BHARATHIDASAN UNIVERSITY, TIRUCHIRAPALLI – 620 024
M.Com – Revised Course Structure under CBCS
(For the candidate admitted from the academic year 2016–2017 onwards)

(updated on 7-12-2017)

Semester	Course	Course Title	Ins. Hrs/ Week	Credit	Exam Hrs	Int	Ext	Total
I	Core Course – I (CC)	Managerial Economics	6	4	3	25	75	100
	Core Course – II (CC)	Services Marketing	6	4	3	25	75	100
	Core Course – III (CC)	Corporate Laws	6	4	3	25	75	100
	Core Course – IV (CC)	Income Tax Theory Law & Practice	6	4	3	25	75	100
	Elective Course – I (EC)	a) Insurance Management (or) b) Retail Management	6	4	3	25	75	100
		Total	**30**	**20**				**500**
II	Core Course – V (CC)	Advanced Financial Management	6	5	3	25	75	100
	Core Course – VI (CC)	Quantitative Techniques for Business Decisions	6	5	3	25	75	100
	Core Course – VII (CC)	Human Resources Management	6	5	3	25	75	100
	Core Course–VIII (CC)	Fundamentals of Information Technology (Theory & Practicals)	6	5	3	25	75	100
	Elective Course–II (EC)	a) Organizational Behaviour (or) b) Advanced Managerial Communication	6	4	3	25	75	100
		Total	**30**	**24**				**500**

III	Core Course – IX (CC)	Total Quality Management	6	5	3	25	75	100
	Core Course – X (CC)	Advanced Corporate Accounting	6	5	3	25	75	100
	Core Course – XI (CC)	Research Methodology	6	5	3	25	75	100
	Core Course – XII (CC)	Strategic Management	6	5	3	25	75	100
	Elective Course–III(EC)	a) Export Marketing (or) b) Brand Management	6	4	3	25	75	100
		Total	**30**	**24**				**500**
IV	Core Course – XIII (CC)	Investment Management	5	5	3	25	75	100
	Core Course – XIV (CC)	Advanced Cost & Management Accounting	5	5	3	25	75	100
	Elective Course-IV (EC)	a) E-Commerce (or) b) Customer Relationship Management	5	4	3	25	75	100
	Elective Course-V (EC)	a) Project Management (or) b) Management Information System.	5	4	3	25	75	100
	Project	Project Work Dissertation (80 marks) Viva voce (20 marks)	10	4				100
		Total	**30**	**22**				**500**
		GRAND TOTAL		**90**				**2000**

Note:

Project   :100 Marks

Dissertation   **: 80 Marks - Passing minimum 40 marks**

Viva Voice   **: 20 Marks - Passing minimum 10 marks**

Core Papers   -   14

Elective Papers -   5

Project   -   1

Note:
1. Theory   Internal   25 marks   External   75 marks
2. Separate Passing Minimum is prescribed for Internal and External
    a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
    b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
    c) The Passing minimum not less than 50 % in the aggregate

CORE COURSE - I
MANAGERIAL ECONOMICS

Objective : To make the students to realize the usefulness of economic tools, principles & laws in making business decisions.

UNIT I

Managerial Economics – Meaning, Nature, Scope and Application – Relationship with other discipline – Role of Managerial Economist – Demand Analysis – Demand Determinants - forecasting and techniques.

UNIT II

Production Function – Managerial use of production function – Supply analysis - Law of Supply – managerial uses of supply curve. Cost Concepts, classification & determinants – Cost Output relationship – Economies of scale - Cost Control and Cost Reduction.

UNIT III

Price and Output decisions under different marketing structures - Perfect competition, Monopoly, Oligopoly & Monopolistic Competition – Price discrimination – Pricing Objectives, policies, Strategies and methods - Price differentials – Price forecasting.

UNIT IV

Profit – Nature & Concept – Profit Planning, Policies and Forecasting- profit theories - Measurement of profit - Interest – Rent and theories.

UNIT V

Business Cycle and policies – Economic forecasting of business – Input Output Analysis – National Income - Accounting and Measurement.

Text and Reference Books (Latest revised edition only)

1. Joel Dean, Managerial Economics – Prentice Hall, New York.
2. Mehta P.L. – Managerial Economics – Sultan Chand and Sons, New Delhi.
3. Varshney and Maheswari - Managerial Economics - Sultan Chand and Sons, New Delhi.
4. Gupta G.S. – Managerial Economics – Tata McGraw Hill, New Delhi.
5. Mithani D.M. – Managerial Economics – Himalaya Publishing House, Mumbai.
6. Dwivedi D.N. - Managerial Economics - Vikas Publishing House P. Ltd, New Delhi.
7. Cauvery, SudhaNayak and Others - Managerial Economics - S. Chand and Sons, New Delhi.
8. H. Craig Petersen, W. Cris Lewis, Managerial Economics, 4th Edition, Pearson Education.

CORE COURSE – II

SERVICES MARKETING

Objective : To enable students to gain expert knowledge on marketing of various services.

UNIT I

Services Marketing – Definition – importance – characteristics of services – Growth of Services Marketing – Types of services – Comparative analysis between services and products.

UNIT II

Concept of services marketing – Societal concept – Buyer behaviour concept – Factors influencing buyer behaviour – Decision making process. Delivering Quality Service - TQM in services marketing - Quality standards - process and technological requirements to implement Quality Standards in services marketing.

UNIT III

Services Marketing Mix – Product Strategy – Product Life Cycle concept – Strategies during the Product Life Cycle – Product Planning Strategy – Development of new products – Diversification and elimination.

UNIT IV

Bank Marketing – Insurance Marketing – Transport Marketing.

UNIT V

Tourism and Hotel Marketing - Education Marketing – Communication Services Marketing – Health services.

Text and Reference Books :(Latest revised edition only)

1. S.M.Jha, Services Marketing, Himalaya Publishing House, Mumbai.
2. M.Y.Khan, Services Marketing, Tata McGraw Hill, New Delhi.
3. C.B.Memoria&R.K.Suri,Marketing Management, Kitab Mahal,
4. Kotler -Marketing Management , Sultan Chand & Sons, New Delhi.
5. Cowell.- Marketing of Services, Heinemann Publishers, London.
6. Christopher Lovelock, JochenWirtz&Jayanta Chatterjee – Service Marketing People, Technology, Strategy. Pearson Education.

CORE COURSE – III

CORPORATE LAWS

Objective: To make the students understand the legal framework with reference to Companies in India.

UNIT I

Provisions of Companies Act 1956 relating to Company Administration – Board of Directors – Managing Director – Provisions relating to various types of meetings. Latest amendments in Companies Act, 2013 relating to company administration and governance.

UNIT II

Industries (Development and Regulation) Act, 1951 - object – Definitions – Central Advisory Council – Development Council – Regulation of Scheduled Industries – Registration and Licensing – Investigation and takeover of Management of Industrial undertakings of Central Government – Effect of Central Government's order – Management and control of undertakings owned by companies in liquidation – Power to provide relief measures – power to exempt special cases – penalties.

UNIT III

Foreign Exchange Management Act, 1999 – Definitions – Regulation and Management of Foreign Exchange – Authorized person – contravention and penalties – adjudication and penalties – Directorate of Enforcement.

UNIT IV

The Essential Commodities Act, 1955 – Powers of Central Government to Control, effect, seizure and confiscation – Consumer Protection Act 1986 – Definition – Consumer Protection Council – Consumer Disputes Redressel Agencies – District Forum – State Commission – National Commission.

UNIT V

Water (Prevention and Control of Pollution) Act, 1974 - Definition – functions and powers of various Boards - Compliance regarding discharges causing pollution, Penalties and Offences – Air (Prevention and Control of Pollution) Act, 1981 - Definition – Functions and powers of various Boards – Duties of occupier of specified industries to ensure adherence to standard offences by companies.

Text and Reference Books : (Latest revised edition only)

1. Bar Act of all relevant Legislations.
2. Corporate Laws and Secretarial Practice –Sultan Chand and Sons, New Delhi.
3. N.D.Kapoor, Dr.G.K.KapoorCorporate Laws and Secretarial Practice, Premier Book Company, New Delhi.
4. TejpalSheth, Corporate Laws, Taxman Publication, Mumbai.
5. U.K.Chandhary,Economic Legislation – Law & Practice, Sultan Chand & Sons, New Delhi.
6. S.S.Gulshan and G.K.Kapoor,Economic and other Legislations Sultan Chand& Sons, New Delhi.

CORE COURSE – IV

INCOME TAX THEORY LAW AND PRACTICE

Objective: To acquaint Students to know the latest Income Tax Law and enable them to file Income Tax Returns.

UNIT I

Income Tax Act – Definition – Income – Agriculture Income – Assessee – Previous year – Assessment year – Residential Status – Scope of Total Income – Capital and Revenue – Receipts and Expenditure – Exempted Incomes.

UNIT II

Computation of Income from Salaries and Income from House Property.

UNIT III

Computation of Profits and Gains of Business or Profession – Computation of Capital Gain - Computation of Income from other sources.

UNIT IV

Set-off and Carry Forward of Losses – Deduction from Gross Total Income – Computation of Tax Liability.

UNIT V

Income Tax Authorities – Procedure for Assessment – Tax Deducted at Source (TDS) – Assessment of Individuals, Hindu Undivided Family, Partnership Firms and Companies.

Note : Theory 25 Marks : Problems - 50 Marks

Text and Reference Books :(Latest revised edition only)

1. Gaur &Narang, "Income Tax Law & Practice", DP Kalyani Publishers, New Delhi.
2. DingarPagare, "Tax Laws", S.Chand&Sons , New Delhi.
3. Vinod K.Singhania, "Direct Taxes", Taxmann's Publications, New Delhi.
4. T.S.Reddy& Hari Prasad Reddy, " Income Tax Theory, Law & Practice", Margham Publications, Chennai.
5. Government of India, Income Tax Manual
6. Dr.H.C.Mehrotra- Income Tax Law and Practice, SahithyaBhavan Publications, Uttar Pradesh.
7. Dr.Bhagawathi Prasad - Law& Practice of Income Tax India, VishwaPrakashan Publishers, Delhi.
8. Murthy, Income Tax- vijay Nicole, Chennai

ELECTIVE COURSE – I

(A) INSURANCE MANAGEMENT

Objective: To impart knowledge on the theory of insurance and to educate the process of insurance activities in India.

UNIT I

Insurance – Definition – Nature - Principles – Role - Importance – Types of Insurance & Insurance Organization. Insurance Contract. Privatization of Insurance in India – Major Players in Insurance Business – Impact of Privatization of insurance in India

UNIT II

Life Insurance – Nature – Classification of Policies - Annuities - Selection of Risk - Measurement of Risk – Mortality Table- Calculation of Premium- Surrender Value - Cover Note – Policy Conditions - Progress of Life Insurance Business in India.

UNIT III

Fire Insurance – Nature – Fire Insurance Contract – Kinds of Policies - Polic Conditions - Payment of Claims – Reinsurance - Double Insurance.

UNIT IV

Marine Insurance – Nature - Policies – Policy Conditions – Premium Calculation – Marine Losses – Payment of Claims - Progress of Marine Insurance Business in India.

UNIT V

General Insurance – Motor Insurance – Burglary and Personal Accident Insurance – Miscellaneous Forms of Insurance – Employee Liability Insurance – Property Insurance - Cattle Insurance – Crop Insurance - Medi-Claim – Overseas Medi - Claim Policy - Rural Insurance in India. Insurance Regulatory and Development Authority Act,1972 - IRDA Regulations 2000.

Text and Reference Books :(Latest revised edition only)

1. Dr.P.K.Gupta-Insurance and Risk Management-Himalaya Publishing House, Mumbai.
2. NaliniPravaTripathy and Pabir Pai-Insurance, Theory and Practice-Prentice Hall , New York.
3. M.N.Mishra-Insurance Principles and Practices-S.Chand& Sons, New Delhi
4. Mark S. Dorfman-Introduction to Risk Management and Insurance-Prentice Hall, New York.
5. IRDA 1999.

(B)   RETAIL MANAGEMENT

Objective : To gain an in-depth knowledge about Retail Management.

UNIT I

Retailing - Definition – Concept - Characteristics – Traditional and non-Traditional   retailing – Applications of information technology in retail management - E – Retailing

UNIT II

Global trend in retailing – Indian retail industry –Drivers to the growth of retail – Macro   and   micro   environmental   influences   – Creativity in retailing - Emerging trends   and   challenges - FDI in retailing - Rural retailing.

UNIT III

Retail formats - types –Choice of location –Store layout and designs – Positioning of   retail shops – Retail store image – Retail service quality Management - Retail   Administration: Store   Management, HRM, Information systems.

UNIT IV

Merchandise management – Service retailing Vs. Product retailing – Retail branding - Pricing for retail – Promotion – Supply chain and logistics - handling returns – Retail   marketing   strategies   -   Retail Communications - Mall Management

UNIT V

Shopping process –Influences of shoppers' attitude, perception, personality and life   style in retail shopping behaviour – Handling complaints – Delivering value to   retail   shoppers   -   CRM   in retailing – Retail research

Text and Reference Books :(Latest revised edition only)

1. Barry Berman, Joel.R.Evans, "Retail Management – A Strategic Approach," Prentice Hall, New York.
2. James   R.   Ogden,   Denise   J.   Ogden,   "Integrated   Retail Management,"Biztantra Publisher, New Delhi.
3. Swapana Pradhan ," Retailing Management, Text & Cases," Tata McGraw Hill Publications, New Delhi.
4. "Retail Management - A Strategic Approach ",Barry Berman and Joel.R.Evans, Prentice Hall of India.
5. Integrated Retail Management" - James R. Ogden and Denise J. Ogden –Biztantra Publisher, New Delhi.

CORE COURSE - V
ADVANCED FINANCIAL MANAGEMENT

Objective : To enable the students understand concepts and application of financial management tools.

UNIT I

Financial Management: Meaning, nature and scope of finance; financial goal – Profit Vs Wealth Maximisation; Finance functions – investment, financing and dividend decisions.

UNIT II

Fundamental valuation concepts: - Time value of money – Compound value, Present value; Risk and Return – concept, Risk in a portfolio context, Relationship between Risk and Return. Valuation of Securities – Valuation concept – Bond Valuation – Valuation of Preference shares, Equity valuation – Dividend valuation approach, Earnings capitalisation approach and Ratio approach.

UNIT III

Cost of capital: Meaning and Significance of cost of capital; calculation of cost of debt, preference capital, equity capital and retained earnings; combined cost of capital (weighted). Financial Leverage: Meaning, Measurement of leverages; Effect of Operating and Financial Leverage on Profit; Analysing alternate financial plans; combined financial and operating leverages.

UNIT IV

Planning the Capital Structure – Factors influencing capital structure; EBIT-EPS Analysis, Return on Investment Analysis, Cash flow analysis, capital structure policies – Theories. Dividend policy -Factors determining dividend pay-out, Forms of dividend; stability in dividend policy; corporate dividend behaviour

UNIT V

Management of working capital:- Meaning, Significance and Types of working capital; calculating operating cycle period and estimation of working capital requirements; sources of working capital; Management of cash, receivables and inventory.

Note: Theory : 25 Marks : Problems: 50 Marks

Text and Reference Books (Latest revised edition only)
1. I.M.Pandey. Financial Management,Vikas Publishing House Pvt ltd, New Delhi.
2. Prasanna Chandra, Financial Management, Theory and Practice, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
3. M.Y.Khan&P.K.Jain,Financial Management, Text and Problems. Tata McGraw-Hill Publishing Company Ltd, New Delhi.
4. P.V. Kulkarni & B.G. Sathyaprasad,Financial Management –Himalaya Pulishing House, Mumbai.
5. S.N.Maheswari, "Financial Management principles and practice,"Sultan Chand & Sons, New Delhi.
6. James C. Van Horne & John M. Wachowicz, Jr.Fundamentals of Financial Management- PHI Learning Private Limited, New Delhi.
7. Srinivasan, Financial Management, Vijay Nicole, Chennai

QUANTITATIVE TECHINIQUES FOR BUSINESS DECISIONS

Objective : To acquaint the students with the Statistical tools and techniques for managerial decisions.

