

Fundamentals of Pipelining, Instruction Level Parallelism, Out-of-Order Execution

Thread-Level Parallelism – Multi-core Processors, Cache Coherency Problem, Synchronization, and Memory Consistency

References:

1. Advanced Computer Architecture by Kai Hwang
2. Computer Organization and Architecture by Moris Mano

3. D. Patterson and J. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Morgan Kaufmann Publishers, Inc., Second edition, 1998.
4. Computer Architecture: A Quantitative Approach, John L. Hennessy & David A Patterson, Morgan Kaufmann, 1996.
5. Structure Computer Organization, 4th Edition, Andrew S. Tanenbaum, Prentice Hall, 1999.
6. Computer Architecture and Organization, J. Hayes, McGraw Hill, 1988. 5. Computer Organization and Architecture, 5th Edition, William Stallings, Prentice Hall, 1996.

Cryptography and Network Security	IT0011E
Prerequisites: Computer Organization, Digital Circuits and Systems.	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1: To understand basics of Cryptography and Network Security.
- CO2: To be able to secure a message over insecure channel by various means.
- CO3: To learn about how to maintain the Confidentiality, Integrity and Availability of a data. CO4: To understand various protocols for network security to protect against the threats in the networks.

Course Content:

Introduction to cryptography, Classical Cryptosystem, Cryptanalysis on Substitution Cipher, Play fair Cipher, Block Cipher;

Data Encryption Standard (DES), Triple DES, Modes of Operation, Stream Cipher, Pseudorandom Sequence;

LFSR based Stream Cipher, Mathematical background, Abstract algebra, Number Theory;

Modular Inverse, Extended Euclid Algorithm, Fermat's Little Theorem, Euler Phi-Function, Euler's theorem, Quadratic Residue, Polynomial Arithmetic.

Advanced Encryption Standard (AES), Introduction to Public Key Cryptosystem, Diffie-Hellman Key Exchange, Knapsack Cryptosystem, RSA Cryptosystem.

More on RSA, Primarily Testing, ElGamal Cryptosystem, Elliptic Curve over the Reals, Elliptic curve Modulo a Prime.

Generalised ElGamal Public Key Cryptosystem, Chinese Remainder Theorem, Rabin Cryptosystem, Legendre and Jacobi Symbol.

Message Authentication, Digital Signature, Key Management, Key Exchange, Hash Function.

Universal Hashing, Cryptographic Hash Function, Secure Hash Algorithm (SHA), Digital Signature Standard (DSS), More on Key Exchange Protocol.

Cryptanalysis, Time-Memory Trade-off Attack, Differential Cryptanalysis, More on Differential Cryptanalysis, Linear Cryptanalysis.

Cryptanalysis on Stream Cipher, Algebraic Attack, Implementation Attacks, side channel attack.

Internetwork Security, SSL, PGP, Cloud Security, Introduction to Blockchain and Bitcoin.

References:

1. William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
2. Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", Pearson.
3. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education.
4. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India..
5. <http://nptel.ac.in/courses/106105031/lecture> by Dr. Debdeep Mukhopadhyay, IIT Kharagpur
6. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system-engineering-spring-2009/video-lectures/> lecture by Prof. Robert Morris and Prof. Samuel Madden MIT.

Data Mining	IT0012E
Prerequisites: Nil	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1: Identify the scope and necessity of Data Mining & Warehousing for the society.
- CO2: Describe the designing of Data Warehousing so that it can be able to solve the root problems.

- CO3: Understand various tools of Data Mining and their techniques to solve the real time problems.
 CO4: Develop ability to design various algorithms based on data mining tools.

Course Content:

Introduction, Data Preprocessing;
 Association Rule Mining, Classification Basics
 Decision Tree, Bayes Classifier, K nearest neighbor
 Support Vector Machine, Kernel Machine, Clustering, Outlier detection
 Sequence mining, Evaluation, Visualization. , Case studies

References:

1. Introduction to Data Mining, Tan, Steinbach and Vipin Kumar, Pearson Education, 2016
2. Data Mining: Concepts and Techniques, Pei, Han and Kamber, Elsevier, 2011

Data Science	IT0013E
Prerequisites: R.	4 - 0 - 0

Course Outcomes:

- Students with a major in Data Science.
 CO1: Students will execute statistical analyses with professional statistical software.
 CO2: Students will develop relevant programming abilities.
 CO3: Students will demonstrate proficiency with statistical analysis of data.
 CO4: Students will develop the ability to build and assess data-based models.

Course Content:

Course philosophy and introduction to R
 Linear algebra for data science: Algebraic view - vectors, matrices, product of matrix & vector, rank, null space, solution of over-determined set of equations and pseudo-inverse);
 Geometric view - vectors, distance, projections, eigen value decomposition;
 Statistics (descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates)
 Optimization: Optimization; Typology of data science problems and a solution framework
 Simple linear regression and verifying assumptions used in linear regression; Multivariate linear regression, model assessment, assessing importance of different variables, subset selection
 Classification using logistic regression
 Classification using KNN and k-means clustering

References:

1. Introduction to linear algebra - by gilbert strang
2. Applied statistics and probability for engineers – by douglasMontgomery

Deep Learning	IT0014E
Prerequisites: Linear Algebra, Probability Theory	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
 CO1: Understand needs and fundamentals of Neural network along with its architecture.
 CO2: Develop neural network algorithms like back propagation etc.
 CO3: Understand advanced topics such as recurrent neural networks, long short term memory cells and convolutional neural networks.
 CO3: Learn concepts of learning models for different applications.

Course Content:

History of Deep Learning, Deep Learning Success Stories, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm
 Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feedforward Neural Networks, Representation Power of Feedforward Neural Networks

FeedForward Neural Networks, Backpropagation
 Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition, Basis
 Principal Component Analysis and its interpretations, Singular Value Decomposition
 Autoencoders and relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders
 Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout
 Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization
 Learning Vectorial Representations Of Words
 Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet,
 Visualizing Convolutional Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks
 Recurrent Neural Networks, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs
 Encoder Decoder Models, Attention Mechanism, Attention over images

References

1. Deep Learning, An MIT Press book, Ian Goodfellow and YoshuaBengio and Aaron
2. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc
3. https://onlinecourses.nptel.ac.in/noc20_cs62/preview, Prof. Prabir Kumar Biswas, IIT Kharagpur

Digital Signal Processing	IT0015E
Prerequisites: Basic Signals and Systems	4 - 0 - 0

Course Outcomes:

On successful completion of the course students will be able to
 CO1: Understand the analytical tools such as Fourier transforms, Discrete Fourier transforms, Fast Fourier Transforms and Z-Transforms required for digital signal processing.
 CO2: Get familiarized with various structures of IIR and FIR systems.
 CO3: Design and realize various digital filters for digital signal processing.
 CO4: Understand the applications of DSP in speech processing and spectrum analysis.

Course Content:

Discrete Time Signals and Systems, DTFT, Relation between DTFT and Analog Fourier Transform
 Rational Systems, Z-transform and Pole-Zero Models
 IIR Filter Design, FIR Filter Design, Filter Structures
 Basics of Multirate Signal Processing
 Discrete Fourier Transform, Circular Convolution, Fast Fourier Transform

References

1. Digital Signal Processing, A. Oppenheim and R. Schafer
2. Discrete Time Signal Processing, A. Oppenheim and R. Schafer
3. Digital Signal Processing, J. G. Proakis and D. G. Manolakis
4. Digital Signal Processing, S. K. Mitra

Distributed System	IT0016E
Prerequisites: Data Structures and Algorithms	4 - 0 - 0

Course Outcomes:

CO1: Understand the design principles in distributed systems and the architectures for distributed systems.
 CO2: Apply various distributed algorithms related to clock synchronization, concurrency control, deadlock detection, load balancing, voting etc.
 CO3: Analyze fault tolerance and recovery in distributed systems and algorithms for the same, analyze the design and functioning of existing distributed systems and file systems.