UNIT I:

Meaning of Quantitative Techniques – Role of Quantitative Techniques – Advantages and Limitations of Quantitative Techniques – Correlation Analysis – Simple – Partial and Multiple –Regression Analysis – Time Series.

UNIT II:

Probability – Problems applying Additional and Multiplication Theorem – Mathematical Expectations – Theoretical Distributions – Binomial – Poisson – Normal Distribution.

UNIT III:

Significance Tests in Small Samples (t test) – Testing the significance of the mean of a random sample – Testing difference between means of two samples (Independent and Dependent Samples) – Chi-square test- Analysis of Variance (One way and two way classification).

UNIT IV:

Linear Programming – Graphical Method – Simplex Method – Transportation Problems – Initial Basic Feasible Solution - Modi Method – Assignment Problems.

UNIT V:

Interpolation and Extrapolation – Methods of Interpolation – Binomial Expansion Method – Newton's Method – Lagrange's Method – Parabolic Curve Method – Extrapolation – Vital Statistics – Life Tables.

Note: Theory 25 Marks : Problems 50 Marks

EQUAL IMPORTANCE TO BE GIVEN TO ALL UNITS

Text and Reference Books (Latest revised edition only)
1. S.P. Gupta, Statistical Methods - Sultan Chand & Sons, New Delhi – 600 002.
2. S. Gurusamy,Operations Research, Vijay Nicole Imprints Pvt. Ltd, Chennai.
3. D. Joseph Anbarasu,Business Statistics –Vijay Nicole Imprints Pvt. Ltd., Chennai.
4. C.R.Kothari, Quantitative Techniques –Vikas Publishing House, New Delhi.
5. Levin, Richard I. and David S Rubin: Statistics for Management, Prentice Hall, Delhi.
6. Hooda, R.P: Statistics for Business and Economics, Macmilla 3rd edition, New Delhi.
7. Hein, L.W: Quantitative Approach to Managerial Decisions, Prentice Hall, Delhi

CORE COURSE VII
HUMAN RESOURCE MANAGEMENT

Objective : To impart knowledge on the concepts and principles of HRM followed in different types of organization.

UNIT I

Human Resource Management- Meaning – Nature and Scope, Objectives - Functions - Distinction between HRM and Personnel Management. Personnel Policies: Procedure and Programmes. Organization of HRM Department– Needs - Recent Trends in HRM Practices – Personnel Audit- Human Resource Information System- need and benefits.

UNIT II

Man Power Planning – Characteristics: Need, Process - Job Analysis- Job Description- Job Specification - Job Design- Job Evaluation Methods – Merits and Demerits - Job Enrichment-Job Enlargement –Re-Engineering - Recruitment – Sources - Selection- Selection Procedure, - Interviews – Placement - Induction

UNIT III

Training –Meaning, Need - Selection of Trainees- Methods of Training – Evaluation of Training - Management Development Programmes- Methods.- Promotion – Types, Merits- Demotions; Carrier Planning - Transfers

UNIT IV

Performance Appraisal – Purpose- Factors Affecting Performance Appraisal – Criteria for Performance Appraisal – Performance Appraisal Techniques – Limitation of Appraisal Methods. Quality of Work Life – Issues in Quality of Work Life- Measuring QWL – Workers Participation in Management.

UNIT V

Grievance – Meaning, Causes of Grievance- Grievance Redressal Procedure – Collective Bargaining – Meaning – levels – methods – pre -requisites – Benefits.

Text and Reference Books (Latest revised edition only)

1. Pravin Durai, Human Resource Management, 2nd Edition, Pearson Education,   New Delhi
2. Dr.Ashwathappa, Human Resource Management ,McGraw Hill Education (India) Pvt. Limited, New Delhi.
3. Edwin Phillip, Personnel Management - Tata McGraw Hill, Delhi.
4. L.M. Prasad ,Human Resources Management, Jain Book Agency, New Delhi.
5. DaleYoder & Paul D. Staudohar, Personnel Management, Prentice Hall.
6. S.S. Khanka, Human Resource Management ,S.Chand& Sons, New Delhi.
7. Gary Dessler, "Human Resource Management", Seventh edition, Prentice-Hall of   India P.Ltd., Pearson.
8. H.John Bernardin&JoyeeE.A.Russel, Human Resource Management - An experiential approach, 4th Edition, McGraw-Hill International Edition., 2007
9. David A. DeCenzo& Stephen P.Robbins, Personnel/Human Resource Management, Thirdedition, PHI/Pearson.
10. VSP Roa, Human Resource Management : Text and cases, First edition, Excel Books, NewDelhi.

CORE COURSE VIII

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Internal Assessment: Theory – 15 Marks; Practical – 10 Marks

University Examinations : *Theory- 45 Marks ; Practical - 30 Marks.*

Examination Duration : **Theory 2 Hours ; Practical 2 Hours**

Objective : To enable the students to acquire knowledge in computers, Information Technology and to develop skills in Computerized Accounting System both theory and in practical.

(Theory & Practical)   (Theory 45 Marks)

UNIT I

Introduction to Computers – Classification of Computers – Generations of Computer – Memory Units – Auxiliary Storage Devices – Input and Output Devices - Computer Software – Operating System – Programming Languages.

UNIT II

Fundamentals of Computerized Accounting – Computerized Accounting Vs Manual Accounting - Procedure for Creating a new company – Groups Creation - Ledger Creation.

UNIT III

Vouchers creations – Payment voucher – Receipts voucher – Sales voucher – Purchase voucher – Journal voucher – Contra voucher.

(PRACTICAL – 30 Marks)

UNIT IV

Creation of a new company – Groups Creation – Multiple Groups and Single Groups - Creation of ledgers – Multiple Ledgers and Single Ledgers.

UNIT V

Vouchers creations – Voucher entry – Payment vouchers – Receipt vouchers – Sales vouchers – Purchase vouchers – Journal voucher and Contra vouchers.

Text and Reference Books (Latest revised edition only)

1. Dr.S.V.Srinivasa Vallabhan - Computer Applications in Business, Sultan Chand, New Delhi
2. Alexis Leon and Mathews Leon by Fundamentals of Information Technology.Vikas Publishing Company, New Delhi
3. Deepak Bharihoke, Fundamentals of Information Technology, Excel Publications, New Delhi.

<center>**ELECTIVE COURSE - II**</center>

<center>**(A) – ORGANISATIONAL BEHAVIOUR**</center>

Objectives : To make the students understand the basics of individual behaviour and group behaviour of people at work and enable them to gain knowledge relating to overall development of the organization.

UNIT I

Organisational Behaviour – Meaning – Characteristics – Disciplines contributing to OB – Relationship with other Social Sciences – Approaches to OB – Hawthorne Experiments.

UNIT II

Perception: Process – Factors influencing perception - Distortion in Perception – Learning: Theories of Learning – Attitudes: Factors influencing Attitude.

UNIT III

Personality: Theories of Personality – Determinants – Types - Emotional Intelligence – Features - Group Dynamics: Formal and Informal Groups – Group Cohesiveness – Stress   Management: Causes and Effects of Stress – Coping strategies for stress.

UNIT IV

Leadership: Theories and styles – Motivation – Theories of Motivation – Communication – Conflict Management: Role Conflict – Goal Conflict and   inter personal conflict

UNIT V

Organisation change – Process – Causes of resistance to change and Overcoming   resistance to change –Organisation Development – OD Process and Techniques – Organisation   Culture   –   Factors influencing organisation culture – Organisational   Effectiveness – Process and factors influencing organizational effectiveness.

Text and Reference Books
1. L.M. Prasad – Organisational Behaviour – Sultan Chand & Sons, Delhi.
2. K. Aswathappa – Essentials of Organisational Behaviour, **McGraw Hill, Delhi.**
3. Fred Luthans, Organisation Behaviour, McGraw Hill, Delhi
4. Hell Riegel, Slocum and Woodman, Organisation Behaviour, South Western, Thomson Learning, 9th Edition,
5. R.S. Dwivdi, Human Relations and Organizational Behaviour, Mc Millan India Ltd., 5th Edition.
6. Stephen P. Robbins, Organizational Behaviour, 9th Edition, Pearson Education, New Delhi,
7. P.Subba Rao, Essentials of Human Resource Management and Industrial Relations, Himalaya Publishing House.
8. P.C. Tripathi, Personnel Management and Industrial Relations ,Sultan Chand & Sons.
9. B.S.Bhatia and G.S.BatraHuman Resource Management — Deep & Deep Publications.

ELECTIVE COURSE – II
(B) ADVANCED MANAGERIAL COMMUNICATION

Objective : To impart knowledge on the theory of communication and to educate the communication techniques used in business organisations.

UNIT I

Managerial Communication - Concept – Evolution and Growth - Functions – Principles - Objectives – Communication as Management Tool, Process - Social Process. Exploring the Nature of Human Communication Process - Oral Communication - Written Communication - Filtering and Distortion of Message - Perception of Interpersonal Communication.

UNIT II

Communication Process - Self Confidence - Essentials for Effective Communication - Barriers – Measures to Overcome Barriers - Group Communication, Net Work- Wheel Pattern - Y-Pattern- Chain Pattern- Cycle Pattern and Free Flow pattern.

UNIT III

Non Verbal Communication - Kinesics, Para-language, Proxemics, Signals. Listening- Importance, Process- Types - Barriers to Effective Listening- Steps in Better Listening.

UNIT IV

Business Correspondence – Importance - Functions - Characteristics - Structure of Business Letters - Common Errors in Letter Writing - Types of Business Letters.

UNIT V

Group Communication – Group and Team Interactions - Team Briefing – Introduction – Process –Sample - Benefits- Format-Pre-requisites for Successful Briefing - Internal Communication – Memos / Circulars / Notes. Company Meetings – Agenda - Minutes.

Text and Reference Books :(Latest revised edition only)

1. C.S. Raydu, Media & Communication Management, Himalaya Publishing House, Mumbai.
2. Wofford, E. Gerloff, Organizational Communication,
3. Berlo, David , Process Of Communication,
4. Iillico, T. Michael, Managerial Communication,
5. Sunder &Kamaraj, Business Communication.
6. Ramachandran K.K Business Communication.

CORE COURSE – IX

TOTAL QUALITY MANAGEMENT

Objective : To make the students understand the recent concepts of total quality management and their importance in both manufacturing and service organisation.

UNIT I

Introduction to Quality Control - Quality and Cost Considerations - Statistics and its   Applications in Quality Control

UNIT II

Sampling Inspection in Engineering Manufacture - Statistical Quality Control by the Use of Control Charts - Methods of Inspection and Quality Appraisal - Reliability Engineering – Value Engineering and Value Analysis

UNIT III

Theory of Sampling Inspection - Standard Tolerance - ABC Analysis - Defect Diagnosis and Prevention

UNIT IV

Quality Improvement: Recent Technique for Quality Improvement - Zero Defect – Quality Motivation Techniques - Quality Management System and Total Quality Control

UNIT V

Selection of ISO Model and Implementation of ISO 9000 - Human Resource Development and Quality Circles - Environmental Management System and Total Quality Control

Note : Only Theory

Book References
1. Dahlgaard Jens J., Kristensen K., Kanji Gopal K, "Fundamentals of Total Quality Management", Bross Chapman & Hall, London
2. George, Stephen and Weimerskirch, Arnold, "Total Quality Management - Strategies and Techniques Proven", Mohit Publications
3. Hakes, Chris (editor), "Total Quality Management: The Key to Business Success",   NY: Chapman and Hall 4. Fox, Roy, "Making Quality Happen. Six Steps to Total Quality Management", McGraw-Hill
4. Srinivasa Gupta and Valarmathy, Vijay Nicole Imprints Pvt Ltd., Chennai
5. Jain, "Quality Control And Total Quality Management", Tata McGraw Hill
6. Lal H, "Total Quality Management: A Practical Approach", New Age International Private Ltd
7. Rao, Ashok, "Total Quality Management: A Cross Functional Perspective", Wiley & Sons

CORE COURSE – X

ADVANCED CORPORATE ACCOUNTING

Objective : **To enable the students to understand the detailed concepts of corporate accounting methods from different types of companies.**

UNIT I

Valuation of Goodwill and Shares – Liquidation - Inflation Accounting.

UNIT II

Amalgamation by merger and Amalgamation by purchases - External Reconstruction of Companies and alteration of Share Capital .

UNIT III

Holding Company Accounts (including intercompany holdings) - Bank Accounts New format – NPA – Classification of investments.

UNIT IV

Insurance Company Accounts(new format) – Double Account System.

UNIT V

Human Resource Accounting – Definition, Objectives, and Valuation Methods – Advantages – Accounting Standards, with reference to depreciation, inventory valuation. (Theory only) - Inflation Accounting - (Theory only).

Note: Theory 25 Marks :   Problems 50 Marks

BOOKS FOR REFERENCE:

1. M.C.Shukla, T.S.Grewall & S.C.Gupta – Advanced Accountancy - II
2. S.P.Jain and K.L. Narang – Advanced Accountancy
3. Dr R Palaniappan & Dr N Hariharan, Corporate Accounting, Vijay Nicole Imprints Pvt. Ltd., Chennai
4. R.L.Gupta and M.L.Radhaswamy – Advanced Accountancy
5. Mukherjee and Hanif – Modern Accountancy – II
6. Reddy & Murthy – Advanced Accounts

CORE COURSE – XI

RESEARCH METHODOLOGY
(Theory only)

Objective : To make the students understand the research process and the methods of presenting report.

UNIT I

Research in Management: An Introduction – Definition, meaning and nature – Scope and objects of Research. Types of Research : Experimental Research – Survey Research – Case Study methods – Ex Post Facto Research.

UNIT II

Research Design – Defining Research Problem and Formulation of Hypothesis – Experimental Designs.

UNIT III

Research Process – Steps in the process of Research, Data Collection and Measurement: Sources of Secondary data – Methods of Primary data collection – Questionnaire construction – Attitude measurement and Scales – Sampling and Sampling Designs – Philosophy and Pre-testing.

UNIT IV

Data presentation and Analysis – Data Processing – Methods of Statistical analysis and interpretation of Data – Testing of Hypothesis and theory of inference.

UNIT V

Report writing and presentation –steps in Report writing - types of reports – Substance of Reports – Formats of Reports – Presentation of a Report - Documentation - Foot Note - Bibliography.

BOOKS FOR REFERENCE:

1. V.P.Michael : Research Methodology in Management, Kitib Mohan Publications, Alahabad.
2. C.R.Kothari : Research Methodology, Wiley Eastern Ltd, New Delhi
3. P.Saravanavel, Research Methodology, Kitab Mahal, Allahabad.
4. O.R. Krishnaswami : Methodology of Research in Social Science
5. D.Amarchend : Research Methods in Commerce.
6. R. Prabhu & T Raju – Research Methods in Management – Vijay Nicole Imprints Pvt. Ltd., Chennai

CORE COURSE – XII
STRATEGIC MANAGEMENT
Objective : To make an understanding the concepts and application of strategic management techniques

UNIT I
Strategic Management – Definition – Scope – Benefits – Risks – Approaches – Models – Strategic change – Strategic Leadership and Decision making.

UNIT II
Situation Analysis – SWOT Analysis - Environmental Scanning and Industry analysis – Forecasting – Internal Scanning - Mission – objectives – Stakeholder Theory – Cyert and March's Behavioural Theory – Objectives of Non-Profit Organizations – Social Responsibility and Business Ethics.

UNIT III
Strategy Formulation – Business Strategy – Corporate Strategy – Diversion Strategy –Portfolio Analysis – BCG Growth /Share matrix – Strategic choice – Development of policies – Strategic Alliances.

UNIT IV
Strategy Implementation – Organization for action – Staffing – Strategic leadership – MBO –Total Quality Management – Functional Strategies – Growth Strategies – Diversification, Acquisition and Joint Venture – Recovery – Recession and Divestments Strategies – Management Burnout.

UNIT V
Strategic Control and Evaluation – Establishing Strategic control – premise control – Implementation control – Strategic Surveillance – Special Alert Control – Evaluation Techniques – Managing change – Strategic issues in Managing Technology and Innovation – Strategic Effectiveness.

BOOKS FOR REFERENCE :
1. Strategic Management – Strategy Formulation and Implementation – John A.Pearce II, Richard B.Robinson Jr.(A.I.T.B.S. Publishers – J-5,6, Krishnan Nagar, Delhi – 110 051).
2. Strategic Management – Awareness and change – John L.Thompson (Cheapman & Hall 32 Second Main Road CIT East, Chennai – 35).
3. Strategic Management-J.David Hunger and Thomas L.Wheelen (Addision – Wesley Longman) (Available at Higginbotham's Ltd., Chennai).
4. Strategic Management – Gregory G.Dess and Alex Miller.
5. Strategic Management – An Integrated Approach – W.L.Charles and John Gareth,
6. International & Strategic Management – R.N.Srivastava.
7. 7.Strategic Planning for Corporate Success – V.S.Ramaswamy and S.Nanakumari.

ELECTIVE COURSE – III

(A)EXPORT MARKETING

Objective : To create awareness on the concepts of export and export marketing procedures

UNIT I

Export Marketing - Introduction - Meaning – objectives – scope – Need and importance of export trade – Distinction between internal trade and international trade – Problems faced by exporters.

UNIT II

Features and Functions of export marketing – Sources of market information – Product planning – Quality control – Export pricing – Export marketing channels – Strategy formulation.

UNIT III

Steps involved in export – Confirmation of order – Production of goods – Shipment – Negotiation – Documents used for export – Commercial documents – Regulatory documents – ISO Certificate.

UNIT IV

Export Policy and Promotion: EXIM Policy – Regulation of export trade - Organisations for promoting export – incentives and assistance – Export Houses – Trading Houses.

UNIT V

Institutions engaged in financing export – ECGC – EXIM Bank – Organisations promoting export – Commodity Board – EPC – STC – MMTC.

BOOKS FOR REFERENCE :

1. Export Marketing – Balagopal, T.A.S., Himalaya Publishing House.
2. Export Marketing – Rathor, B.S., and Rathor, J.S.,HPH.
3. International Trade and Export Management – Francis Cherunilam.

ELECTIVE COURSE – III

(B) BRAND MANAGEMENT
Objective : To create an awareness on the concepts and valuation of brand image

UNIT I

Brand- concept – Evolution, perspectives, anatomy, types of brand names, brand name associations, Brands Vs Products, Advantages of Brands to consumers & firms. Brand elements: Components & choosing brand elements, Branding challenges & opportunities.

UNIT II

Brand positioning – Basic concepts – alternatives – risks – Brands & consumers – Strategies for positioning the brand for competitive advantage – Points of parity – Points of difference - Buying decision perspectives on consumer behaviour, Building a strong brand – Method & implications.

UNIT III

Brand Image, image dimensions, brand associations & image, Brand identity – perspectives, levels, and prisms. Managing Brand image – stages – functional, symbolic & experiential brands. Brand Equity – Sources of Equity. Brand Equity models, Brand audits. Brand Loyalty & cult brands.

UNIT IV

Leveraging Brands – Brand extensions, extendibility, merits & demerits, Line extensions, line trap – Co-branding & Licensing Brands. Reinforcing and Revitalisation of Brands – need, methods, Brand Architecture – product, line, range, umbrella & source endorsed brands. Brand Portfolio Management.

UNIT V

Brand valuation – Methods of valuation, implications for buying & selling brands. Applications – Branding industrial products, services and Retailers – Building Brands online. Indianisation of Foreign brands & taking Indian brands global – Issues & Challenges.

Reference:

1. Kevin Lane Keller, Strategic Brand Management, PHI/Pearson, New Delhi.
2. Kapferer, Strategic Brand Management, Kogan Page, New Delhi.
3. Harsh Varma, Brand Management, Excell Books, New Delhi.
4. Majumdar, Product Management in India, PHI.
5. Sengupta, Brand Positioning, Tata McGraw Hill.
6. Rameshkumar, Managing Indian Brands, Vikas.
7. Chandrasekar, Product Management, Himalaya.
8. A Anandan & Prasanna Mohan Raj – Brand Management – Vijay Nicole Imprints Pvt. Ltd., Chennai

INVESTMENT MANAGEMENT

Objective: To make the student to understand the investment opportunities and portfolio management

UNIT I

Investment Management - Nature and scope - Objectives – Process – Investment Media Security and Non-security forms of Investment - gilt edged securities – Sources of Investment information.

UNIT II

New Issues Market – Methods of Issuing – Parties involved in the new issue market – Secondary market – Stock Exchanges – NSE and BSE – Trading mechanism – online trading – SEBI and Investors production.

UNIT III

Security Analysis – Approaches – Fundamental Analysis – Technical Analysis – Dow Theory – Random Walk Theory - Efficient Market Hypothesis.

UNIT IV

Portfolio Analysis – Traditional and Modern approach – Rationale of Diversification of Investments – Markovitz theory – Sharpe Index Model - Capital Asset Pricing Model.

UNIT V

Investment companies in India – Types Mutual Fund Operations in India – UTI – SEBI and RBI Guidelines for Mutual Funds.

Note: Theory only

BOOKS FOR REFERENCE:
1. Punithavathy Pandian : Security Analysis and Portfolio Management (Vikas Publishing House)
2. Dr S Gurusamy –Security Analysis & Portfolio Management –Vijay Nicole Imprints Pvt Ltd, Chennai.
3. Gupta L.C. : Return of Equities – The Indian Experience (New Delhi OXFORD).
4. Bhalla V.K. : Investment Management and Portfolio Management (S.Chand & Co. Delhi).
5. Fisher & Jordon : Security Analysis and Portfolio Management.
6. Preeti Singh : Security Analysis (Himalaya Publishing House).
7. Avadhani V.A. : Investment and Securities Markets in India.
8. SEBI : Guidelines 1992.
9. Jack dark Francis Investment : Analysis and Management (McGraw Hill 1990).
10. Gara.K.L : Stock Exchanges in India.

CORE COURSE – XIV
ADVANCED COST & MANAGEMENT ACCOUNTING

Objective: To create knowledge on various aspects of the braches of cost and management accounting techniques.

UNIT I

Cost Accounting – meaning – objectives – Nature and Scope – methods of costing – techniques of costing - classification and coding of costs – inventory control – stock levels – inventory systems - methods of pricing material issues.

UNIT II

Labour costs – Direct and indirect – importance –Remuneration method – labour performance reports – labour turnover and stability – Overheads – Importance – allocation and apportionment of overheads - overhead cost control

UNIT III

Process costing - normal and abnormal loss and gains - equivalent production - joint   product and by product - contract costing.

UNIT IV

Management Accounting – Nature & Scope – Tools and Techniques – Ratio analysis   – marginal costing– cost-volume profit analysis – Break-even analysis – utility and   limitations of cost volume profit analysis – Financial and profit planning – objectives.

UNIT V

Budget administration – types of budget – advantages – budgeting and budgetary control - Standard Costing, Material, Labour and Overhead variances.

Note: Theory 30 Marks : Problems 45 Marks

BOOKS FOR REFERENCE :

1. S.P Jin and Narang, Csot account and management accounting, Kalyani publications
2. M. N. Arora, "Cost and Management Accounting", 8th Edition, Vikas Publishing House (P) Ltd.
3. Hilton, Maher and Selto, "Cost Management", 2nd Edition, Tata McGraw-Hill   Publishing Company Ltd.
4. B.M. Lall Nigam and I.C. Jain, "Cost Accounting", Prentice-Hall of India (P) Ltd.
5. Dr A Murthy & Dr S Gurusamy – Cost & Management Accounting, Vijay Nicole Imprints Pvt. Ltd., Chennai

(A) E – COMMERCE

Objective: To educate the importance and usage electronic knowledge in the field of commerce.

UNIT I

Introduction to E-Commerce – Electronic Commerce Frame work – Electronic commerce and Media convergence – The anatomy of E-Commerce Applications – Components of the Iway – Network Access Equipment – Global Information Distribution Networks – Internet Terminology – NSFNET : Architecture and Components - National Research and Educational Network.

UNIT II

Electronic Commerce and World Wide Web: Architectural Frame work for E- – WWW Architecture – Hypertext Publishing – Consumer Oriented Applications – Mercantile Process Models – Consumer's Perspective – Merchant's Perspective – Electronic Payment Systems (EPS) – Types - Designing EPS - Smart Cards and EPS – Credit Cards and EPS.

UNIT III

Electronic Data Interchange (EDI) : Applications – Security and Privacy Issues – Software Implementations – Value Added Networks – Internal Information System – Work-flow Automation and Coordination – Customization – Supply Chain Management .

UNIT IV

Marketing on the Internet: Advertising on the Internet – Chatting the On-Line Marketing Process – E-Commerce Catalogs or Directories – Information Filtering – Consumer-Data Interface: Emerging Tools.

UNIT V

Multimedia and Digital Video: Concepts – Digital Video and E-Commerce – Video Conferencing – Frame Relay – Cell Relay – Mobile Computing - Frame Work – Wireless Delivery Technology – Cellular - Data Communication Protocols.

Books for Reference:

1. Frontiers of Electronic Commerce - Ravi Kalakota, Andrew Winston
2. E-Commerce- A Managerial perspective - P.T.Joseph
3. Designing Systems for Internet Commerce- G.Winfield Treese & Lawrence C.Stewart
4. E-Commerce The Cutting Edge Of Business - Kamelesh K Bajaj, Debjani Nag
5. E Business Road Map for Success - Dr.Ravi Kalakota, Marcia Robinson
6. E-Commerce - Srinivasa Vallabhan .S.V, Vijay Nicole Imprints pvt. Ltd., Chennai

ELECTIVE COURSE - IV

(B) CUSTOMER RELATIONSHIP MANAGEMENT

Objective : To facilitates the students to understand the process of CRM, implementation of CRM strategies and customisation of services

UNIT I

Introduction and Significance - CRM Emerging Concepts; Need for CRM; CRM Applications; CRM Decisions; The Myth of Customer Satisfaction; CRM Model; Understanding Principles of Customer Relationship; Relationship Building Strategies; Building Customer Relationship Management by Customer Retention; Stages of Retention; Sequences in Retention Process; Understanding Strategies to Prevent Defection and Recover Customers.

UNIT II

CRM Process: Introduction and Objectives - an Insight into CRM and e-CRM/ online CRM; The CRM cycle - Assessment Phase; Planning Phase; The Executive Phase; Modules in CRM, 4C's of CRM Process; CRM Process for Marketing Organization; CRM Affiliation in Retailing Sector; Key e-CRM features.

UNIT III

CRM Architecture: IT Tools in CRM; Data Warehousing - Integrating Data from different phases with Data Warehousing Technology; Data Mining: - Learning from Information Using Date Mining Technology like OLAP etc.; Understanding of Data Mining Process; Use of Modelling Tools; Benefits of CRM Architecture in Sales & Productivity; Relationship Marketing and Customer Care, CRM Over Internet.

UNIT IV

CRM Implementation: Choosing the right CRM Solution; Framework for Implementing CRM: a Step-by-Step Process: Five Phases of CRM Projects

UNIT V

Development of Customizations; Beta Test and Data Import; Train and Retain; Roll out and System Hand-off; Support, System Optimization and Follow-up; Client/Server CRM Model; Use of CRM in Call Centers using Computer Telephony Integration (CTI); CTI Functionality; Integration of CRM with ERP System. Case Studies

Reference Books:
1. Mohammed, H. Peeru and a Sagadevan (2004). Customer Relationship Management. Vikas Publishing House, Delhi.
2. Paul Greenberge (2005). CRM-Essential Customer Strategies for the 21st Century. Tata McGraw Hill.
3. William, G. Zikmund, Raymund McLeod Jr.; Faye W. Gilbert (2003). Customer Relationships Management. Wiley.
4. Alex Berson, Stephen Smith, Kurt Thearling (2004). Building Data Mining Applications for CRM. Tata McGraw Hill

ELECTIVE COURSE - V

(A) PROJECT MANAGEMENT

Objective : To impart knowledge on the formation of projects to implementation of projects

UNIT I

Project – Meaning – Nature – Types of project and project life cycle – Project management – Nature and scope of project management– Project management as a profession – Role of project manager.

UNIT II

Project Identification and Formation: Project environment – Identification of investment opportunities – Projects screening – Feasibility study – Project selection – Project formulation – Stages in project formulation – Project report preparation – Planning Commission's guidelines for project formulation.

UNIT III

Project Appraisal: Objectives, essentials of a project methodology – Market appraisal – Technical appraisal – Financial appraisal – Socio – economic appraisal – Management appraisal.

UNIT IV

Project Planning and Scheduling : Objectives – Process or Planning Components or good planning – Project designing and project scheduling and time estimation – Scheduling to match availability of man power and release of funds – Cost and time.

UNIT V

Project Execution and Administration – Project contracting: Contract pricing, types – Project organisation: Forms of organisation – Project direction – Project communication – Project co ordination – Factors influencing effective project management – project time monitoring and cost monitoring – Project over runs. Project Control : Control techniques – PERT, CPM–Project audit.

Recommended Text book

1. For Unit II and IV Total project T Management The Indian context by PK. Joy – Mac   millan India Ltd.,
2. For UNIT I and V Project Management – by R. Panneerselvam and P. Senthil kumar   PHI learning India PVT Ltd.,
3. Project Management By Bhavesh .M Patel, Vikas Publishing Hous PVT Ltd.,
4. Project Management By S. Choudhury Tata Mcgraw Hill Co.
5. Project Management India Edition By CIDO I Clements, Cengage learning.

ELECTIVE COURSE - V
B) MANAGEMENT INFORMATION SYSTEM

Objective : To enable the students understand the concept Management Information system and implementation.

UNIT - I Introduction To Business Systems:

Need for IS in Business – fundamentals of IS – System concepts – Components of IS – IS resources Activities – Overview of IS – Operation Support Systems, Management Support Systems, Other Classification – System approach to Problem solving – Global business scenario – trends in technology and applications.

UNIT - II Information Systems for Business Operations:

Business Information Systems – Marketing Information Systems – Manufacturing Information Systems – Human Resource Information Systems – Accounting Information Systems, Financial Information Systems – Transaction Processing System.

UNIT - III Information Systems for Managerial Decision Support:

Management Information & Decision Support Systems – Management Information Systems – Expert Systems – Examples, Executive Information Systems – Artificial Intelligence Technologies.

UNIT - IV Information Systems for Strategic Advantage:

Strategic roles of IS-Breaking Business Barriers – Reengineering Business Processes Improving Business Quality – Creating Virtual Company – Building knowledge Creating Company – Using Internet Strategically – Challenges of Strategic IS – Enterprise – wide systems and E-Business applications. Internet and GST : Online Registration and filing of returns.

UNIT - V Managing Information Systems:

Enterprise Management – Information Resource Management – Strategic Management, Operational Management – Resource Management Technology Management – Distributed Management. Organizing Planning – IS planning methodologies – Critical Success Factors – Business Systems Planning – Computer Aided Planning Tools. Security & Ethical Challenges; IS controls – Facility Controls – Procedural Controls – Computer Crime – Privacy Issues.

Recommended Text books

1. Information Systems Today, By Leonard Jessup and Joseph VALACICH INDIAN Edition, PHI learning PVT Ltd.,
2. Management Information System, M Azam, Vijay Nicole Imprints Pvt. Ltd., Chennai-91.
3. Management Information system, By EFF OZ, Indian Edition, Cengage learning.
4. Management of Information systems by S.A. Kelkar, PHI learning PVT Ltd.,
5. Management Information systems Indian Edition, Gordon B. Davis and Margrethe H. Olson, Tata Mcgraw Hill.
6. Introduction to Information Systems by Alexis Leon and Mathews Leon Tata Mcgrawhill Co.
7. India GST for Beginners 2nd Edition, by Jayaram Hiregange & Deepak Rao, White Falcone Publishing.

PROJECT

PROJECT (DISSERTATION AND VIVA-VOCE)

OBJECTIVE :

To facilitate the students to understand the Business enterprises systematically and present the research report as per the acceptable format.