CO4: Implement different distributed algorithms over current distributed platforms.

Course Content:

Introduction to Distributed Systems, Message Passing, Leader Election, Distributed Models, Causality and Logical Time
Logical Time, Size of Vector Clock, Matrix Clocks, Virtual Time and Physical Clock Synchronization, Global State & Snapshot Recording Algorithms and Distributed Mutual Exclusion-Non-Token and Quorum based approaches
Distributed Mutual Exclusion-Token based approaches, Consensus & Agreement, Checkpointing & Rollback Recovery
Deadlock Detection, Distributed Shared Memory (DSM) and Distributed Minimum Spanning Tree Termination Detection, Message Ordering & Group Communication, Fault Tolerance and Self-Stabilization
Distributed Randomized Algorithms, Distributed Hash Table & Peer to Peer Computing
Case Studies: GFS, HDFS, Map Reduce and Spark. Sensor Networks, Authentication & Security in DS: Introduction to Sensor Networks, Distributed Algorithms for Sensor Networks, Authentication in Distributed Systems, Security in Distributed Systems and Block Chain

Reference:

1. Distributed Computing: Principles, Algorithms, and Systems- Ajay D. Kshemkalyani and Mukesh Singhal
2. Distributed Computing: Fundamentals, Simulations and Advanced Topics-HagitAttiya and Jennifer Welch
Distributed Algorithms-Nancy Lynch

Embedded Systems	IT0017E
Prerequisites: Computer Organization, Basic of Microprocessors	4 - 0 - 0

Course Outcomes:

On successful completion of the course students will be able to
CO1: Acquire a basic knowledge about fundamentals of microcontrollers, programming and system control to perform a specific task.
CO2: Acquire knowledge about devices and buses used in embedded networking
CO3: Develop programming skills in embedded systems for various applications.
CO4: Acquire knowledge about basic concepts of circuit emulators, Life cycle of embedded design and its testing.

Course Content:

Introduction to Embedded System, ASICs and ASIPs
Designing Single Purpose Processors and Optimization
Introduction to FPGAs and Synthesis, Verilog Hardware Description Language (Verilog HDL)
Microcontrollers and Power Aware Embedded System Design
Real Time Operating System, Real Time Scheduling Algorithms
Modelling and Specification, Design Synthesis
Digital Camera Design and Hardware Software Partitioning, Design Optimization, Simulation and Verification.

Reference:

1. Wayne Wolf, “Computers as Components-principles of Embedded Computer system Design”, 1st edition, Elsevier, 2009.
2. Labrosse, “Embedding system building blocks”, 2nd edition, CMP Publishers, 2007.
3. Kenneth J. Ayala and Thomson, “The 8051 Microcontroller”, 3rd edition, Thompson Delmar, Learning, 2008.
4. Frank Vahid, Tony Givargis and John Wiley, “Embedded System Design, Microcontrollers”, 3rd edition, Pearson Education, 2008.
5. Michael J. Pont, “Embedded C”, Addison Wesley, 2002

Image Processing	IT0018E
Prerequisites: Concepts of Digital Signal Processing	4 - 0 - 0

Course Outcomes:

On successful completion of the course students will be able to

CO1: Understand the need for image transforms different types of image transforms and their properties. Develop any image processing application.

CO2: Understand the rapid advances in Machine vision. Learn different techniques employed for the enhancement of images.

CO3: Learn different causes for image degradation and overview of image restoration techniques. Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.

CO4: Learn different feature extraction techniques for image analysis and recognition

Course Content:

Introduction and signal digitization; Pixel relationship; Camera models & imaging geometry

Image interpolation; Image transformation; Image enhancement

Image restoration & Image registration

Colour image processing; Image segmentation

Morphological image processing; Object representation, description and recognition

Suggested reading:

1. Digital Image Processing by Rafael C Gonzalez & Richard E Woods, 3rd Edition
2. Fundamentals of Digital Image Processing by Anil K Jain
3. Digital Image Processing by William K Pratt.
4. J.C. Russ, "The Image Processing Handbook", (5/e), CRC, 2006

Information Theory and Coding Techniques	IT0019E
Prerequisites: Probability basics	3 - 0 - 0

Course Outcomes:

On completion of the course, student will be able to:

CO1: Perform information theoretic analysis of communication systems.

CO2: Design a data compression scheme using suitable source coding technique.

CO3: Design a channel coding scheme for a communication system.

CO4: Understand and apply fundamental principles of data communication and networking.

Course Content:

Introduction to Information Theory, Entropy, Mutual Information, Conditional and Joint Entropy, Measures for Continuous Random Variable, Relative Entropy

Variable Length Codes, Prefix Codes, Source Coding Theorem, Various source coding techniques: Huffman, Arithmetic, Lempel Ziv, Run Length

Optimum Quantizer, Practical Application of Source Coding: JPEG Compression, Introduction to Super Information, Models and Channel Capacity

Noisy Channel Coding Theorem, Gaussian Channel and Information Capacity Theorem, Capacity of MIMO channels

Introduction to Error Control Coding, Galois Field, Equivalent Codes, Generator Matrix and Parity Check Matrix

Systematic Codes, Error Detections and Correction, Erasure and Errors, Standard Array and Syndrome Decoding, Probability of Error, Coding Gain and Hamming Bound

Hamming Codes, LDPC Codes and MDS Codes, Cyclic Codes, Generator Polynomial, Syndrome Polynomial and Matrix Representation

Fire Code, Golay Code, CRC Codes and Circuit Implementation of Cyclic Codes

Introduction to BCH Codes: Generator Polynomials

Multiple Error Correcting BCH Codes, Decoding of BCH Codes

Reed Solomon (RS) Codes, Convolutional Codes, Trellis Codes: Generator Polynomial Matrix and Encoding using Trellis, Viterbi Decoding and Known good convolutional Codes, Turbo Codes, Trellis Coded Modulation (TCM)

Ungerboeck's design rules and Performance Evaluation of TCM schemes, for fading channels and Space Time Trellis Codes (STTC), Space Time Block Codes (STBC)
 Real Orthogonal Design and Complex Orthogonal Design, Generalized Real Orthogonal Design and Generalized Complex Orthogonal Design

Reference:

1. T.M. Cover and J. A. Thomas, Elements of information theory, John Wiley & Sons, 2012.
2. A. B. Robert, Information Theory, Dover Special Priced Titles, 2007.
3. R. M. Roth, Introduction to Coding Theory, Cambridge University Press, 2006.
4. S. Lin and D. J. Costello, Error Control Coding, 2 nd Edition, Prentice-Hall, 2004.
5. R. E. Blahut, Algebraic Codes for Data Transmission, Cambridge University Press, 2002.
6. T. K. Moon, Error Correction Coding: Mathematical Methods and Algorithms, Wiley, 2005.
7. R.H. Morelos-Zaragoza, The Art of Error Correcting Coding, Wiley and sons, 2006.
8. R. Johannesson and K.S. Zigangirov, Fundamentals of Convolutional Coding, 2 nd Edition, Wiley-IEEE Press, 2015.
9. E. Biglieri, D. Divsalar, P.J. McLane, M.K. Simon, Introduction to Trellis-Coded Modulation with Applications, Macmillan, 1991.