The project topics are to be finalised to the students at the end of the second semester with a time schedule to carryout various stages of work. During the semester vocation, the data Collection may be commenced. The theme selected by each student for the Dissertation should be related to various problems and issues pertaining to Commerce. Each candidate should submit two copies of dissertation as per the guidelines to the Controller of Examination and one copy to the department concerned. The project will be evaluated for 100 marks (ie. 80 marks for Dissertation work and 20 marks for Viva-Voce) by Internal (Supervisor) and External Examiners. The average of the Marks of the Internal Examiners (Supervisors) and External Examiners shall be considered as the final marks to be awarded for project. The passing minimum for Dissertation is 40 marks and viva voce examination is 10 marks.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024

M.A. Economics Syllabus under CBCS

(Applicable to the candidate admitted from the academic year 2016-2017 onwards)

Seme ster	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks		Total
						Int.	Ext.	
I	Core Course – I (CC)	Micro Economics – I	6	4	3	25	75	100
	Core Course – II (CC)	Macro Economics I	6	4	3	25	75	100
	Core Course – III (CC)	Monetary Economics	6	4	3	25	75	100
	Core Course – IV (CC)	Mathematical methods for Economic Analysis	6	4	3	25	75	100
	Elective Course – I (EC)	Environmental Economics	6	4	3	25	75	100
		Total	**30**	**20**	**--**	**--**	**--**	**500**
II	Core Course – V (CC)	Financial Economics	6	5	3	25	75	100
	Core Course – VI (CC)	Micro Economics II	6	5	3	25	75	100
	Core Course – VII (CC)	Macro Economics II	6	5	3	25	75	100
	Core Course – VIII (CC)	Statistics	6	5	3	25	75	100
	Elective Course – II (EC)	Research Methodology	6	4	3	25	75	100
		Total	**30**	**24**	**--**	**--**	**--**	**500**
III	Core Course – IX (CC)	Indian Economy	6	5	3	25	75	100
	Core Course – X (CC)	International Business	6	5	3	25	75	100
	Core Course – XI (CC)	Industrial Economics	6	5	3	25	75	100
	Core Course – XII (CC)	Fiscal Economics	6	5	3	25	75	100
	Elective Course – III (EC)	Project Appraisal	6	4	3	25	75	100
		Total	**30**	**24**	**--**	**--**	**--**	**500**
IV	Core Course – XIII (CC)	Economics of Growth and Development	5	5	3	25	75	100
	Core Course – XIV (CC)	Economics of Natural Resources	5	5	3	25	75	100
	Elective Course - IV (EC)	Management Information Systems	5	4	3	25	75	100
	Elective Course - V (EC)	Computer Applications in Economics **(updated on 16-11-2016)**	5	4	3	25	75	100
	Project Work Viva voce 20 marks Dissertation 80 marks		10	4	---	---	---	100
		Total	**30**	**22**	**--**	**--**	**--**	**500**
			120	**90**	**--**	**--**	**--**	**2000**

1

Note:

Project   :100 Marks
Dissertation   : 80 Marks
Viva Voice   : 20 Marks

Core Papers   - 14
Elective Papers - 5
Project   - 1

Note:

1. Theory Internal 25 marks External 75 marks

2. Separate Passing Minimum is prescribed for Internal and External

 a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
 b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
 c) The Passing minimum not less than 50 % in the aggregate

References / Text Books contain the following details :

 I. Name of the Author
 II. Title of the Book
 III. Name of the Publisher
 IV. Year

CORE COURSE I
MICRO ECONOMICS I

Objective: To make the students understand the fundamental theories of Microeconomics and their applications.

Module I: Demand Analysis

Utility theory – Ordinal approach – Indifference curve (income and substitution effects, Slutsky theorem, compensated demand curve) and their applications, Revealed preference theory, Revision of demand theory by Hicks; Characteristics of goods approach (Lancaster), consumer's choice involving risk (N-M hypothesis) – Friedman-Savage, Markowitz hypotheses; indirect utility functions (duality theory); Recent developments in demand analysis (pragmatic approach and linear expenditure systems); Inter-temporal consumption; Recent developments in demand; Elementary theory of price formation – demand and supply equilibrium; Cobweb theorem; lagged adjustment in interrelated markets.

Module II: Theory of Production and Costs

Production function – short period and long period; law of variable proportions and returns to scale; Isoquants – Least cost combination of inputs; Returns to factors: Economies of Scale; Multi-product firm; Elasticity of substitution; Euler's theorem; Technical programme and production function; Cobb – Douglas and CES Production functions and their properties; Empirical work on production functions; Traditional and modern theories of costs – Empirical evidence; Derivation of cost functions from production functions; derived demand for factors.

Module III: Price and Output Determination – Perfect competition and Monopoly

Marginal analysis as an approach to price and output determination: perfect competition – short run and long run equilibrium of the firm and industry, price and output determination, supply curve; Monopoly – short run and long run equilibrium, price discrimination, welfare aspects, monopoly control and regulation.

Module IV: Monopolistic Competition and Oligopoly Models

Monopolistic competition – general and Chamberlin approaches to equilibrium, equilibrium of the firm and the group with product differentiation and selling costs, excess capacity under monopolistic and imperfect competition, criticism of monopolistic competition; Oligopoly – Non-collusive (Cournot, Bertrand, Edgeworth, Chamberlin, kinked demand curve and Stackelberg's solution) and collusive (Cartels and mergers, price leadership models); Price and output determination under monopsony and bilateral monopoly; Workable competition – Structure, conduct and performance norms – Concept of Contestable Market.

Module V: Alternative Theories of the Firm

Critical evaluation of marginal analysis; Baumol's sales revenue maximization model; Williamson's model of managerial discretion; Marris   model of managerial enterprise, Full cost pricing rule; Bain's limit pricing theory and its recent developments including Sylos-Labini's model; Behaviours model of the firm; Game theoretic models.

References:

1. Kreps, David M (1990) A Course in Microeconomic Theory, Princeton University Press, Princeton
2. Koutsoyiannis, A (1979), Modern Microeconomics (2nd Edition) Macmillan Press, London.
3. Layard P.R.G and A.W. Walters (1978) Microeconomic Theory, McGraw Hill, New York
4. Sen A. (1999) Microeconomics: Theory and Applications, Oxford University Press, New Delhi
5. Stigler, G (1996), Theory of Price, (4th Edition), Prentice Hall of India, New Delhi
6. Varian,H. (2000) Microeconomic Analysis, W.W. Norton, New York
7. Baumol, W.J. (1982) Economic Theory and Operations Analysis, Prentice Hall of India, New Delhi
8. Hirshleifer, J. and A Glazer (1997), Price Theory and Applications, Prentice Hall of India, New Delhi
9. Da Costa, G.C. (1980), Production, Prices and Distribution, Tata McGraw Hill, New Delhi
10. Salvatore, Domnick (1991), Micro Economic Theory, 3rd Edition, McGraw Hill, New Delhi

CORE COURSE II
MACRO ECONOMICS I

Objective: To make the students to understand the macro economic concepts and their relevance to the economy.

Module I: Basic Concepts

Macro Economics – meaning and scope – macro static and dynamics – macro economic goals – national income – employment and unemployment - price – inflation – GDP and GNP concepts and measurements – aggregate demand and supply.

Module II: National Income and Accounts

Circular Flow of Income in two – three and four – sector economy; different forms of national income accounting –social accounting, input – output accounting, flow of funds accounting and balance of payments accounting.

Module III: Consumption Function

Keynes psychological law of consumption-implications of the law; short-run and long- run consumption function; Empirical evidence on consumption function; Income-consumption relationship-absolute income, relative income, life cycle and permanent income hypotheses

Module IV: Investment function

Marginal efficiency of capital and investment – long run and short run; The Multiplier – accelerator and investment behaviour –impact of inflation; Influence of policy measure on investment – empirical evidence.

Module V: Neo – Classical, Keynesian Synthesis and Post-Keynesian Syntheses

Neo – Classical and Keynesian views on interest; the IS – LM model; Slopes of IS and LM; Extension of IS-LM model with government sector; Relative effectiveness of monetary and fiscal policies; extension of IS-LM models with labour market and flexible prices.

References:

1. Ackley, G (1978) Macroeconomics: Theory and Policy, Macmillan, New York
2. Blackhouse, R. and A Salansi (Eds.) (2000), Macroeconomics and the Real World (2 Vols.), Oxford University Press, London
3. Branson, W.A. (1989) Macroeconomics Theory and Policy (3rd Edition), Harper and Row, New York
4. Bornbusch, R. and F. Stanley (1997), Macroeconomics, McGraw Hill, Inc., New York
5. Hall, R.E. and J.B. Taylor (1986) Macroeconomics W.W. Norton, New York
6. Heijdra, B.J. and V.P. Frederick (2001), Foundations of Modern Macroeconomics, Oxford University Press, New Delhi
7. Jha, R. (1991) Contemporary Macroeconomic Theory and Policy, Wiley Eastern Ltd., New Delhi.
8. Romer, D.L. (1996), Advanced Macroeconomics, McGraw Hill Company Ltd, New York
9. Scarfe, B.L. (1977) Cycles, Growth and Inflation, McGraw Hill, New York
10. Shapiro, E. (1996), Macroeconomic Analysis, Galgotia Publications, New Delhi
11. Surrey, M.J.C. (Ed.) (1976), Macroeconomic Theories, Oxford University Press, Oxford.

MONETARY ECONOMICS

Objective: To understand the concepts relating to Monetary Economics and their
practical applicability.

Module I: Supply of Money

Financial intermediation a mechanistic model of bank deposit determination; A
behavioural model of money supply determination, a demand determined money
supply process – Inside and outside money (Gurley and Shaw) – RBI approach to
money supply; High powered money and money multiplier; Budget deficits and
money supply; money supply and open economy; control of money supply –
Instruments of credit control.

Module II: Demand for Money

Classical approach to demand for money-Quantity theory approach, Fisher's
equation, Cambridge quantity theory – Neutrality of money, Classical dichotomy
–Keynes's liquidity preference approach, transaction, precautionary and
speculative demand for money-aggregate demand for money, derivation of LM
curve

Module III: Theory of Inflation

Classical, Keynesian and Monetarist approaches to inflation; Structuralist theory
of inflation; Philips curve analysis-Short run and long run Philips curve;
Samuelson and Solow – the natural rate of unemployment hypothesis; Tobin's
modified Philips curve, Adaptive expectations and rational expectations; policies
to control inflation

Module IV: Post-Keynesian Demand for Money

Post – Keynesian approaches to demand for money-Patinkin and the Real
Balance Effect, Approaches of Baumol and Tobin; Friedman and the modern
quantity theory; Crisis in Keynesian economics and the revival of monetarism;
Mundell – Fleming model-Asset markets, expectations and exchange rates;
Monetary approach to balance of payments

Module V: Financial Market

Nature and functions of financial market – Money market – Meaning,
Characteristics and constituents, functions, structure and institutions of money
market – Bankers – Weakness of Indian money market – measures for
improvement – recent concepts and instruments of financial market – capital
market – Sensex and Nifty – SEBI and its role

References:

1. Ackley, G (1978) Macroeconomics: Theory and Policy, Macmillan, New York
2. Blackhouse, R. and A Salansi (Eds.) (2000), Macroeconomics and the Real World (2 Vols.), Oxford University Press, London
3. Branson, W.A. (1989) Macroeconomics Theory and Policy (3rd Edition), Harper and Row, New York
4. Bornbusch, R. and F. Stanley (1997), Macroeconomics, McGraw Hill, Inc., New York
5. Hall, R.E. and J.B. Taylor (1986) Macroeconomics W.W. Norton, New York
6. Heijdra, B.J. and V.P. Frederick (2001), Foundations of Modern Macroeconomics, Oxford University Press, New Delhi
7. Jha, R. (1991) Contemporary Macroeconomic Theory and Policy, Wiley Eastern Ltd., New Delhi.
8. Romer, D.L. (1996), Advanced Macroeconomics, McGraw Hill Company Ltd, New York
9. Scarfe, B.L. (1977) Cycles, Growth and Inflation, McGraw Hill, New York
10. Shapiro, E. (1996), Macroeconomic Analysis, Galgotia Publications, New Delhi
11. Surrey, M.J.C. (Ed.) (1976), Macroeconomic Theories, Oxford University Press, Oxford.

CORE COURSE IV
MATHEMATICAL METHODS FOR ECONOMIC ANALYSIS

Objective: To familiarize the mathematical concepts relating to Economics and their applications.

Module I: Terminology, Concepts and tools

Addition, subtraction, multiplication and division of fractions and decimals – Constants, variables, parameters, intercepts Coefficients – Functions – inverse, general and specific functions – Equations – Applications – Demand and supply functions – Cost and revenue functions – Consumption function –IS & LM functions – Multivariable functions –Market equilibria.

Module II: Differential Calculus

Rules of differentiation – slopes – linear and non linear functions – partial derivatives – higher order derivatives – Young's Theorem – Constrained & unconstrained optimization – Lagrangian Multiplier – Interpretation – Use of derivatives in economics – Maximization, minimization, elasticities - Utility function – production function – revenue, cost and profit functions (simple problems)

Module III: Integration

Concept-simple rules of integration-application to Consumer's surplus & producer's surplus-Costs & revenues

Module IV: Matrix and Determinants

Matrices and Determinants: Rules and applications – Crammer's rule-Input-Output analysis: Uses.

Module V: Linear Programming

Basic Concepts - formulation of LP problem-feasible, basic and optimal solution – Graphic and Simplex method (Concept only) – Duality Problem – Applications of LP technique.

References:
1. Allen, R.G.D. (1974) Mathematical Analysis of Economists, Macmillan Pressand ELBS, London
2. Chiang, A.C. (1986) Fundamental Methods of Mathematical Economics, McGraw Hill, New York
3. Yamane, Taro (1975) Mathematics of Economists, Prentice Hall of India, New Delhi
4. Baumol, W.J. (1984) Economic Theory and Operations Analysis, Prentice Hall. Englewood Cliffs, New Jersey
5. Monga, G.S. (1972), Mathematics and Statistics for Economists, Vikas Publishing House, New Delhi
6. Salvatore Dominick (1992) Mathematics for Economists, Schaum Series

ELECTIVE COURSE I
ENVIRONMENTAL ECONOMICS

Objective: To help students to understand current issues and policies relating to physical environment.

Module I: Concepts

Environment – Eco-system – Nexus between Economics and Environment – The principle of material balance – Private versus Social Cost – Entropy – Ecological balance – Sustainable development – Externalities.

Module II: Environmental Issues

Environmental quality – Non-marketed goods – Regulatory – Command and Control Method – Environmentalism – Trade off between Environmental Protection and Economic Growth – Institutional Approach to Environmental Problems – Environmental Education.

Module III: Measurement of Environmental Values

User values: Option values and non-use values; Valuation methods – Methods based on observed market behaviour; Hedonic property values and household production models (travel cost methods and household health production function), Methods based on response to hypothetical markets contingent valuation methods.

Module IV: Environment and Society

Pollution and Environment – Impact of population growth (Trends, Sex ratio, Rural and Urban) on environment – Urbanisation and environment – Poverty and Environment – Culture and Environment – People Participation in Environmental movement.