Internet of Things	IT0020E
Prerequisites: Basic programming knowledge	4 - 0 - 0

Course Outcomes:

- On successful completion of the course, the student will:
- CO1: Understand the concept of IoT
 - CO2: Understand what constitutes an IoT design solution
 - CO3: Identify the sensors and basic electronic design needed for different IoT solutions
 - CO4: Analyze basic protocols of IoT.

Course Content:

Introduction to IoT; Sensing, Actuation, Basics of Networking;
 Communication Protocols; Sensor Networks; Machine-to-Machine Communications
 Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino;
 Introduction to Python programming; Introduction to Raspberry Pi;
 Implementation of IoT with Raspberry Pi;
 Introduction to SDN; SDN for IoT;
 Data Handling and Analytics; Cloud Computing; Sensor-Cloud;
 Fog Computing; Smart Cities and Smart Homes;
 Connected Vehicles; Smart Grid; Industrial IoT;

References:

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madiseti (Universities Press)

Knowledge Representation and Reasoning	IT0021E
Prerequisites: Basic formal languages, logic and programming	4 - 0 - 0

Course Outcomes:

- On successful completion of the course, the student will:
- CO1:has theoretical knowledge about principles for logic-based representation and reasoning.
 - CO2:has a basic understanding of Kripke models, production systems, frames, inheritance systems and approaches to handling uncertain or incomplete knowledge.
 - CO3:has a basic understanding of principles for reasoning with respect to explanation and planning.

CO4: has a broad understanding of how knowledge based systems work which provides a solid foundation for further studies and for assessing when knowledge based approaches to problem solving are appropriate

Course Content:

Introduction, Propositional Logic, Syntax and Semantics
 Proof Systems, Natural Deduction, Tableau Method, Resolution Method
 First Order Logic (FOL), Syntax and Semantics, Unification, Forward Chaining
 The Rete Algorithm, Rete example, Programming Rule Based Systems
 Representation in FOL, Categories and Properties, Reification, Event Calculus
 Conceptual Dependency (CD) Theory, Understanding Natural Language
 Deductive Retrieval, Backward Chaining, Logic Programming with Prolog
 Resolution Refutation in FOL, FOL with Equality, Complexity of Theorem Proving
 Semantic Nets, Frames, Scripts, Goals and Plans
 Description Logic (DL), Structure Matching, Classification
 Extensions of DL, The ALC Language, Inheritance in Taxonomies
 Default Reasoning, Circumscription, The Event Calculus Revisited
 Default Logic, Autoepistemic Logic, Epistemic Logic, Multi Agent Scenarios

References:

1. Language, Proof and Logic, Jon Barwise & John Etchemendy, CSLI Publications (1999); ch 9-11, 19.
2. Knowledge representation and Reasoning, Ronald J. Brachman & Hector J. Levesque, Elsevier (2004); ch 2- 5, 9, 11.
3. The Description Logic Handbook: Theory, implementation, and applications, Franz Baader, Deborah L. McGuinness, Daniele Nardi and Peter F. Patel-Schneider, Cambridge University Press(2010); ch 2, 5-6

Machine Learning	IT0022E
Prerequisites: Basic programming, algorithm design, basics of probability & statistics	4 - 0 - 0

Course Outcomes:

On successful completion of the course, the student will:
 CO1: Understand Machine Learning Techniques
 CO2: Design Basic Practical Applications
 CO3: Understand Model Based Prediction
 CO4: To develop skills of using recent machine learning software for solving practical problems.

Course Content:

Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation
 Linear regression, Decision trees, overfitting
 Instance based learning, Feature reduction, Collaborative filtering based recommendation
 Probability and Bayes learning
 Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM
 Neural network: Perceptron, multilayer network, backpropagation, introduction to deep neural network
 Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning
 Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model

References:

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Introduction to Machine Learning Edition 2, by EthemAlpaydin.
3. Pattern Recognition and Machine Learning, Chris Bishop
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning Data Mining, Inference, and Prediction

5. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern classification, Wiley, New York, 2001.
6. Course material available on Swayam platform and NPTEL, for the course on Introduction to Machine Learning, conducted by Prof. Sudeshna Sarkar, IIT Kharagpur.

Medical Electronics	IT0023E
Prerequisites: Basic Electronics and biology	4 - 0 - 0

Course Outcomes:

- On successful completion of the course, the student will:
- CO1: Understanding biomedical signals and specifically cardiological signals like ECG
 - CO2: Analyzing biomedical signals in Frequency domain
 - CO3: Spectral Analyzing of biomedical signals
 - CO4: Understanding adaptive filtering of biomedical signals

Course Content:

Anatomy and physiology: Elementary ideas of cell structure, Heart and circulatory system, Central nervous system, Muscle action, Respiratory system, Body temperature and reproduction system
 Overview of Medical Electronics Equipment, classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments
 Electrodes: Bioelectric signals, Bio electrodes, Electrode, Electrode tissue interface, contact impedance, Types of Electrodes, Electrodes used for ECG , EEG
 Transducers: Typical signals from physiological parameters, pressure transducer, flow, transducer, temperature transducer, pulse sensor, respiration sensor,
 Bio Medical Recorders and Patient Monitoring Systems: Block diagram description and application of following instruments, ECG Machine, EEG Machine, EMG Machine. Heart rate measurement, Pulse rate measurement, Respiration rate measurement, Blood pressure measurement.

References:

1. Handbook of biomedical Instrumentation by RS Khandpur
2. Biomedical Instrumentation by Cromwell,
3. Modern Electronics Equipment by RS Khandpur, TMMH, New Delhi
4. Introduction to BioMedical Electronics by Edward J. Perkstein; Howard Bj, USA

Mobile Computing	IT0024E
Prerequisites: Java Programming and OS	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1: Have knowledge of fundamentals of mobile communications systems
 - CO2: Choose a system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of transmission, channel properties etc.
 - CO3: Identify the requirements of mobile communication as compared to static communication
 - CO4: Identify the limitations of 2G and 2.5G wireless mobile communication and use design of 3G and beyond mobile communication systems.

Course Content:

Introduction to mobile computing, installing of Android Studio and the latest SDK Tools and preparing the working environment, creating your first Android Application
 Layouts, Views, Resources, Activities, Intents, Background tasks, connecting to the Internet
 Fragments, Preferences
 User Interaction – input, menu items, custom views, User Experience – themes and styles, material design, adaptive layouts, accessibility, localization, debugging the UI
 Storing Data, SQLite database, Sharing Data, content resolvers and providers, loaders to load data
 Services, background work, alarms, broadcast receivers
 Notification, widgets, transferring data efficiently, publishing app
 Multiple form factors, sensors, Google cloud messaging, monetizing your app

References:

1. Android Programming (Big Nerd Ranch Guide), by Phillips, Stewart, Hardy and Marsicano
2. Android Programming – Pushing the limits by Hellman
3. Android Developer Training
4. Android Testing Support Library

Modern Digital Communication Techniques	IT0025E
Prerequisites: Basic knowledge Analog and Digital Communication and signals and System	4 - 0 - 0

Course Outcomes:

CO1: Students will be able to understand and apply knowledge of human communication and language processes as they occur across various contexts, e.g., interpersonal, intrapersonal, small group, organizational, media, gender, family, intercultural communication, technologically mediated communication, etc. from multiple perspectives.