Module V: Environmental Policy

Ministry of Environment and Forest – Water Pollution (Prevention and Control) Act 1974 – Air Pollution (Prevention and Control) Act 1981 – Comprehensive Environment Bill 1986 –Recent Policy – WTO and Environment

References:

1. Agarwal S.K. (1997) "Environmental Issues and Themes", APH Publishing Corporation, 5 – Ansari Road, New Delhi
2. Pravin Sheth (1997), Environmentalism Policies, Ecology and Development", Rawat Publications, Jaipur and New Delhi
3. Neela Mukaherjee (1997) "Participatory appraisal of Natural Resources",Concept Publications, company New Delhi.
4. Pashupathi Nath and Siddha Nath (1990), Environmental Pollution Conservation and Planning" Chugu Publication, Alahabad, India.
5. Sumi Krishna (1996), "Environmental Politics People's lives and Development Choices" Saga Publications, New Delhi.
6. Ajit Kumar Singh (1997), "Land use Environment and Economic Growth in India", MD Publications PVT, LTD, New Delhi
7. Baumol, W.J. and W.E. Oates (1988), "The Theory of Environmental Policy" (2nd Edition) Cambridge University Press, Cambridge
8. Bromley, D.W. (Ed.,) (1995)"Handbook of Environmental Economics" Cambridge University Press Cambridge
9. Fisher, AC (1981), "Resource and Environmental Economics" Cambridge University Press Cambridge
10. Hanley, N.J.F., Shorgen and B. White (197), "Environmental Economics in Theory and Practice", Macmillan
11. Hussen, A.M. (1999), "Principles of Environmental Economics", Routledge, London.
12. Jeroen, C.J.M. Van Den Bergh (1999), "Handbook of Environmental and Resource Economics", Edward Elgar Publication Ltd, UK.
13. Kolstad, C.D. (1999), "Environmental Economics", Oxford University Press, New Delhi
14. D.W. and R.Turner (1991), "Economics of Natural Resource use and Environment", John Hopkins University Press, Baltimore
15. Perman, R. Ma and J.Mc. Mivary (1996), "Natural Resource and Environmental Economics", Longman, London.
16. Sankar,U. (Ed.) (2001), "Environmental Economics", Oxford University Press, New Delhi
17. Rabindra N. Battacharya (2001), "Environmental Economics", (Ed.), Oxford University Press, New Delhi.

CORE COURSE V
FINANCIAL ECONOMICS

Objective: To gain knowledge about the linkage among financial sub markets.

Module I : Introduction to Financial Economics

Objectives – Functions – Scope – Evolution – Interface of financial economics with other areas – Corporate finance

Module II: Time Value of Money

Future value of single cash flow, Multiple cash flow, annuity, sinking fund factor – Present value of single cash flow – Multiple cash flow, annuity, annuity dues, perpetuities, comparison rates.

Module III: Sources of Long –term Finance

Equity capital, retained earnings, preference capital, term loans, debentures, pattern of corporate financing in India.

Module IV: Financial Statement Analysis

Introduction, meaning of financial analysis – Types and devices of financial analysis – Understanding financial statements: Balance sheet, Income statement. Common size analysis, trend analysis and ratio analysis - Financial ratios as perceived by commercial banks, corporate controllers, forecasting financial failure.

Module V: Fund Flow and Cash Flow Analysis

Working capital – Basics of working capital – Working capital finance – Sources of working capital

References:
1. Rose et.al, 1999, Fundamentals of Corporate Finance, Tata McGrawHill, New Delhi
2. Prasanna Chandra, 2001, Financial Management: Theory and Practice, Tata McGraw-Hill, New Delhi
3. Charles H. Gibson, 2001, Financial Reporting and Analysis, South Western College, Publication
4. Wild et al, 2001, Financial Statement Analysis, McGraw-Hill International.

CORE COURSE VI
MICRO ECONOMICS II

Objective: To make the students understand the fundamental theories of
Microeconomics and their applications.

Module I: Distribution

Neo-classical approach – Marginal productivity theory, Product exhaustion theorem, Elasticity of technical substitution, technical progress and factor shares: Theory of distribution in imperfect product and factor markets; Macro theories of distribution – Ricardo, Marx, Kalecki and Kaldor.

Module II: Welfare Economics

Pigovian welfare economics: Pareto optional conditions; Value judgement; Social welfare function; Compensation principle, Inability to obtain optimum welfare – Imperfections, market failure, decreasing costs, uncertainty and non-existent and incomplete markets; Theory of Second Best – Arrow's impossibility theorem; Rawl's theory of justice - Equity – efficiency trade off.

Module III: General Equilibrium

Partial and general equilibrium - Walrasian excess demand and input-output approaches to general equilibrium, existence, stability and uniqueness of equilibrium and general equilibrium, coalitions and monopolies; Production without consumption – one sector model, homogeneous functions, income distribution; Production without consumption – two sector model, relationship between relative commodity and factor prices (Stopler-Samuelson theorem), relationship between output mix and real factor prices, effect of changes in factor supply in closed economy (Rybczynski theorem), production and consumption – Contributions of Arrow and Debreu to general equilibrium analysis.

Module IV: Economics of Uncertainty

Individual behaviour towards risk, expected utility and certainty equivalence approaches, risk and risk aversion – sensitivity analysis, gambling and insurance, the economics of insurance, cost and risk, risk pooling and risk spreading, mean-variance analysis and portfolio selection, optional consumption under uncertainty.

Module V: Competitive Firm under Uncertainty

Factor demand under price uncertainty, the economics of search – different models, the efficient market hypothesis, stochastic models of inventory demand; Market with incomplete information, search and transaction costs, the economics of information.

References:

1. Kreps, David M (1990) A Course in Microeconomic Theory, Princeton University Press, Princeton
2. Koutsoyiannis, A (1979), Modern Microeconomics (2nd Edition) Macmillan Press, London.
3. Layard P.R.G and A.W. Walters (1978) Microeconomic Theory, McGraw Hill, New York
4. Sen A. (1999) Microeconomics: Theory and Applications, Oxford University Press, New Delhi
5. Stigler, G (1996), Theory of Price, (4th Edition), Prentice Hall of India, New Delhi
6. Varian,H. (2000) Microeconomic Analysis, W.W. Norton, New York
7. Baumol, W.J. (1982) Economic Theory and Operations Analysis, Prentice Hall of India, New Delhi
8. Hirshleifer, J. and A Glazer (1997), Price Theory and Applications, Prentice Hall of India, New Delhi
9. Da Costa, G.C. (1980), Production, Prices and Distribution, Tata McGraw Hill, New Delhi
10. Salvatore, Domonick (1991), Micro Economic Theory, 3rd Edition, McGraw Hill, New Delhi

CORE COURSE VII
MACRO ECONOMICS II

Objective: To make the students to understand the macro economic concepts and their relevance to the economy.

Module I: New Classical macro economics

The new classical critique of micro foundations, micro foundations of macro economics – the new classical approach - Policy implications of new classical approach - Empirical evidence.

Module II: Stabilization policy - I

Lags in the effects of policy – role of expectations –uncertainty and economic policy – rules versus discretion – Phillips curve and the aggregate supply curve – expectations and short run Phillips curves – Friedman – Phelps argument – shifting short-run Phillips curve – trade off between inflation and employment – natural rate of unemployment.

Module III: Stabilization policy - II

Okun's law –budget deficit and inflation – mechanics of financing the budget – income policies –monetarists and Keynesian models – portfolio approach – crowding out – government budget constraint – Rational expectations and short run ineffectiveness of stabilization policy – Criticisms of the rational expectations hypothesis

Module IV: Equilibrium and disequilibrium analysis

Walrasian general equilibrium models – problem of consistency and invalid dichotomy – real balance effect – assessment of the significance of real balance effect – effective demand, notional demand and involuntary unemployment – price and quality flexibility – source of non instantaneous price adjustment – new Keynesianism and the theory of unemployment.

Module V: Macro economics in the open economy

Application of fiscal and monetary policies in an open economy – fiscal policy and monetary policy with fixed exchange rates and flexible exchange rates – global co-operation and coordination in macro economic policy – internal and external balances – monetary approach to the balance of payment.

References:

1. Ackley, G (1978) Macroeconomics: Theory and Policy, Macmillan, New York
2. Blackhouse, R. and A Salansi (Eds.) (2000), Macroeconomics and the Real World (2 Vols.), Oxford University Press, London
3. Branson, W.A. (1989) Macroeconomics Theory and Policy (3rd Edition), Harper and Row, New York
4. Bornbusch, R. and F. Stanley (1997), Macroeconomics, McGraw Hill, Inc., New York
5. Hall, R.E. and J.B. Taylor (1986) Macroeconomics W.W. Norton, New York
6. Heijdra, B.J. and V.P. Frederick (2001), Foundations of Modern Macroeconomics, Oxford University Press, New Delhi
7. Jha, R. (1991) Contemporary Macroeconomic Theory and Policy, Wiley Eastern Ltd., New Delhi.
8. Leijonhufvud, A (1968) On Keynesian Economics of Keynes, OUP, Oxford
9. Romer, D.L. (1996), Advanced Macroeconomics, McGraw Hill Company Ltd, New York
10. Scarfe, B.L. (1977) Cycles, Growth and Inflation, McGraw Hill, New York
11. Shapiro, E. (1996), Macroeconomic Analysis, Galgotia Publications, New Delhi
12. Surrey, M.J.C. (Ed.) (1976), Macroeconomic Theories, Oxford University Press, Oxford.

CORE COURSE VIII
STATISTICS

Objective: To help the students understand and apply statistical tools for research

Module I: Univariate Analysis

Measures of central tendency, dispersion – standard deviation co-efficient of variation, Lorenz curve, Gini concentration ratio – Skewness (simple problems)

Module II: Bivariate Analysis

Correlation, regression, simple, multiple, l (simple problems) – OLS – assumptions – violation of assumptions – heteroscedasticity, autocorrelation and multicollinearity (concepts only) Interpretation of Co-efficients – Introduction to multiple and non-linear regression – relation between regression and correlation coefficients – relation between b_{yx} and b_{xy} –relation between intercept and slope.

Module III: Probability and distributions

Elementary probability theory, concepts, binomial – expansion, coefficient – Poisson and normal distribution – application in economics.

Module IV: Sampling Distribution

Sampling distribution, standard error-testing of hypothesis – one tailed and two tailed tests – testing of means, proportions, standard deviations : $x^{2,}$ F- ANOVA testing correlation and regression coefficients.

Module 5: Index numbers and Time Series

Uses, selection of number of items, base year price relatives-Fisher's ideal index-Factor reversal test-Time reversal test-Chain index-Bas shifting –conversion of current price data into constant price data – price index numbers in India – WPI & CPI – applications – Components of time series – Moving averages-Straight line trend – Deseasonalisation of data – Seasonal Index

References:
1. Gupta, S.C. (1993), Fundamentals of Applied Statistics, S.Chand & Sons, New Delhi.
2. Speigal, M.R. (1992), Theory and Problems of Statistics, McGraw Hill Book Co., London
3. Chou, Y. (1975), Statistics Analysis, Holt, Reinhart and Winston, New York
4. Croxton, Crowden and Klein (1971), Applied General Statistics, Prentice Hall of India, New Delhi.
5. Nagar, A.L. and R.K. Das (1993), Basic Statistics, Oxford University Press, New Delhi
6. Salvatore, Dominick (1982), Statistics and Econometrics, McGraw Hill, New Delhi

Objective: To make the students understand the methods and steps of doing research in social sciences.

Module I: Basic concepts of research

Science –its meaning and characteristics – The meaning of 'research' – Specific features of research in Social Sciences as opposed to Physical and Natural Sciences – Objectivity in research Sources of bias – Good evidence and true evidence – Basic categories in scientific method –Facts –Concepts – Causality – Uncertainty - Probability – Dialectical and Historical Materialism.

Module II: Research methods

Methods of Research – Falsification and verification criteria (Karl Popper) – Paradigm Shift (Kuhn) – Deductive and inductive Reasoning –Steps of Scientific Method – Historical Method – Case study – Scaling Techniques – Sample surveys – Various sampling methods – Importance of proper sampling design.

Module III: Stages in research

Steps in Research - Formulation of a Research problem – Guiding principles in the choice of a research topic – Role of Review of Literature – Formulation of Research Design –Model building – Hypothesis: concept, definition, formulation and testing

Module IV: Sources and methods of data collection

Secondary data – some important sources: NSSO, CSO, Economic Survey, Season & Crop Report, Agricultural Census, Livestock Census, Annual survey of Industries, RBI Reports, WDR, HDR, IDR; Primary Data collection – Tools – observation, schedule, questionnaire, projective techniques – Principles underlying construction of a questionnaire – Preparation of master table – Data processing – Analytical Tables.

Module V: Report writing

Report writing – Structure and General format – Style – Language punctuation, grammar, symbols – Use of footnotes, references –citations – Presentation of tables, diagrams, charts and maps – Bibliography.

References:

1. Ghose, B.N. Scientific Method and Social Research, New Delhi, Sterling Publishers, 1982
2. Goode, W.J. & Hatt,P.K. Methods in Social Research, New York, McGraw Hill, 1952
3. Kate Turabina, Manual of style for writing dissertations, thesis and reports, University of Chicago Press, Chicago
4. Myrdal,G. Objectivity in Social Research
5. C.T. Kurien (Ed.) A Guide to Research in Economics (Sangam Publishers)
6. Wilson Gee, Social Science Research Methods (N.Y. Appleton Century Croft 1950)
7. Pauline V, Young, Scientific Social Surveys and Research
8. Parson,C.J., Thesis and Project Work
9. Karl Popper, The Logic of Scientific Discovery, (Lond, Hutchinson, 1934)
10. T.S.Kuhn, The Structure of Scientific Revolutions, (Chicago 1962)

CORE COURSE IX
INDIAN ECONOMY

Objective: To make the students understand the structure and functioning of Indian economy

Module I: Natural Resource s and Population

Natural Resource – Meaning and Importance - Forest resources – Energy resources – Mineral resources – Water resources – Environmental degradation – Indian population size, density and distribution – urbanization – National population policy – Human capital and its development.

Module II: Poverty and Unemployment

Poverty – its dimensions, nature and causes – Poverty line: definition – Poverty alleviation programmes – Unemployment and its types – New Employment Policy in XI Plan – RLEGP – inequalities in distribution – programmes and measures – causes of income inequalities – suggested measures to redress inequalities – parallel economy: meaning, magnitude and consequences – causes and remedies.

Module III: Foreign Trade and WTO

Direction and composition of foreign Trade – Balance of trade and payments – The New Economic Reforms – Partial convertibility – Foreign Direct Investment – Foreign exchange rate – Foreign exchange reserve – India's foreign Trade Policy – WTO – Features and assessment – Globalization: Features and problems – Sectoral contribution.

Module IV: Agricultural and Industrial Sectors

Technological change in agriculture – Pricing of agricultural inputs and outputs – Agricultural marketing – New agricultural policy – Issues in food security, availability – Farmers suicide – Policies for sustainable irrigation – Government's investment on irrigation – Disincentive to agricultural sector – New industrial policy – Problems of corporate sector – Subsidies to corporate sector – Privatization and disinvestments – Labour market reform

Module V: Planning in India

Objectives – Achievements since 1950 – Agriculture, industry and social sectors – X Plan performance to tackle poverty, inequality and unemployment – XII Plan :Overview.

References:

1. Agrawal, A.N. (2004) Indian Economy, Wishwa Prakashan, New Delhi
2. Ahluwalia, J.J. and I.M.D. Little (Eds.) (1999), India's Economic Reforms and Development (Essays I honour of Manmohan Singh), Oxford University Press, New Delhi.
3. Bardhan, P.K. (9th Edition) (1999), The Political Economy of Development in India, Oxford University Press, New Delhi
4. Bawa, R.S. and P.S. RAikhy (Ed.) (1997), Structural Changes in India Economy, Guru Nanak Dev University Press, Amritsar
5. Brahmananda P.R. and V.R. Panchmukhi (Eds.) (2001), Development Experience in the Indian Economy: Inter – State Perspectives, Bookwell, Delhi
6. Chakravarrty, S. (1987), Development Planning: The Indian Experience, Oxford University Press, New Delhi
7. Dantwala, M.L. (1996), Dilemmas of Growth : The Indian Experience, Saga Publications, New Delhi
8. Datt and Sundaram (2002), Indian Economy, S. Chand & Co, New Delhi
9. Dhingra C. (2003), The Indian Economy, Sultan Chand & Sons, New Delhi
10. Government of India, Economic Survey, (Annual), Ministry of Finance, New Delhi
11. Jalan,B. (1992) The Indian Economy – Problems and Prospects, Viking, New Delhi
12. Parkh, K.S. (1999), India Development Report (Annual), Oxford University Press, New Delhi
13. Reserve Bank of India, Report of Currency and Fiance (Annual)
14. Dreze, Jean and Amarta Sen (1999), India: Economic Development and Social Opportunity, OUP, New Delhi
15. Datt Ruddar and K.P.M. Sundaram (2001), Indian Economy, S.Chand & Co., New Delhi
16. Alagh, Y.K. (1995), Indian Development Planning and Policy, Vikas, New Delhi

CORE COURSE X
INTERNATIONAL BUSINESS

Objective: To make the students understand the consequences of international business on income, employment and social standards.

Module I: General Concepts

Special features of international business – reasons for IB – Difference in endowments, cultures, currencies, technologies, wages, tastes, language – understanding world map – location of countries, their capital, currencies.

Module II: Concepts and Institutions

Free trade versus protection – arguments for and against Laissez faire – Terms of trade – tariffs – quotas – non-tariff barriers – phyto-sanitary measures – dumping – exchange rate –foreign exchange reserves – IMF –WB –GATT-WTO – UNCTAD – SAARC – SAAPTA – ASSFTA – NAFTA – ASEAN – MNCs – BOP – BOT – FDI.

Module III: Foreign Trade Documents

Need, rationale and type of documents – export & import licenses – processing of export order – pre-shipment inspection and quality control – foreign exchange formalities – excise and customs clearance – port procedures

Module IV: Foreign Trade Procedure

Claiming duty drawbacks and other benefits – determination of freight – containerization – booking of cargo space – packing and marking for exports – forwarding and clearing agents and their operations – cargo insurance

Module V: Exports

Role of export – selection of export products – selection of export markets – role of export houses – appointment of agents – payment of agency commission - promotion abroad – participation in trade fairs – export contracts – arbitration and dispute settlements – pre-shipment and post-shipment finance – letters of credit – EXIM bank – international capital markets foreign exchange rates.

References:
1. T.A.S. Balgopal, Export Management
2. Handbook of export and import procedure
3. S.R. Ullal, Export Management
4. Paras Ram, Export, what, where and how
5. Keshkamat, Finance of foreign trade
6. G.S. Lall, Finance of foreign trade
7. Ministry of Commerce, Government of India, India's trade agreement, latest number
8. R.S. Rathore, Export Marketing
9. Economic Survey, Ministry of Finance, Government of India, latest issue

CORE COURSE XI
INDUSTRIAL ECONOMICS

Objectives: To help the students understand the basic aspects of industrial structure, finance and Labour

Module I: Patterns and Structure

Process and pattern of industrialization – Industrial structure and change – Alternate patterns – Hoffman's Hypothesis of Market Economics –Simon Kuznets' Interpretation of secular changes in industrial development – Industrialization in Planned Economics – Key Role of Capital Goods Sector – HB Chenery's pattern of industrial change

Module II: Market Structure

Sellers' concentration; Production differentiation; Entry conditions; Economics of scale; Market structure and profitability; Market structure and innovation; Theories of industrial location – Weber, Losch and Sargent Florence; Factors affecting location.

Module III: Industrial Finance

Owned, external and other components of funds; Role, nature, volume and types of institutional finance – IDBI, IFCI, SFCs, SIDC, commercial banks, etc., Financial statement – Balance Sheet, Profit and loss account; assessment of financial soundness, ration analysis

Module IV: Industrial Labour

Structure of industrial labour; employment dimensions of Indian industry; industrial legislations; industrial relations; Exit policy and Social security; Wages and problems of bonus – labour market reforms.

Module V: Project Planning and Appraisal

Cost-benefit analysis – Net Present Value (NPV) and internal rate of return (IRR) criteria – balancing private and social returns.

References:

1. Barthwal, R.R. (1985), Industrial Economics, Wiley Eastern Ltd, New Delhi
2. Cherunilam, F (1994), Industrial Economics; Indian Perspective (3rd Edition) Himalaya Publishing House, Mumbai
3. Divine, P.J. and R.M.. Jones et.al. (1976), An Introduction to Industrial Economics, George Allen and Unwin Ltd, London.
4. Hay, D. and D.J. Morris (1979), Industrial Economics : Theory and Evidence, Oxford University Press, New Delhi
5. Kuchhal, S.C. (1980), Industrial Economy of India (5th Edition), Chaitanya Publishing House, Allahabad
6. Singh, A. and A.N. Sadhu (1988), Industrial Economics, Himalaya Publishing Home, Bombay
7. Mamoria and Mamoria (2000) Dynamics of Industrial Relations in India (15th Edition), Himalaya Pub. House, Mumbai

CORE COURSE XII
FISCAL ECONOMICS

Objective: To help the students to understand the fiscal economic theories and practices.

Module I: Theory of Public Goods and Public Choice

The economic role of government – Allocation, Growth and Stabilisation – Private goods, public goods and merit goods, Market failure-imperfections, decreasing costs, externalities, public goods; Uncertainty and non-existence of futures markets; Informational asymmetry – Theory of second best – Private and public mechanism for allocating resources; Problems of allocating resources; Problems of preference revelation and aggregation of preferences; Voting systems; Arrow impossibility theorem; An economic theory of democracy, Politico-eco-bureaucracy; Rent seeking and directly unproductive profit seeking (DUP) activities.

Module II: Public Expenditure

Wagner's law of increasing state activities,; Wiesman-Peacock hypothesis, Pure theory of public expenditure; Structure and growth of public expenditures; Criteria for public investment; Social cost-benefit analysis-Project evaluation, estimation of costs, discount rate; Reforms in expenditure budgeting; Programme budgeting and zero base budgeting.

Module III: Taxation and Public Debt

Theory of incidence; Alternative concepts on incidence – Allocate and equity aspects of individual taxes; Benefit and ability to pay approaches; theory of optional taxations; Excess burden of taxes Trade off between equity and efficiency – Laffer curve – Theory of measurement of dead weight losses; the problem of double taxation – The rationale behind VAT – Indian tax structure and trends

Public debt – Classical view of public debt; Compensatory aspect of debt policy; Burden of public debt; Sources of public debt; Debt through created money; Public borrowings and price level; Crowding out of private investment and activity; principles of debt management and repayment

Module IV: Fiscal Policy

Objectives of fiscal policy - Budgetary procedure - Budgetary deficit and its implication; fiscal policy for stabilization-automatic vs. discretionary stabilization; Alternative measures of resource mobilization and their impact on growth, distribution and prices; Balanced budget multiplier-Meaning and significance of budgetary terms; revenue account, capital account, fiscal deficit and other types of deficit – recent Budget.

Module V: Fiscal Federalism

Principles of multi-unit finance; Fiscal federalism in India; Vertical and horizontal imbalance; Assignment of function and sources of revenue; Constitutional provisions; finance Commission and Planning Commission; Devolution of resources and grants; Theory of grants; resource transfer from Union to States – Criteria for transfer of resources; Centre-State financial relations in India; Problems of state's resources and indebtedness; Transfer of resources from union and State to local bodies.

References:

1. Atkinson, A.B. and J.E. Siglitz (1980), Lectures on Public Economics, Tata McGraw Hill, New York
2. Auerbach, A.J. and M. Feldstern (Edn.) (1985), Handbook of Public Economics, Vol. I, North Holland, Amsterdam.
3. Buchanan, J.M. (1970), The Public Finances, Richard D, Irwin, Homewood
4. Goode,R. (1986), Government Finance in Developing Countries, Tata McGraw Hill, New Delhi
5. Houghton, J.M. (1970), The Public Finance; Selected Readings, Penguin, Harmondsworth
6. Jha,R. (1998), Modern Public Economics, Routledge, London
7. Menutt,P. (1996), The Economics of Public Choice, Edward Elgar, U.K.
8. Musgrave, R.A. (1959), The Theory of Public Finance, McGraw Hill, Kogakusha, Tokyo
9. Musgrave, R.A. and P.B. Musgrave (1976), Public Finance in Theory and Practice, McGraw Hill, Kogakusha, Tokyo
10. Shoup, C.S. (1970), Public Finance, Aldine, Chicago
11. Shome,P. (Ed.) (1995), Tax Policy; Handbook, Tax Division, Fiscal Affairs Department, International Monetary Fund, Washington D.C.
12. Srivastava, D.K. (Ed.) (2000), Fiscal Federalismin India, Har Anand Publishers, New Delhi
13. Reports of various Finance Commissions

ELECTIVE COURSE III
PROJECT APPRAISAL

Objective: To help the students to understand the steps and methods of project appraisal.

Module I: Introduction

Capital expenditure – importance and difficulties – objectives, resource allocation – Criteria – Investment strategic– Generation and screening of investment ideas.

Module II: Project Analysis

Market and demand analysis – Technical analysis – Financial analysis – Economic viability – Technical feasibility – Social acceptability.

Module III: Selection of Project

Project cash flows – Appraisal criteria – Pay back period – Rate of Return – Discount cash flow methods – NPV, IRR – Calculation of IRR for two years and more – Risk analysis – Types and measures of risk – Sensitivity analysis – Scenario analysis – Decision tree analysis – Uncertainty – Stochastic dominance

Module IV: Special Decision Situations

Choice between mutually exclusive projects of unequal life – Optional timing – determination of economic life – Interrelationship between investment and financing aspects – Price index numbers and capital budgeting comparison of time series data – Deflating.

Module V: Implementation

Project organization – Project planning – Project control – Pre-requisites for successful project implementation – Network techniques – Development of Project net work – Time estimation – Scheduling – PERT –CPM – Network cost system – Project evaluation – Accounting, Economic and Social costs and benefits – Abandonment analysis – Administrative aspects in capital budgeting.

References:

1. Prasanna Chandra, Projects; Planning, Analysis, Selection, Implementation and Review, Tata McGraw Hill.
2. Clark J.C. et al., Capital Budgeting: Planning and Control of Capital Expenditure, Prentice Hall.
3. Little I M D and S A Mirlees, Project Appraisal and Planning for Developing Countries, Heimann, London
4. Marghin E. and A.K. Sen, Guideline for Project Evaluation, UNIDO, New York
5. Bhavesh M Patel, Project Management, Vikas Publishing House New Delhi

CORE COURSE XIII
ECONOMICS OF GROWTH AND DEVELOPMENT

Objective: To make the students to understand the concepts of growth and development and their implications on the economy.

Module I: Economic Growth and Development

Economic Growth and development – Factors affecting economic growth and development – Basic social and economic structure - Sustainable development – social and economic environmental balances.

Module II: Economic Growth Models

Growth models-Harrod and Domar, Neoclassical growth models – Solow and Meade, Mrs. Joan Robinson's growth model; criticism of Neo-classical analysis of growth, the capital controversy - Technical Progress – embodied and disembodied technical progress; Kaldor and Pasinetti models.

Module III: Social and Institutional Aspects of development

Development and underdevelopment – Poverty – Absolute and relative measure development and development gap – inequality of income, human development index and other indices of development and quality of life – Food security, education, health and nutrition; Human resource development; Theory of demographic transition, Population as limits to growth and as ultimate source – Population, poverty and environment; economic development and institutions

Module IV: Theories of Development

Classical theory of development – contributions of Adam smith, Ricardo, Malthus and James Mill Karl Marx and development of capitalist economy – theory of social change, surplus value and profit; immutable laws of capitalist development; crisis in capitalism – Schumpeter and capitalist development; innovation-role of credit, profit and degeneration of capitalism

Module V: Approaches to Development

Partial theories of growth and development –vicious circle of poverty, circular causation, unlimited supply of labour, big push, balanced growth, unbalanced growth, critical minimum effort thesis, low income equilibrium trap; Dualism-technical, behavioural and social; Ranis and Fei model

References:

1. Adelman, I. (1961), Theories of Economic Growth and Development, Stanford University Press, Stanford
2. Behrman, S. and T.N. Srinivasan (1995), Handbook of Development Economics Vol.3, Elsevier, Amsterdam
3. Chenery, H. and T.N. Srinivasan (Eds.) (1989) Handbook of Development Economics, Vols. 1 & 2, Elsevier, Amsterdam
4. Ghatak, S. (1986), An Introduction of Development Economics, Allen and Unwin, London
5. Gimmell, N. (1987), Surveys in Development Economics, Blackwell, Oxford
6. Kindleberger, C.P. (1977), Economic Development, (3rd Edition), Mc Graw Hill, New York
7. Meier, G.M. (1995), Leading Issues in Economic Development, (6th Edition), Oxford University Press, New Delhi
8. Myint, Hla (1965), The Economics of Underdeveloped Countries, Preager, New York
9. Todaro, M.P. (1996) (6th Edition), Economic Development, Longman, London
10. Thirwal, A.P. (1999), (6th Edition), Growth and Development, Macmillan, U.K.

CORE COURSE XIV
ECONOMICS OF NATURAL RESOURCES

Objective: To enable the students to understand the different types of natural resources and their uses for economic development.

Module I: Natural Resources: Uses and misuses

Land, Water, Air – Mining, petroleum extraction, fishing, forestry – Energy – Pollution: Meaning and forms: Domestic, Solid Waste, Health and Sanitation and Unsafe Drinking Water, Industrial: Air Pollution, Water Pollution, Soil Pollution, Noise Pollution - Soil erosion– Deforestation.

Module II: Nexus between Economics and Natural Resources

Material balance principle – Externalities and market inefficiency - Pareto optimal provision of public goods – Lindahl's equilibrium - Common property resources.

Module III: Natural Resource Management and Sustainable Development

Theories of optimal use of exhaustible and renewable resources; Issues in biodiversity – Environment and development trade off - Sustainable development: Concept, Significance and Indicators - Macroeconomic policies on natural resources – water, air, land, copper, gold, silver, diamond, iron, lead, limestone, oil, salt, tin and uranium.

Module IV: Natural Resource Problems in India

Mechanism for environment regulation in India; Environmental laws and their implementation - Policy instruments for controlling water and air pollution and forestry policy - People's participation in the management of common and forest lands - Social forestry – Rationale and benefits

Module V: Environmental Policy and Environmental Education

Environmental externalities – Pigouvian taxes and subsidies - marketable pollution permits and mixed instruments - Coase's bargaining solution and collective action- Environmental institutions and movements – Environmental Education: Concept and Significance.

References:

1. Baumol, W.J. and W.E. Oates (1988), "The Theory of Environmental Policy" (2nd Edition) Cambridge University Press, Cambridge
2. Bromley, D.W. (Ed.,) (1995)"Handbook of Environmental Economics" Cambridge University Press Cambridge
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12. Joseph Pearce (2001), Small is still Beautiful, Harper Collins, London

ELECTIVE COURSE IV
MANAGEMENT INFORMATION SYSTEMS

Objective: To help the students understand the uses of Information Technology for Business.

Module I: Foundation Concepts

Information system (IS) and technologies – Importance of IS – System concepts – Feedback and control – Components of an IS – IS resources: people, hardware, software, data, network – IS activities: processing, storage, control – Role of IS application – Trends in IS – Types of IS – Managerial challenges – Real world cases.

Module II: Competing with Information Technologies

Strategic IT – Strategic links in the supply chain – Competitive strategy concepts – Strategic uses of IT – Value chain and strategic IS – Using IT for strategic advantage – improving business quality – Real world cases.

Module III: Information Technologies

Managing data resources – Types of data bases :operational, distributed, external, hypermedia db – data warehouses – data mining – db management software – db interrogation – db maintenance – data resource management – challenges – db structures – hierarchical, network, relational, multidimensional, object oriented – Telecommunication and networks – Trends; industry, technology, business application – Internet applications – Business use of interest Real world cases.

Module IV: Business Applications

Functional business systems – Target marketing – IT in business – Marketing systems: interactive marketing, targeted marketing – sales for automation – Manufacturing systems: integrated manufacturing, process control, machine control – Human Resource Systems: HRM and internet, HRM and corporate sector – staffing and training – Real world cases.

Module V: Management Challenges

Security and ethical challenges – ethical responsibility of business professionals: business ethics technology ethics, ethical guidelines – computer crime: hacking, cyber theft, unauthorized use at work, software privacy, piracy of intellectual property, viruses and worms – privacy issues – Other challenges: employment, monitoring, working conditions – Health issues.

References:

1. James A.O'brien, 2006, Management Information Systems, Tata McGraw Hill Edition, New Delhi
2. Gerald V. Post & David L. Anderson, 1999, Management Information Systems, Tata McGraw Hill Edition,   New Delhi
3. C.S.V. Murthy, 2000, Management Information Systems, Himalaya Publication, Mumbai
4. D.P. Goyal 2000, Management Information Systems, Macmillan Delhi

ELECTIVE COURSE V
COMPUTER APPLICATIONS IN ECONOMICS (updated on 16-11-2016)
(THEORY ONLY)

Objectives:

1. To enable the students to understand the fundamentals of computers, the MS Word, MS Excel, MS Power Point and Internet.
2. To motive the students to learn the application of most up-to-date technology in the discipline (Economics).