CO2: Students will be able to understand and evaluate key theoretical approaches used in the interdisciplinary field of communication. I.e., students will be able to explain major theoretical frameworks, constructs, and concepts for the study of communication and language, summarize the work of central thinkers associated with particular approaches, and begin to evaluate the strengths and weaknesses of their approaches.

CO3: Students will be able to understand the research methods associated with the study of human communication, and apply at least one of those approaches to the analysis and evaluation of human communication.

CO4: Students will be able to find, use, and evaluate primary academic writing associated with the communication discipline.

Course Content:

Introduction to digital communication systems, Source Coding, Characterization of Communication Signals & Systems

Signal space Representation, Representation of Memory less Modulation Methods, Nonlinear modulation methods

Optimal receivers of AWGN, Receiver for non-ideal channel

Probability of error of different modulation schemes

Fundamentals of estimation and detection theory used in digital communication

Carrier phase and symbol timing synchronization techniques

Channel estimation and equalization techniques, Power Adaptation methods for colored noise channel

References:

1. Digital Communications by John G. Proakis
2. Digital Communications by Bernard Sklar
3. Digital Communications by Robert Gallager
4. Digital Communications by Simon Haykin
5. Modern Digital and Analog communications by B.P. Lathi

Modern Digital System Design	IT0026E
Prerequisites: Basic knowledge of digital electronics at UG level	4 - 0 - 0

Course Outcomes:

The goals of this laboratory course are:

CO1: To apply concepts and methods of digital system design techniques as discussed in the class (ESE170) through hands-on projects.

CO2: To analyze the results of logic and timing simulations and to use these simulation results to debug digital systems.

CO3: To learn to design combinational and sequential digital systems starting from a word description that performs a set of specified tasks and functions.

CO4: To develop skills, techniques and learn state-of-the-art engineering tools (such as VHDL, Xilinx ISE, etc.) to design, implement and test modern-day digital systems on FPGAs.

Course Content:

Memory Element: Review of Latch, R-S, J-K, D flip flops, Master Slave arrangement, Edge triggered flip flops, shift registers, asynchronous and synchronous counters.

Synchronous sequential finite state machines: Synchronous analysis process, design approaches, state reduction, design of next state decoder and output decoder, design of counters and decoders, code sequence detector, sequential code generators

ASM: ASM Chart, ASM block, Design using FFs. Design using separate FFs, Design using multiplexers, PLA and design of circuits using PLA

Asynchronous Sequential finite state machines: Need for asynchronous circuit, analysis, cycles and races, Hazards, map entered variable approaches to asynchronous Design.

Data Converters: Introduction to Analog to Digital and digital to Analog conversions, design and study of Register divider network, R-2R network, Circuits of DACs. ADCs: Flash Converters, Counter type Converters, continuous type converter. Fast converters, Successive Approximation techniques. Split counter converter etc.

References:

1. An Engineering approach to Digital Design: William J. Fletcher PHI
2. Digital Design: Principles and Practices PHI
3. Fundamental of Digital Design CH Roth Jr. Jaico Pub House
4. Digital Design. Morris Mano. PHI
5. Digital Principles and Design Donald D. Givone TMH

Multimedia Processing	IT0027E
Prerequisites: Digital Signal Processing	4 - 0 - 0

Course Outcomes:

CO1: Understand the concepts of image acquisition and digitization.

CO2: Classify image enhancement techniques and apply these techniques in both spatial and frequency domain.

CO3: Recognize the types of noise present in images and apply appropriate image restoration technique.

CO4: Categorize image segmentation techniques and apply these techniques.

Course Content:

Introduction to Multimedia, Elements of Image Compression System

Video Coding: Fixed-length and Variable-length Codes

Lossless and Lossy Compression, Discrete Cosine Transforms, Short-term Fourier Transform & Continuous and Discrete Wavelet Transform, Coding Techniques in 2 - D Wavelet Transforms

Motion Estimation: Matching Criteria, Generalized Matching, Generalized Deformation Model in Motion Estimation

Multimedia Standards, Still Image Compression Standards: JPEG, JPEG-2000

Video Compression Standards: An Overview, H.261 & H.263 Standards, MPEG-1 Standards: Specifications, Continuity & Synchronization, Synchronization of Media, Continuity Aspects of MPEG-1 Multimedia Streams

Multimedia Synchronization, MPEG-2 Standards, Scalable Profiles

MPEG- 4 Standards: Introduction, Audio Visual Objects, Multifunctional Coding Capabilities

MPEG- 1 Audio Standards, Audio Coder, Encoding, Bit Allocation and Psychoacoustic Model, Masking Effects and Layer-3 Encoding

Multimedia Content Representation and Retrieval, Video Content Representation, Motion Representation, Low to High-level Representation, Content Retrieval Schemes.

References:

1. Vaughan, V. Multimedia Making it Work. 8th ed., McGraw-Hill, New York, 2011.
2. N. Chapman, J. Chapman. Digital Multimedia 3th ed., John Wiley & Sons, New York, 2009.
3. Yun Qing Shi, Huifang Shu, Image and Video Compression for Multimedia Engineering, CRC Press, New York, 2008.
4. Z-N Li, M.S. Drew. Fundamentals of Multimedia
5. W. Sebesta, Programming the World Wide Web (2nd Ed.), Addison Wesley, Boston, 2003.

- Manuals for working with the selected software tools for creating multimedia elements and systems

Natural Language Processing	IT0028E
Prerequisites: Basic probabilities knowledge	4 - 0 - 0

Course Outcomes:

On successful completion of the course students will be able to
 CO1: Develop algorithms based on NLP Concepts.
 CO2: Develop applications based on Statistical Approaches of NLP
 CO3: Create applications for Indian Language Processing.
 CO4: To develop skills of using recent Natural Language Processing software for solving practical problems.

Course Content:

Introduction and Basic Text Processing, Spelling Correction, Language Modeling, Advanced smoothing for language modeling, POS tagging
 Models for Sequential tagging – MaxEnt, CRF , Syntax – Constituency Parsing
 Dependency Parsing , Lexical Semantics , Distributional Semantics
 Topic Models , Entity Linking, Information Extraction
 Text Summarization, Text Classification
 Sentiment Analysis and Opinion Mining.

References:

- Daniel Jurafsky and James H.Martin Speech and Language Processing(2nd Edition),Prentice Hall:2ndedition,2008.
- Machine Learning for Text by CharuC.Aggarwal,Springer,2018 edition
- Foundations of Statistical Natural Language Processing by Christopher D.Manning and HinrichSchuetze,MIT press, 1999
- Steven Bird,Ewan Klein and Edward Loper Natural Language Processing with Python,O’Reilly Media;1 edition,2009
- Roland R.Hausser, Foundations of Computational Linguistics:HumanComputer Communication in Natural Language,Paperback,MIT press,2011

Pattern Recognition	IT0029E
Prerequisites: Basic knowledge of Linear Algebra; Probability and Statistics	4 - 0 - 0

Course Outcomes:

CO1: Students will understand Bayesian Decision Theory, the canonical classifier model, and how different classification methods define decision boundaries. Evaluation: Assignments and projects
 CO2: Students will be able to apply performance evaluation methods for pattern recognition. Evaluation: Projects
 CO3: Students will be able to select appropriate techniques for addressing recognition problems. Evaluation: Assignments and projects
 CO4: Students will be able to implement basic pattern recognition algorithms. Evaluation: Assignments and projects
 CO5: Students will be able to summarize current pattern recognition research verbally and in writing. Evaluation: Assignments and research paper presentations

Course Content:

Introduction and mathematical preliminaries - What is pattern recognition? Clustering vs. Classification; Applications; Linear Algebra, vector spaces, probability theory, estimation techniques. Classification: Bayes decision rule, Error probability, Error rate, Minimum distance classifier, Mahalanobis distance; K-NN Classifier, Linear discriminant functions and Non-linear decision boundaries.
 Fisher’s LDA, Single and Multilayer perceptron, training set and test sets, standardization and normalization.

Clustering: Different distance functions and similarity measures, Minimum within cluster distance criterion, K-means clustering, single linkage and complete linkage clustering, MST, medoids, DBSCAN, Visualization of datasets, existence of unique clusters or no clusters.

Feature selection: Problem statement and Uses, Probabilistic separability based criterion functions, interclass distance based criterion functions, Branch and bound algorithm, sequential forward/backward selection algorithms, (l,r) algorithm.

Feature Extraction: PCA, Kernel PCA.

Recent advances in PR: Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy.

References:

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
2. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.
3. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

Social Network	IT0030E
Prerequisites: Basic programming, algorithm design, basics of probability & statistics	4 - 0 - 0

Course Outcomes:

On completion of the course students should be able to:

CO1: Use data communication vocabulary appropriately when discussing issues with other networking professionals.

CO2: Troubleshoot simple business network design errors.

CO3: Design simple business local, metropolitan and wide area networks using appropriate architectures, hardware and security.

Course Content:

Introduction; Handling Real-world Network Datasets

Strength of Weak Ties; Strong and Weak Relationships (Continued) & Homophily

Homophily Continued and +Ve / -Ve Relationships

Link Analysis ; Cascading Behaviour in Networks

Power Laws and Rich-Get-Richer Phenomena and Epidemics

Small World Phenomenon; Pseudocore (How to go viral on web)

References:

1. Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge University Press, 2010
2. Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010.

Soft Computing	IT0031E
Prerequisites: Basic programming, algorithm design, basics of probability & statistics	4 - 0 - 0

Course Outcomes:

On successful completion of the course students will be able to

CO1: Develop NN network based application.

CO2: Differential between supervised, unsupervised and reinforcement learning.

CO3: Apply fuzzy logic on real life problems.

CO4: Design Hybrid Systems viz Neuro-Fuzzy, Neuro- Genetic, FuzzyGenetic systems.

Course Content:

Introduction to Soft Computing, Introduction to Fuzzy logic, Fuzzy membership functions, Operations on Fuzzy sets; Fuzzy relations, Fuzzy propositions, Fuzzy implications, Fuzzy inferences; Defuzzification Techniques, Fuzzy logic controller;

Concept of GA, GA Operators: Encoding, Crossover, Mutation

Introduction to EC, MOEA Approaches: Non-Pareto, Pareto;

Introduction to ANN, ANN Architecture; ANN Training, Applications of ANN

References:

1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)

2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhizer(Springer)
3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)

Software Engineering	IT0032E
Prerequisites: Basic programming	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1: Understand and implement the concept of SDLC
- CO2: Understand the concept of project management
- CO3: Apply software quality assurance practices to ensure that software designs, development, and maintenance.
- CO4: Perform various testing techniques.

Course Content:

- Introduction; Life Cycle Models
- Requirements analysis and specification; Basics of software design; Procedural design methodology; Object-oriented concepts;
- Introduction to UML: Class and Interaction Diagrams
- Object-oriented analysis and design; Testing

References:

1. Software Engineering: A practitioner's approach by Roger S. Pressman, 7th edition, McGraw-Hill International edition
2. Software Engineering by Ian Sommerville, 7th edition, Addison-Wesley.
3. Fundamentals of Software Engineering by Rajib Mall

Switching Circuits and Logic Design	IT0033E
Prerequisites: Null	4 - 0 - 0

Course Outcomes:

- CO1: Able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.
- CO2: Able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
- CO3: Able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
- CO4: Able to design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

Course Content:

- Introduction to number systems and codes, error detection and correction, binary arithmetic.
- Switching primitives and logic gates, logic families: TTL, CMOS, memristors, all-optical realizations.
- Boolean algebra: Boolean operations and functions, algebraic manipulation, minterms and maxterms, sum-of-products and product-of-sum representations, functional completeness.
- Minimization of Boolean functions: K-map method, prime implicants, don't care conditions, Quine-McCluskey method, multi-level minimization.
- Design of combinational logic circuits: adders and subtractors, comparator, multiplexer, demultiplexer, encoder, etc.
- Representation of Boolean functions: binary decision diagram, Shannon's decomposition, Reed-Muller canonical form, etc.
- Design of latches and flip-flops: SR, D, JK, T. Master-slave and edge-triggered flip-flops. Clocking and timing issues.
- Synthesis of synchronous sequential circuits, Mealy and Moore machines, state minimization.
- Design of registers, shift registers, ring counters, binary and BCD counters. General counter design methodology.

Algorithmic state machine and data/control path design.
Asynchronous sequential circuits: analysis and synthesis, minimization, static and dynamic hazards.

References:

1. ZviKohavi and Niraj K. Jha, “Switching and Finite Automata Theory”, 3rd Edition, Cambridge University Press, 2010.
2. M. Morris Mano and Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL”, 5th Edition, Pearson Education, 2013.
3. Randy H. Katz and Gaetano Borriello, “Contemporary Logic Design”, 2nd Edition, Pearson Education, 2005.

Theory of Computation	IT0034E
Prerequisites: Data Structures and Algorithms.	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1: Understand concepts in formal language theory, grammars, automata theory, computability theory, and complexity theory
 - CO2: Understand abstract models of computing, including deterministic, non-deterministic, Push Down Automata and Turing machine models and their power to recognize the languages
 - CO3: Relate practical problems to languages, automata, computability, and complexity.
 - CO4: Apply mathematical and formal techniques for solving problems in computer science

Course

Content:

Finite Automata – deterministic and nondeterministic, regular operations
Regular Expression, Equivalence of DFA, NFA and REs, closure properties
Non regular languages and pumping lemma, DFA Minimization,
CFGs, Chomsky Normal Form
Non CFLs and pumping lemma for CFLs, PDAs, Equivalence of PDA and CFG
Properties of CFLs, DCFLs, Turing Machines and its variants
Configuration graph, closure properties of decidable languages, decidability properties of regular languages and CFLs
Undecidability, reductions, Rice's Theorem, introduction to complexity theory

References:

1. Introduction to the Theory of Computation by Michael Sipser.
2. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman (2007), Introduction to Automata Theory Languages and Computation, 3rd edition, Pearson Education, India.
3. K. L. P Mishra, N. Chandrashekar (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.

Web Technology	IT0035E
Prerequisites: Basics of programming	4 - 0 - 0

Course Outcomes:

- On successful completion of the course students will be able to
- CO1. Explain different components and technologies of World Wide Web as a platform.
 - CO2: Design and develop websites using fundamental web languages, technologies, and tools.
 - CO3: Distinguish between server-side and client-side web technologies.
 - CO4: Describe various web technology and application development issues and trends.

Course Content:

Introduction to Web, Web development strategies, Web applications, Working of Internet, Connections, TCP/UDP/IP, IP addressing, Ipv4 to Ipv6. ARP, RARP, DHCP, ICMP, HTTP, SMTP, and E-mail SNMP, Domain Name System (DNS), Internet Services, WWW, Web Servers. Web Browsers.
HTML and DHTML HTML Tag, Rules of HTML, Text Formatting & Style, List, Adding Graphics to Html Document, Tables and Layout , Linking Documents, Frame, Forms, Project in HTML.