Module I : Fundamentals of Computer

Basic concepts and components of a computer – CPU, input – output devices –bit, byte, data storage, retrieval, hard disk – computer networking and resources sharing – hardware & software.

Module II: Operating System

Disk Operating System, Windows & LINUX [Basic ideas only] – operating systems.

Module III: MS Word & MS Power Point

Introduction : overview, basic terminology – tool bars, scrolling, word processing, formatting text and document – tabs and sorting – working with graphics, templates – creating a slide show – opening and closing presentations.

Module IV: MS Excel and Software Packages

Working with date – managing Excel workbooks 7& worksheets – formulas and functions – formatting data – creating charts – uses of SPSS for univariate & multivariate analyses.

Module V: World Wide Web

Internet basics – search engines – opening e-mail id – downloading text from internet – uses of internet for business and commercial activities.

References:

1. Sanders, D.H (1988) Computers Today, McGraw Hill (3rd Edition) New York
2. Sinha, (1992), Computer Fundamentals, BPB Publications, New Delhi.
3. Rajaraman V (1996), Fundamentals of Computers, (Prentice Hall of India, New Delhi)
4. Lipschultz M.M and S. Lipschultz (1982) Theory and Problems and Data Processing, Schaum Outline Series, McGraw Hill, New Delhi.
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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024

M.A. HISTORY PROGRAMME Syllabus UNDER CBCS

(Applicable to the candidates admitted from the academic year 2016-17 onwards)

Sem	Course	Ins. Hours	Credit	Exam Hours	Marks		Total
					Int.	Ext.	
I	**Core Course – I (CC)** Indian Civilization and Culture from Pre history to 1206 A.D	6	4	3	25	75	100
	Core Course – II (CC) Indian Civilization and Culture from1206 A.D. to 1707 A.D.	6	4	3	25	75	100
	Core Course – III (CC) Socio - Cultural History of Tamilnadu from the Sangam Age to 1800 A.D	6	4	3	25	75	100
	Core Course – IV (CC) History of World Civilizations upto 1453 A.D. (Excluding India)	6	4	3	25	75	100
	Elective Course – I (EC) Human Rights / Archives Keeping	6	4	3	25	75	100
	Total	**30**	**20**				**500**
II	**Core Course – V (CC)** Socio - Cultural History of India from 1707 A.D. to 1857 A.D.	6	5	3	25	75	100
	Core Course – VI (CC) Socio - Cultural History of Tamilnadu from 1800 A.D to 1967 A.D.	6	5	3	25	75	100
	Core Course – VII (CC) History of Europe from 1453 A.D. to 1789 A.D.	6	5	3	25	75	100
	Core Course – VIII (CC) History of Science and Technology	6	5	3	25	75	100
	Elective Course – II (EC) India and Her Neighbours / Principles and Methods of Archaeology	6	4	3	25	75	100
	Total	**30**	**24**				**500**

III	**Core Course – IX (CC)** Freedom Movement in India	6	5	3	25	75	100
	Core Course – X (CC) History of Europe from 1789 A.D. to 1945 A.D.	6	5	3	25	75	100
	Core Course – XI (CC) International Relations Since 1945 A.D.	6	5	3	25	75	100
	Core Course – XII (CC) Historiography	6	5	3	25	75	100
	Elective Course – III (EC) Environmental History (with reference to India) / Ideas in History	6	4	3	25	75	100
	Total	**30**	**24**				**500**
IV	**Core Course – XIII (CC)** India since 1947 A.D.	5	5	3	25	75	100
	Core Course – XIV (CC) Constitutional History of India	5	5	3	25	75	100
	Elective Course – IV (EC) Tourism and Travel Management / Journalism	5	4	3	25	75	100
	Elective Course – V (EC) Women Studies / General Knowledge and Current Affairs	5	4	3	25	75	100
	Project	10	4	--	--	--	100
	Total	**30**	**24**				**500**
	Grand Total	**120**	**90**				**2000**

CORE COURSE I

INDIAN CIVILIZATION AND CULTURE FROM PREHISTORY TO 1206 A.D

Objectives
1. To understand the scope of the study of ancient history of India.
2. To understand the political ideas.
3. To study the origin of the religion.
4. To understand the study of Antiquities.

UNIT I :   **PRE-HISTORY AND PROTO-HISTORY OF INDIA:**
Introducing Prehistory and Proto history--Pre-historic and Proto-historic archaeological sources - Other sources of the Ancient Indian History –Beginning of Food production – Early domestication- Mehrgarh and its significance -Indus Valley - Beginning of Iron and the Transition to history.

UNIT II :   **POLITICAL IDEAS AND INSTITUTIONS:**
Approaches to the study of Polity - Origin of the State -Vedic Assemblies –Oligarchies – Republic - Councillors and officials - Post Vedic & Pre Mauryan - The Saptanga theory of Kautilya – Nandas - Mauryas; Paternal despotism-Asoka's welfare state: Kingship – Army - Judiciary, Interstate relations - Post Mauryan period; Satavahanas, Kushans and Guptas – Harsha - their Political Institutions.

UNIT III :   **DEVELOPMENT OF INDIAN RELIGIONS:**
Approaches to the Study of religions-Pre-historic religions: Religion of the Harappans - Development of religious thought in Vedic and epic literature -Religious ideas and practices in the 6th century B.C. Rise of Buddhism and Jainism –Bhagavathism - Growth of Saivism - Vaishnavism in Gupta period.

UNIT IV :   **SOCIO-ECONOMIC LIFE:**
Primitive man-Agriculture and animal husbandry - Urban Harappa - trade relations - Society and Economy in the Early Vedic Period - Formation of Caste and classes in the Post Vedic Period - Mauryan Economy – Post-Mauryan economy-Land system, Trade.- Position of women-Guilds and social change. Feudalism in the post Gupta period.

UNIT V :   **ART AND EDUCATION**
Primitive art – Terracottas – Minor arts - Mauryan art - Kushans, Gandhara, Mathura, Sarnath, Amravati and other schools - Gupta art - Vedic education and Educational Centres. Nalanda, Vikramashila University - Vallabi-Kanchipuram - Literature in Gupta period.

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5. R.S. Sharma, Material Culture and Social Formation in Ancient India, MacMillan, New Delhi, 1983.
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11. V. Shinde, Early Settlements in the Central Tapi Basin, Munshiram Manoharlal, New Delhi, 1998.
12. J.SE. Swain, A History of World Civilization, Eurasia Publishing House Pvt. Ltd, New Delhi, 1994.
13. Kalpana, Rajaram and R. Vidhya, Facet of Indian Culture, spectrum Books, New Delhi, 2013.

CORE COURSE II
INDIAN CIVILIZATION AND CULTURE FROM 1206 A.D. TO 1707 A.D.

Objectives
1. To understand the scope of the study of medieval history of India.
2. To understand the political ideas.
3. To study the religious policy of the Muhamadians.

UNIT I : Sources-documentary and Non-documentary, trends in medieval Indian historiography- Barani's ideas of the ruling class-Abul Fazl and Badaoni - The ahl-i-qalam (people of the pen) - The concept of sovereignty: the growth of centralized state polity; the political views of the Khaljis and the Tughluqs, Afghans-state and religion, the Ulema, influence of Ulema - Rise of independent regional kingdoms in the Deccan (A.D. 1400-1526) relations with the Delhi - Sultanate-the emergence of the Rajputs as a political force-Administration, Judiciary and military organization - India of the first half of the sixteenth century assessment of Babur's Memoirs, polity, society, economy - Political problems of Humayun: Afghan resistance, the role of Humayun's brothers in politics.

UNIT II : The Second Afgan Empire, nature of the State, composition of the governing class, the Sur Administrative system - Re-establishment and consolidation of the Mughal Empire - Akbar's theory of Kingship: emancipation of the state from theological tutelage emergence of a non-sectarian state - Akbar's relations with the Rajputs, the main determinants of his Rajput policy, its nature and results - Akbar's religious concepts-Evolution of Din-illa-hi - Akbar and the Justice - The Mughals and the North West Frontier, Mughal objectives and policy in relations to the Persians; conquest and integration of Sindh, Baluchistan, Kashmir and Kabul (Afghanistan)in the Mughal Empire - The Mughal Empire and the Deccan; Main issues in the North-South relationship, Mughal, Objectives-their expansion into the Deccan - Assessment of Akbar's Deccan policy - Mughal Administration: central structure provincial and local administration, army organization - Mansabdari system.

UNIT III : Religion and state: Orthodox Muslim opposition to Akbar's policies, revivalist movements. (specially the role of Mujaddid alf-I-sani) its impact on the reins of Jahangir and Shahjahan. Contest for the throne, issues involved, success of Aurangzeb and the failure of Mughal Deccan Policy - Mughal-Maratha relations : The Maratha Administration nature of the state, social base of the Maratha State Administrative structure - Revolts of the Jats Satnamis, Sikhs and the Bundelas, nature of their challenge to the central authority - The decline of the Mughal Empire.

UNIT IV :   The growth of population - The rural class structure and nature of land rights, village organization, Iqtadars, the chieftains Zamindars and Jagirdars - The land systems; social distribution of landed property, agrarian relations, the revenue and the tax structure - The growth of the cities and towns; centers of large scale production, important ports. Inland and sea trade route - Urban life, social and economic base, stratification within the Urban society, regional shifts - The debate on the nature of economy in medieval India.

UNIT V :   Religion and social dissent in Historical Perspective - Rise and Growth of non-conformist movements; Siddhas and Nathpanthis; social and religious practices - Continuity and intensification of socio-religious movement : Kabir, Dadu, Raidas, Nanak, Namdev, Tulsidas, Mira, Surdas - Sufisim and the Development of languages, literature and popular culture. Interaction between Bhakti, Sufi and Yogic traditions.

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1.   S.M. Edwards, The History of India as Told by its Own Historians, 8Vols, Trubner, London, 1877.
2.   Irfan Habib, (ed), Researches in the History of India 1200-1750, Oxford University Press, Delhi, 1992.
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5.   H.K. Naqui, History of Mughal Government and Administration, Kanishka, Delhi, 1990.
6.   H.C. Ray, The Dynastic History of Northern India, Vol. II, Munshiram Manoharlal, New Delhi, 1973.
7.   S.R. Sharma, Mughal Empire in India Lakshmi Narain Agarwal, Agra.
8.   N,D. Srivastava, The Sultanate of Delhi [711-1526 A.D.], Shiva Lal Agarwala, Agra, 1976.
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13.   B.N. Luniya, Evolution of Indian Culture, Laxshmi Narain Agarwal, Agra, 2001.
14.   S. Abid Husain, The National Culture of India, National Book Trust- India, New Delhi, 2000.
15.   Jawaharlal Nehru, Discovery of India, Oxford University Press, New Delhi, 2012.

CORE COURSE III

SOCIO-CULTURAL HISTORY OF TAMIL NADU FROM THE SANGAM AGE TO 1800 A.D.

Objectives

1. To understand the scope of the study of ancient history of tamilnadu
2. To understand the political ideas.
3. To study the origin of the religion.
4. To understand the study of Antiquities.
5. To know the ethnology of the Tamils.

UNIT I : **Sources:** Archaeology, Epigraphy, Literature and Numismatics [for the entire period] - Sangam and Post Sangam: Social institutions-customs and practice - Pallavas: Society, religion and Bhakthi Movement - Cholas and Pandyas: Society, Religion and the role of temples - Nayaks: Society and religion.

UNIT II : **Pre-Sangam:** Neolithic and Megalithic Economy - Agriculture and Trade - Sangam Age: Agriculture and Trade - Roman Trade – Industries - Labour-Revenue – Coinage - Urbanization

UNIT III : **Pallavas and Pandyas:** Land Classification - Ownership of Land - Agriculture and Crops - Irrigation - Trade and Industries - Revenue System - Features of Feudalism - Coinage and Urbanization.

UNIT IV : **Cholas:** Land System - Trade: Inland and Foreign - Trade Guilds – Markets - Monetary System – Coinage - Features of Feudalism - Urbanisation.

UNIT V : Nayaks: Land System - Agriculture and Trade.

References:

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2. T.V. Mahalingam, Economic Life in the Vijayanagar Empire. Madras University, Madras, 1951.
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4. "-----------------------", Kanchipuram in Early south Indian History, Asia Publication, Madras, 1969.
5. C. Meenakshi, Administration and Social Life Under the Pallavas Madras University, Madras, 1977.
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11. P.T. Srinivasa Iyengar, History of Tamils. C. Coomaraswamy and Sons, Madras, 1929.
12. K.R. Srinivasan, Temples of South India. NBT, New Delhi: 1995.
13. Y. Subbarayalu, Political Geography of the Chola Country, Tamil Nadu State Department of Archaeology, Madras, 1973.
14. N. Subramanian, Sangam Polity. Asia Publishing House, Madras, 1966.
15. Burton Stein, Peasant State and Society in Medieval South India, Oxford University Press, Delhi, 1994.
16. Kamil.Zvelebil, The Smile of Murugan. E.J.Brill, Leiden, 1973.

HISTORY OF WORLD CIVILIZATIONS UPTO 1453 A.D. (Excluding India)

Objectives

1. To understand the scope of the study of ancient civilizations
2. To understand the political ideas.
3. To study the origin of the religion.
4. To understand the study of Antiquities.

UNIT I : Meaning and Definition–Rise and growth of civilizations – River Valley Civilization – Nile- Mesopotamia – Hwang – Ho – their legacies – Development of arts, writings – Economy, Society and religious belief – Technology.

UNIT II :   Greece – City States – Political experiments – Age of Pericles – legacy of Greece.

UNIT III : Roman Civilization – Augustan Age – Legacy – Charlemagne – Contributions of Roman empire to the world.

UNIT IV : Rise and growth of Major Religions – Confusionism – Christianity – Zoroastrianism – Islam.

UNIT V : Middle Ages in Europe – The Church – Monastic Orders – The Crusades – Feudalism – Guild system - Universities.

References

1. H.A.L. Fisher,   A History of Europe, Vol.I

2. V.G. Gordan Childe,   What happened in History?

3. M.I. Finely,   Studies in Ancient Societies

4. W. Watsom,   Early Civilization in China

5. Allen Gardinal,   Egypt at pharaoh

6. J.E. Swain,   The world Civilization

7. Wall Bank Taylor,   History of World Civilization

8. H.G. Wells   A Short History of the World

ELECTIVE COURSE I

A) HUMAN RIGHTS

Objectives

1. To understand the value of human rights
2. To study various theories of human rights
3. To know various laws and acts pertaining to human rights

UNIT I :   Definition of Human Rights- Theories on Human Rights- Historical Development of Human Rights- Nation Law and Nation Rights in ancient, medieval and modern periods

UNIT II :   The emergence of Human Rights on to the world stage- Human Rights and the U.N.O- Universal Declaration of Human Rights- International Covenant on Civil and Political Right-, International Covenant on Economic, social and cultural Rights- U.N. Human Rights Commission.

UNIT III :   India and Human Rights: Constitutional provisions- Evolution of Fundamental Rights during Freedom Struggle-Nature of Fundamental Rights-Directive Principles of State Policy-National Human Rights Commission- Main recommendations of the National Human Rights Commission — State Human Rights Commission

UNIT IV :   Right against Discrimination-Right to Affirmative Action- Right to Life: Livelihood, Health, Education, Privacy, Legal aid, Speedy trial, -Prevention of Sexual harassment at workplace

UNIT V :   Contemporary Human Rights Issues: Women's rights- children's rights- bonded labour- refugees- capital punishment-Status of Dalits and Tribals in Contemporary Indian Society-

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10. R.S. Pathak, (ed.), Human Rights in the Changing World, International Law Association, New Delhi, 1988.
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12. Amartya Sen,. Development As Freedom, Oxford University Press, New Delhi, 1999.
13. Edward James Schuster, Human Rights Today : Evolution or Revolution, Philosophical Library, New York, 1981.
14. Subbian, A Human Rights Systems, New Delhi, 2000.