Introduction to DHTML, CSS, Class & DIV, External Style Sheet. XML: DTD, XML schemes, presenting and using XML. Scripting: Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; introduction to AJAX.

Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, JSP pages, Session, Application: data base action. PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,mail, file upload, session, error, exception, filter, PHP-ODBC.

Referenes:

1. Xavier, C, “ Web Technology and Design” , New Age International
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
3. Ramesh Bangia, “Internet and Web Design” , New Age International
4. Bhave, “Programming with Java”, Pearson Education
5. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
6. Deitel, “Java for programmers”, Pearson Education.

CURRICULUM-2021
PH.D in MUSIC (DANCE)



DEPARTMENT OF MUSIC
TRIPURA UNIVERSITY (A Central University) SURYAMANINAGAR,
AGARTALA- 799 022,TRIPURA, INDIA

Programme: PH.D in Music (Dance)

Programme Educational Objectives

This programme focuses on the systematic research studies and promote deep study and awareness about Indian Dance: Performing Art tradition , the rich classical heritage of the India .This programme aims to produce of talented and skilled researchers, as well as teachers .

This curriculum focuses on various branches of Traditional and Modern Indian Dance forms: classical dances, Folk dances and Tribal Dances , Indian Modern Dance and Indian Contemporary Dance etc.

This curriculum opens path to the students in a various ways like - Indian Classical/ Folk Dance teacher and Lecturer in the schools, colleges and universities , Independent Researcher , Dance critic, 'Kalarasikas' in the field of Indian Dance.

Programme Specific Outcome

After obtaining advanced research skills and ethics of the Performing Art: 'Dance' discipline in this PH.D degree curriculum, research scholar can be benefited in the following ways:

This programme will be enable the student to

● PO.1	Advanced skills as Independent Researcher
	The scholars become able to publish their research findings in both National and Internationally reputed journals of 'Dance' discipline .
● PO.2	Ability to guide or supervision for Ph.D programme
	Researchers become able to teach and guide in future in research area of Dance Discipline.
● PO.3	Cognizance to critical thinking
	Researchers able to recognize the problems that exists in the Dance discipline areas and able to find solutions for the same by using well designed research methods, advanced technologies critical thinking .
● PO.4	Development of Innovative Ideas
	Find out innovative ideas that will help grow the pedagogic of Dance teaching profession .
● PO.5	Understand Tribal folk Dance Culture of North East India
	Researchers become able to find out problems of especially Tribal-folk Dance culture of North east and particular in the Tripura state.
● PO.6	Employability Potential
	After obtaining this curriculum and NET examination's researcher will get jobs of 'Assistant Professor'/Lecturer in Kathak Dance discipline in the higher education, affiliated institutions , Colleges and Universities

**Structure of the Marking scheme of the syllabus of Ph.D
Coursework in the ‘Dance Discipline’ of the Department. of Music**

Course Code/Course Name	Pass mark	Total Marks	Credits
DN-2001- Paper I- Research Methodology- I	50	100	4
DN-2002-Paper II- Research Methodology- II	50	100	4
DN-2003-Paper III - Advanced Area of Research in Dance	50	100	4
DN-2004-Paper IV - Seminar/ Practical/ Project and Assignment etc.	50	100	4
Total Marks =	200	400	16

Programme: PH.D in Music (Dance)

Detailed Syllabus and Course Specific Outcome

Paper I Research Methodology- I

Course Code	Name of the course	Course Structure Core/Elective Theory/Practical	Credit Distribution			Total Credit	Total Marks
			L	T	P		
DN-2001- Paper I	Research Methodology- I	Theory core	4	0	0	04	100
<p>CO : The outcome of this course is the development of students in an insight into the presentation of research ethics , computer analysis, and data analysis.</p>							
<p>At the end of the course, students enable to</p> <ul style="list-style-type: none"> ❖ Illustrate the research methods and research design ,its objective, Aim, Methodology ,types etc. ❖ Explain about Research writing , Synopsis writing, Bibliography , Synopsis writing preparation, research paper writing, , references, footnotes, index, Appendix, organization of thesis, hypothesis concept, academic language etc. ❖ Upskill the Primary and secondary sources, Manuscript and Books, Journal Magazine , Sculpture -Paintings & Archaeological findings, Museums etc. ❖ Research Ethics: issues of academic ethics: copyright issues, anti-plagiarism, plagiarism software etc. 							

Unit-I

Research Methods and Design: Definition, Aim, Objective, Importance of research, types of research, Methodology and research design.

Unit-II

Research Writing: Definition, Importance, Synopsis writing preparation, research paper writing, bibliography, references, footnotes, index, Appendix, organization of thesis, hypothesis concept, academic language etc.

Unit-III

Primary and secondary sources, Manuscript and Books, Journal Magazines , Sculpture -Paintings & Archaeological findings, Museums etc.

Research Communication: presentation in conferences and seminars, personal communication

Unit-IV

Research Ethics: issues of academic ethics: copyright issues, anti-plagiarism, plagiarism software etc.

Suggested Readings/Reference Books:

1. Research Methods in Indian Music, Prof. Najma Perveen Ahmad, Manohar Publishers and Distributors, New Delhi.
2. Research Methodology: Methods and techniques, C.R. Kothari, Wiley Eastern Ltd. New Delhi, 1985.
3. Sources of research in Indian Classical Music, Dr. Ms. Reena Gautam, Kanishka Publishers, New Delhi, 2002.
4. Research Methodology, Dr. Madan Mohan Lavaniya, College Book House, Jaipur, 1985. (In Hindi)
5. "Shodh Pravidhi" Dr. Vinaymohan Sharma, National Publishing House, Delhi, 1980 (In Hindi)
6. Research Methodology, Dr. B.M. Jain, Research Publications, Jaipur, 1987 (In Hindi)

Paper II
Research Methodology- II

Course Code	Name of the course	Course Structure Core/ Elective Theory/ Practical	Total Credit	Total Marks
DN-2002 Paper II	Research Methodology -II	Theory Core	04	100

CO: The outcome of this course is the development of students in an insight into the Data collection , Literature Review, and data analysis computer applications internet and plagiarism .

At the end of the course students enable to

- ❖ Illumine Data , Types of Data , Methods of Data collection, Interview, questionnaire, Library visits , Selection of research topics etc. Use of handy cam and recorder for data collection and transcription, Documentation and archiving etc.
- ❖ Edify the review of the Literature: Purpose of the Review: Identification of the Literature: Organizing the literature, Review concepts, Literature Review , Published , Unpublished papers , books other sources of information, media-Print and electronic etc.
- ❖ Explicate computer applications- Application of computer -Spreadsheet , Presentation , Outlook , Google applications - drive ,cloud, use of MS Word, MS PowerPoint for slide preparation, Internet surfing, electronic devices, discs and tapes etc.
- ❖ Illuminate about Internet, Plagiarism etc, Indexing-rules, Use of MS Word, MS excel, PowerPoint for slide preparation, Internet surfing etc.

Unit - I

Data , Types of Data , Methods of Data collection, Interview, questionnaire, Libraray visits , Selection of research topics etc. Use of handicam and recorder for data collection and transcription, Documentation and archiving etc.

Unit – II

Review of the Literature: Purpose of the Review: Identification of the Literature: Organizing the literature, Review concepts, Literature Review , Published , Unpublished papers , books other sources of information, media- Print and electronic etc.

Unit -III

Computer applications- Application of computer -Spreadsheet , Presentation , Outlook , Google applications - drive ,cloud, use of MS Word, MS PowerPoint for slide preparation, Internet surfing, electronic devices, discs and tapes etc.

Unit-IV

Internet – Internet, Plagiarism etc, Indexing-rules, Use of MS Word, MS excel, PowerPoint for slide preparation, Internet surfing etc.

Suggested Readings/Reference Books:

1. Survey Research Methods –Floyd. J.F., Sage Publications, New Delhi.
2. Methods in Social Research- Goode C.V. & D.E. Scates, McGrawHill, 1954.
3. The Art Heritage of India- Havell.E.B; D.B Taraporevala Sons and Co. Pvt. Ltd. 1964.
4. Research Methodology, Misra R.P, Concept publishing company, New York,1989.
5. Exploring research, Salkind N.J., Printice Hall, New Jersey, 1997.
6. Advanced Research Methodology, Srivastava, G.N.P. Radha Publications, New Delhi,
7. The Elements of Research, Whitney F.L., Printice Hall, New York, 1950.

PAPER- III

ADVANCED RESEARCH IN DANCE

Course Code	Name of the course	Course Structure Core/Elective Theory/Practical	Total Credit	Total Marks
DN-2003 Paper- III	ADVANCED RESEARCH IN DANCE	Theory	04	100

CO: This course will enable the students to be acquainted with recent trends in Dance (Indian traditional Classical dance, folk Dance, Tribal Dance, Modern-Contemporary Dance etc.) Including evaluation of different theoretical perspectives and topics related to the interest of course instructors, supervisors , and research scholars .

At the end of the course students enable to

- ❖ Delineate about Modern dance India : Origin , Concept and development , Contribution of Pt.Uday Shankar and his associates and followers, choreographers to Modern Dance.
- ❖ Expound about the new experiments and directions in the traditional Indian classical dance forms : Kathak, Bharatnatyam ,Odissi, Kuchipudi and Contribution of artists, choreographers.
- ❖ Explicate the Contemporary Dance : Concept, history , Any two famous Artist and choreographers of western Contemporary Dance and contribution etc. Concept of Contemporary Dance in India , Any two famous Indian contemporary dance choreographers / artists and their work, contribution etc.
- ❖ Elucidate about the performing Arts in India: Status of Women performing artists and mindset of society.Performing arts and social equality , Discrimination and castisam.

Unit - I

- a. Modern dance India : Origin , Concept and development etc

- b. Contribution of Pt. Udayshankar and his associates and followers, choreographers to Modern Dance.

Unit - II

- a. New experiments and directions in the traditional Indian classical dance forms : Kathak, Bharatnatyam ,Odissi, Kuchipudi etc. all eight classical dance forms.
- b. Contribution of artists, choreographers in this direction of all Indian Classical dance forms.

Unit -III

- a. Contemporary Dance : Concept, history , Any two famous Artist and choreographers of western Contemporary Dance and contribution etc.
- b. Concept of Contemporary Dance in India , Any two famous Indian contemporary dance choreographers / artists and their work, contribution etc.

Unit-IV

- a.Performing Arts in India: Status, Women’s role in Indian performing arts,Women performing artists and mindset of society.
- b.Performing arts and social equality , Discrimination and castisam.

Suggested readings , Books:

1. Contemporary Indian Dance: New creative Choreography in India and the Diaspora - Ketu H.Katrak, Palgrave macmilan publication.
2. Indian Contemporary dance an extravaganza , Utpal K banerjee, shubhi Publication, Delhi.
3. Pt.Udayshankar: 21st century Natraja, Ashokkumar Mukhopadhaya, Rupa Publication.
4. Kathak Nritya Shiksha -Part -II.Dr.Puru Dadhich , Bindu Prakashan, Indore.
5. New Directions in Dance, Sunil Kothari , Marg Prakashan.
6. Asian Dance, Kapila Vastyana,B.r.Rhythms Publication, Delhi.
7. Performing Arts in India: A policy perspective , Shovana Narayan,Kanishka Publication Delhi.
8. Contemporary Dance: Practices, Paradigms and practioners, Tripura Kashyap , Aau publication.

Paper -IV

Seminar Presentation

Course Code	Name of the course	Course Structure Core/Elective Theory/Practical	Total Credit	Total Marks
DN-2004 Paper-IV	SEMINAR PRESENTATION	Practical Elective	04	100
<p>CO: The outcome of the course is to develop skills of the public speaking in seminars to the research scholars.</p>				
<p>At the end of the course students enable to.....</p> <ul style="list-style-type: none"> ❖ Demonstrate the prepared presentation of the research draft and papers etc. with the help of LCD projector. ❖ Command over public speaking and expound about research work etc. 				

Preparation of seminar: Preparing the draft after consultation with the supervisor, art of public speaking and presentation paper etc., prioritizing data, transliteration and abbreviation, body language, using overhead projector and LCD projector etc. Research scholars have to give presentation of two public seminars and (100 marks) (Alternatively there could be teaching practice to P.G classes of Dance theory practical, required to be done by every Ph.D. student in order to train them in the Art, Methodology skills of Kathak Dance practical and Theory teaching)

त्रिपुरा विश्वविद्यालय

TRIPURA UNIVERSITY

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List of programmes where syllabus revision was carried out during 2019-20

Program me Code	Programm e name	Year of Introd uction	Year of revision (if any)	If revision has been carried out in the syllabus during last 5 years, Percentage of content added or replaced	Link to the relevant document
GEO	MA/MSc in Geograph y & Disaster Managem ent	2004	2015 & 2020	50%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Geography%20%20D.M.%20(GEDM%20Syllabus).pdf
BEN	MA in Bengali	1977	2015, 2016, 2020	70%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Bengali%20%20syllabus.pdf
MAT	MSc in Mathemat ics	1987	2020	35%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Mathematics.p df
KOK	MA in Kokborok	2015	2015(introduction), 2020	10%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Kokborok Sylla bus BPGS.pdf
ECN	MA/MSc in Economics	1987	2015, 2019, 2020	60%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Economics.pdf
POL	M.A. in Political Science	1994	2015, 2020	75%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision



					/1.1.2 Pol.Sc syllabus BPGS minutes.pdf
BTN	MSc in Botany	2007	2020	5%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1_2.1_Syllabus_revision/1.1.2_Botany%20Syllabus,%202020.pdf
ENG	M.A. in English	1990	2020	20%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1_2.1_Syllabus_revision/1.1.2_English.pdf
CHM	MSc in Chemistry	1976	2015, 2017, 2020	60%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1_2.1_Syllabus_revision/1.1.2_Chemistry_BPGS_Syllabus.pdf
MSE	M.Tech, Material Science and Engineering	2016	2016(introduction), 2020	45%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1_2.1_Syllabus_revision/1.1.2_MatSciEngg_syllabus_BPGS.pdf
CSE	M.Tech in Computer Sc & Engineering	2005	2017,2018,2019	10%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1_2.1_Syllabus_revision/1.1.2_CSE_syllabus_BPGS.pdf
BLIS	Bachelor of Library and Information Science	2016	2016(introduction), 2020	20%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1_2.1_Syllabus_revision/1.1.2_BLIS_syllabus.pdf
FBS	M.Sc. in Forestry and Biodiversity	2012	2015, 2020	60%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1_2.1_Syllabus_revision/1.1.2_FBD_Syllabus_BPGS_DCM.pdf
MCA	Master of Computer Application	2009	2015, 2019, 2020	35%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1_2.1_Syllabus_revision/1.1.2_IT_Syllabus_BPGS_BCA_MCA_MTech_PhD_2015_2019_2020.pdf



L TTL	MA in Linguistics & Tribal Languages	2016	2016(introduction), 2019, 2020	20%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Linguistics_Syllabus_BPGS.pdf
LAW	Master of Law (One Year)	2017	2017(introduction), 2020	Not applicable	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_BFS_BPGS_AC/10th%20bfs%20arts%20(Revision%202020).pdf
HSS	M.A. in HISTORY	1978	2016, 2020	25%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_History_New%20Syllabus.pdf
HIN	MA IN HINDI	2006	2020	20%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Hindi_Syllabus_Structure_BPGS.pdf
HPH	M. Sc. in Human Physiology	2007	2015, 2017, 2020	40%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Human%20Physiology_BPGS_Minutes_Syllabus_New_Courses.pdf
PHY	MA in Psychology	2012	2018, 2020	75%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Psychology_MA%20Syllabus.pdf
MIB	MSc in Microbiology	2011	2015, 2016, 2018, 2019	75%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Microbiology.pdf
MBA	MBA	2005	2015,2016, 2019	70%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Business_Management.pdf



BBA	BBA	2003	2015,2019, 2020	60%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2 Business Management.pdf
PHS	MA in Philosophy	1994	2020	30%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2 M.A. Philosophy.pdf
SOC	M.A IN SOCIOLOGY	2012	2014, 2018, 2020	25%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2 Sociology.pdf
SNK	M.A in Sanskrit	1977	2020	10%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2 Sanskrit.pdf
MRM	Masters in Rural Studies	2006	2015, 2020	25%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2 Rural%20Studies.pdf
MCOM	Masters in Commerce	1988	2015, 2016, 2020	45%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2 Commerce.pdf
PGDFT	Post Graduate Diploma in Finance and Taxation	2015	2020	30%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2 Commerce.pdf
MMV	M.A in Hindustani Music (Vocal)	2009	2020	10%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2 music(Vocal).pdf
MMD	M.A in Classical Dance (Kathak)	2009	2020	10%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2 Music(Kathak).pdf



PHY	M. Sc. in Physics	1990	2015, 2020	25%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Physics_Syllabus.pdf
PED	Masters in Physical Education (M.P.Ed.)	2012	2016, 2020	40%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_M.PEd_Syllabus_BPGS.pdf
EDU	MA in Education	2012	2015, 2018, 2020	60%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Education.pdf
ZLG	M.Sc. in Zoology	2007	2015, 2016, 2000	40%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Zoology_Syllabus_BPGS.pdf
PGDWS	Post Graduate Diploma in Women Studies	2016	2020	5%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_BFS_BPGS_AC/10th%20bfs%20arts%20(Revision%202020).pdf
PGTS	Post Graduate Diploma in Tribal and Ethnic Studies	2010	2020	5%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_PGDTEs%20%20PhD%20in%20Social%20exclusion%20and%20inclusive%20policy%20.pdf
CHM-BVOC	B.Voc. in Rubber Technology	2015	2015(introduction), 2020	5%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_B.Voc.(Rubber%20Technology).pdf
JMC-BVOC	B.Voc. in Film Production	2015	2015(introduction), 2020	5%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_B.Voc.(Rubber%20Technology).pdf



त्रिपुरा विश्वविद्यालय

TRIPURA UNIVERSITY

(केन्द्रीय विश्वविद्यालय / A Central University)

MFA	Master in Fine Arts(Drawing and Painting)	2009	2020	5%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Fine_Arts.pdf
MFS	Master in Fine Arts(Modelling and Sculptures)	2009	2020	5%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Fine_Arts.pdf
MSE-PHD	PhD in Material Science and Engineering	2017	2017(introduction), 2020	10%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_MatSciEngg_syllabus_BPGS.pdf
MIB-PHD	PhD in Microbiology	2013	2015, 2016, 2018, 2019	75%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_Microbiology.pdf
MEE-PHD	Ph.D in Electrical Engineering	2013	2019	70%	https://tripurauniv.ac.in/Content/pdf/NAAC_SSR_Criteria1/TU_1.1.2.1_Syllabus_revision/1.1.2_EE_BPGS%20Proceedings%20and%20syllabus.pdf



CERTIFICATE

The syllabus of the following programmes were revised during the period 2015-2020:

Programme Code	Programme name	Year of revision
GEO	MA/MSc in Geography & Disaster Management	2015 & 2020
BEN	MA in Bengali	2015, 2016, 2020
MAT	MSc in Mathematics	2020
KOK	MA in Kokborok	2015(introduction), 2020
ECN	MA/MSc in Economics	2015, 2019, 2020
ECN-IMD	IMD in Economics	2016
POL	M.A. in Political Science	2015, 2020
POL-IMD	IMD in Political Science	2015
BTN	MSc in Botany	2020
STA	M.Sc in Statistics	2017
ENG	M.A. in English	2020
CHM	MSc in Chemistry	2015, 2017, 2020
MSE	M.Tech, Material Science and Engineering	2016(introduction), 2020
CSE	M.Tech in Computer Sc & Engineering	2017,2018,2019
BLIS	Bachelor of Library and Information Science	2016(introduction), 2020
FBS	M.Sc. in Forestry and Biodiversity	2015, 2020
MCA	Master of Computer Application	2015, 2019, 2020
LTTL	MA in Linguistics & Tribal Languages	2016(introduction), 2019, 2020
MBI	M.Sc. In Molecular Biology & Bioinformatics	2018
LAW	Master of Law (One Year)	2017(introduction), 2020
HSS	M.A. in HISTORY	2016, 2020
HIN	MA IN HINDI	2020
HPH	M. Sc. in Human Physiology	2015, 2017, 2020
PHY	MA in Psychology	2018, 2020
MIB	MSc in Microbiology	2015, 2016, 2018, 2019
MBA	MBA	2015,2016, 2019
BBA	BBA	2015,2019, 2020
PHS	MA in Philosophy	2020
SOC	M.A IN SOCIOLOGY	2014, 2018, 2020
SNK	M.A in Sanskrit	2020
ECE	M.Tech in ECE	2017, 2018, 2019
MEE	M.Tech in Electrical Engineering	2015, 2016,2018,2019


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PAR	M.Pharm (Pharmaceutical Chemistr)	2019
MRM	Masters in Rural Studies	2015, 2020
MCOM	Masters in Commerce	2015, 2016, 2020
PGDFT	Post Graduate Diploma in Finance and Taxation	2020
MMV	M.A in Hindustani Music (Vocal)	2020
MMD	M.A in Classical Dance (Kathak)	2020
PHY	M. Sc. in Physics	2015, 2020
PED	Masters in Physical Education(M.P.Ed.)	2016, 2020
EDU	MA in Education	2015, 2018, 2020
ZLG	M.Sc. in Zoology	2015, 2016,2000
CPE	MTech in Chemical and Polymer Engg.	2017
PGDWS	Post Graduate Diploma in Women Studies	2020
PDKOK	Post Graduate Diploma in Kokborok	2015
PGTS	Post Graduate Diploma in Tribal and Ethnic Studies	2020
CHM-BVOC	B.Voc. in Rubber Technology	2015(introduction), 2020
JMC-BVOC	B.Voc. in Film Production	2015(introduction), 2020
MFA	Master in Fine Arts(Drawing and Painting)	2020
MFS	Master in Fine Arts(Modelling and Sculptures)	2020
PHD	PhD in various disciplines	2015-2020


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