ELECTIVE COURSE I

B) ARCHIVES KEEPING

Objectives

1. To know the history of the archives
2. To study the activities of various archives
3. To understand the importance of archives keeping

Unit I : History of Archives – Archives keeping Europe through the ages – International Archives – Archives in India: Ancient, Medieval and Modern.

Unit II : Creation of Archives: Establishment of registry – Racking – Shelves and other materials – Archives and Libraries - Organisation of Archives in India: Court Archives – Public Department – Revenue Department – Secret Department – Central Government Archives – Organisation of Archives in European Countries: France, England – Archives in U.S.A., Canada.

Unit III : Preservation of Archives – Methods of Preservation – Preliminary and precautionary measures – Preventive measures – Factors of deterioration – Atmospheric factors: Temperature, Humidity, Sunlight, Dust, Impurities, Micro-organisms and pest: Pests, Silver fish, Termites or White Ants, Wood Warm, other insects – Methods of Preservation and repair of Archival material.

Unit IV : Administration of Archives: National Archive – Tamil Nadu Archive - Functions of Archives - Uses of Archives.

Unit V : National Archives: Its origin, growth and activities - Tamilnadu Archives: Its origin, growth and activities - Private Archives: Definition – Difference between private and public archives – Categories of Private Archives – Nehru Memorial Museum – IUCIS, Hyderabad – Parry and Company, Chennai – Asiatic Society of Bengal – Bengal Club – Vishva Bharathi – Sringeri Mutt – Indo-Portuguese Archive, Goa – Arch Diocese of Madras – Archives of Shenbaganoor, Kodaikanal – Problem of private archives – National Registrar of Private Records.

References:

1. B.S. Baliga, A Guide to the records preserved in the Madras Record Office, Superintendent, Government Press, Madras, 1936.
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26. M. Sundararaj, A Manual of Archival Systems and the World of Archives. Siva Publication, 1999.

CORE COURSE V

SOCIO-CULTURAL HISTORY OF INDIA FROM 1707 A.D. TO 1857 A.D.

Objectives:
1. To trace the Islamic influences of Hinduism and Vice versa.
2. To reveal Socio-Economic and Cultural Changes occurred in the Deccanic Kingdoms.
3. To Understand the impact of westerners contact with India.
4. To Study the salient features of the western and Eastern influences.
5. To highlight the influence of Bakthi Movement on Indian society.

Unit I   :   Disintegration of the Mughal empire-- European settlements and their impact on Indian Society—British Annexation of Bengal.

Unit II :   The British conquest and expansion: Lord Clive – Warren Hastings – Lord Wellesley – Lord Hastings. The wars: Anglo-Mysore wars – Anglo-Maratha wars – Anglo Burmese war – Annexation of sind - Ranjit singh – Anglo – Sikh wars – Lord Dalhousie and Doctrine of Lapse – Anglo-Afghan relations.

Unit III :   British policy towards India states: Ring Fence Policy 1765-1813, Subordinate Isolation, 1813- 57 – Indian states under the Crown.

Unit IV :   Cornwallis and Permanent Land revenue settlement — Lord Dalhousie and his reforms .

Unit V   :   Socio-religious movements of the 19th century: Reforms of Lord Bentinck – Educational policy under East India Company- Administrative structure and policies : judicial and police reforms.

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2. Desai, A.R.Social Background of India Nationalism
3. Grover, B.L.A New Look on Modern Indian History
4. Majurndar, R.C. and et al. An Advanced History of India, revised
5. Nanda, B.R.and V.C.Joshi, Studies in Modern Indian History
6. Roberts, P.E.History of British India
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CORE COURSE VI

SOCIO-CULTURAL HISTORY OF TAMILNADU FROM 1800 A.D TO 1967 A.D.

Objectives:

1. To know the social condition of Tamilnadu since 1800AD.
2. To understand the Land Systems.
3. To know about the Economic condition in Tamilnadu.
4. To understand the Impact of Western Education.
5. To know the Art and Education of Tamil Country.

Unit I : Sources : archival- institutional papers -Private papers-literature-folklore-newspapers and journals -Social Conditions: Caste system origin and growth - Castes conflicts- Family : Emigrations-Joint family-break up- position of women-sati-child marriage - devadasi system-infanticide-changes in the 19th and 20th centuries - Social beliefs and social practices: social ceremonies- festivals-entertainments- superstitions. Religion: Saivism: St. Ramalingar- Vaishnavism: the Schism- village gods and deities -Christianity: Policy of the Company- growth and impact- Islam: growth and impact-Village Gods and deities.

Unit II : Land systems: - Zamindari to Ryotwari-General economic conditions: agriculture and industry during colonial and post-colonial periods- Landlords-Peasants - small tenant-serfdom-trading classes. Rise of indigenous commercial Elite- the Dubashies.

Unit III : Indigenous institutions of learning-Introduction of Western education- Missionary and Government education-Munro's Scheme of Education- Professional and Technical education-education of Depressed Classes-Muslim education - Female education- rise of Administrative Elite-Professional Elite.

Unit IV : Modern socio-religious movements: Theosophical and Ramakrishna Mission. Radical social reform movements : Concept of Dravidian culture- Non-Brahmin Movement-Periyar E.V.R and Self-Respect Movement-Temple Entry Movement : Dalit Movement : Ayothidhasar-M.C.Raja-Erattamalai Srinivasan.

Unit V : Music: folk and classical- Tamil Literature: Subramania Bharathi-Bharathidasan-Namakkal Ramalingam Pillai-Kavimani Desika Vinayakam Pillai- Maraimalai Adigal-Film : impact on society and politics.

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CORE COURSE VII

HISTORY OF EUROPE FROM 1453 A.D. TO 1789 A.D.

Objectives:
1. To know about the Fall & Roman Empire and ottoman Turks.
2. To understand Renaissance and its results.
3. To know the Emergence of Absolute Monarchies.
4. To understand the Growth of parliamentary institution in England.
5. To trace the Age of Enlightenment.

Unit I   :   Fall of Eastern Roman Empire-Ottoman Turks-Geographical Discoveries-Decline of feudalism-Beginning of Capitalism.

Unit II :   Commercial Revolution in Western Europe -Mercantilism-Renaissance and Reformation-Counter Reformation-Thirty Years War in Europe.

Unit III :   Emergence of the Nation States- The rise of new absolute monarchies - Louis XIV

Unit IV :   Growth of Parliamentary institutions in England

Unit V   :   The Age of Enlightenment - The emergence of a scientific view of the world.

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CORE COURSE VIII

HISTORY OF SCIENCE AND TECHNOLOGY

Objectives:

1. To know about the origin of the Science and Technology.
2. To understand the evolution of Science and Technology.
3. To know the development of Indian Science.
4. To make the students to understand the development of Science and Technology in Medieval and Modern period.
5. To understand the Effects of Science and Technology.

Unit I :   Science as an Institution: The Emergence and Character of Science - The Methods of Science— The Cumulative Tradition of Science — Science and the Means of Production – Natural Science as a Source of Ideas- Interactions of Science and Society.

Unit II :   Science in the Ancient World: Agriculture and Civilization: Civilization - The Techniques of Civilization - The Origin of Quantitative Science - The Legacy of Early Civilization - The Origins of Iron age Cultures - Early Greek Science -Rome and the Decadence of Classical Science - The Legacy of the Classical World - History of Science and Technology in Ancient India -Astronomy, Medicine and Metallurgy.

Unit III :   Science in the Age of Faith: Dogma and Science - Islamic Science - Medieval Science -The Revolutions in Science and Society - The Future of the Physical Sciences - Science and Ideas in an Age of Tranisition.

Unit IV :   The Birth of Modern Science: The Renaissance(1440-1540) - The New Philosophy - Science Comes of Age(1650-90) - The Character of Science in the Industrial Revolution -The Nineteenth- Century Advances of Science- The World's Need of Science.

Unit V :   Science in Colonial India: Colonial Science Policy - Science in Education - Indian response - Indian Advancement Science and Technology since 1947.

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ELECTIVE COURSE II
A) INDIA AND HER NEIGHBOURS

Objectives:
1. To understand the Foreign policy of India.
2. To trace the relationship of India with the neighbouring states.
3. To know the role of India in SAARC
4. To understand the ethnic crisis in Srilanka, Pakistan, Bangladesh.

Unit I : The Sub- continent of India - Determinants of India's foreign policy: Historical factors - Geographical factors -Economic factors - National Interest, Ideologies: World peace - Anti-colonialism - Anti-racism - Pancha Sheel - NAM.

Unit II : India and Pakistan: India's relations with Pakistan - factors influencing Indo-Pak relations -Kashmir issue - The areas of conflict - crisis and co-operation-Nuclear race in the Indian sub- India and Bangladesh.

Unit III : India and China: Sino-Indian relations – Panch sheel Agreement - Chinese action in Tibet - Strains in Sino- Indian Relations - Normalisation process in the Sino- Indian Relations

Unit IV : India and Sri Lanka: Policy towards India-Ethnic Problem and its impact - IPKF. India and Nepal: Interaction between India and Nepal -Indo-Nepal economic co-operation. India's political and economic relations with Bangladesh, Bhutan, Maldives, Burma [Myanmar]; Cultural contacts.

Unit V : India and the Non-Aligned Movement - its role in international relations - Indian Ocean being made a zone of peace - Problems and Prospects - SAARC and Co-operation in South Asia - Trade and economic development U.N. and India- Human Rights in South Asian Countries.

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ELECTIVE COURSE II
B) PRINCIPLES AND METHODS OF ARCHAEOLOGY

Objectives:
1. To understand the scope of the study of Archaeology.
2. To involve the students in understanding the field methods of Exploration.
3. To understand the field Methods of Excavation.
4. To study the Methods of recording and preservation.
5. To understand the study of Antiquities.

Unit I : Definition, Aim and Scope of Archaeology – Methods and Principles

Unit II : Exploration: Identification of Ancient Sites - Nature of Ancient Sites - Open Air – Caves – Mounds – Burials

Unit III : Excavation: Laying of the Trenches - Digging and recording – Stratigraphy - Photography and Surveying – Interpretation - Publication

Unit IV : Study of Antiquities – Stone – Bone – Metals - Pottery and others

Unit V : Preservation: Antiquities – Wood – Bone – Ivory – Metal – Stone - Other objects – Monuments - Principles of Conservation

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3. Plenderleith, H. : Conservation of Antiquities and Works of Art.
4. Crawford, O.G.S. . : Archaeology in the Field.
5. Glynn Daniel : The Origin and Growth of Archaeology.
6. Raman,K.V. : Principles and Methods of Archaeology, Madras.
7. Padigar, S.V. : Puratatva Sastra Sodhane, Dharwad.

CORE COURSE IX
FREEDOM MOVEMENT IN INDIA

Objectives:
1. To understand the need of freedom movement
2. To know the courses of freedom movement
3. To know and feel the people's conditions of the British rule in India
4. To know the history of Swaraj and non cooperation movement during the period
5. To know the reality while partition of India before independence
6. To understand, how we won our independence

UNIT I :   The first war of Indian Independence 1857 – Political, Social, Religious, Economic and Military causes – Proclamation of Queen Victoria - Act of 1858.

UNIT II :   Causes of the Nationalist Movement - Predecessors of the congress – British India society.- British Indian Association – Bombay Association – Madras Native Association – The Indian Association – Madras Mahajon Sabha – Bombay Presidency Association

UNIT III :   Foundation of Indian National Congress – First session – Second Session, Third session – Calcutta Session. Moderates and Extremists – Home Rule Movement – The Revolutionary and Terrorist Movements – India and World War I.

UNIT IV :   Constitutional Development (1919 -35) - Non Co-operation Movement – Swarajist Party – Civil Disobedience movement – India and World War II – Cripps' Mission – Quit – India Movement.

UNIT V :   Indian National Army – Partition of India – Indian Independence – Some leaders of Freedom struggle – Gokhale – S.N. Banerjee – Annie Besant – Maulana Azad –Dadabhal Naoroji – Tilak – Vallababhai Patel – Mahatma Gandhi – Pt. Jawaharlal Nehru.

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CORE COURSE X
HISTORY OF EUROPE FROM 1789 A.D. TO 1945 A.D.

Objectives

1. To understand the origin of the revolutionary thinking in modern Europe
2. To study the causes and nature of Revolution in Modern Europe.
3. To know the significance of French revolution in modern Europe.
4. To study the impact of Great Depression in Europe.
5. To analyse the causes and impact of Second War in Europe.

UNIT I :   The French Revolution and Napoleonic Era (1789-1815) – Their Significance in World History- Vienna Congress, 1815 - Revolutions of 1830 and 1840.

UNIT II :   Industrial Revolution-Stages of Industrial Revolution in Europe - Socialist and Labour Movements in Europe.

UNIT III :   Napoleon III - The Unification of Italy and the founding of the German Empire - The European powers and the Ottoman Empire (1815-1914).

UNIT IV :   The Russian Revolution, 1917 - The First World War - The Economic and Social impact of the War - The Peace of Paris, 1919- League of Nations- Collective Security.

UNIT V :   Great Depression of 1929-32. Totalitarianism in Europe:- Fascism in Italy, Nazism in Germany. Origins and Impact of Second World War - UNO.

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CORE COURSE XI
INTERNATIONAL RELATIONS SINCE 1945 A.D.

Objectives

1. To understand the definition and scope of the International Politics.
2. To familiar with the various theories of International politics.
3. To analyses the post world War II scenario in International relations.
4. To know the impact of World War II in the Global Economics.
5. To understand the role of world organizations in peace making process.

UNIT I : Definition and scope - Theories of international Politics: The Realist Theory, Systems Theory, Decision Making-Game Theory.

UNIT II : Concepts of International Politics: Power - National interest - Balance of Power - Collective Security: NATO, CENTO, Warsaw Pact, SEATO, ANZ US. Old and New Diplomacy-practice.

UNIT III : The (Post-II World War) foreign policies of the major powers: United States, Soviet Union - China. and India's foreign policy and relations; India and the Super Powers-Oil Diplomacy, Palestine-Israel conflicts, West Asian conflict- Palestine- Israel confides- Arms race, disarmament and arms control: - The Partial Test-Ban Treaty - The Nuclear Non-Proliferation Treaty (NPT); Comprehensive Test Ban Treaty [CTBT]- India's-Nuclear Policy — Terrorism its impact — Afghanistan , Iraq — US War.

UNIT IV : New International Economic order; GATT and its implications. The North South: "Dialogue" in the United Nations and Outside — Impact of Globalization.

UNIT V : Origin and Development of International Organizations: The United Nations and its Specialized Agencies; OAS, OAU, the Arab League, The ASEAN, the EEC, SAARC their role in international relations.

References:

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CORE COURSE XII

HISTRIOGRAPHY

Objectives:

1. To understand the need for studying history
2. To analyse definition, nature and scope of history
3. To know the contribution of historians through ages
4. To evaluate their approaches to history.
5. To introduce the methodology in writing

UNIT I : History - Definition - Nature, Scope and Value – Social necessity of History – Philosophy of History – History and its ancillary fields.

UNIT II : Historiography – Traditions of historical writing – Interpretation and Development of history through Ages – Theological Interpretation – Scientific Interpretation – Marxist Interpretation.

UNIT III : Practitioners of history – Herodotus – Banabhatta – Thomas Aquinas – Alberuni –Voltaire – Leopold Von Ranke – James Mill – Vincent Arthur Smith – K.A. Nilakanda Sastri – K.K. Pillai.

UNIT IV : Approaches to history – British Marxists – E.P.Thomson – Indian Marxist – D.D.Kosambi – Cliometrics- R.W. Fogel – Modernism – Lewis Namier – Structuralism – Claude Levi Strauss – Subaltern Studies – Ranajit Guha.

UNIT V : Historian Work – Selection of topic – Review of literature- Collection of data – Primary and Secondary sources – Internal and External Criticism Foot notes – Bibliography – Appendix – Documentation.

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2. Jacques and Henry F. Graff, The Modern Researcher. Harcourt Brace, San Diego, 1985.

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ELECTIVE COURSE III

A) ENVIRONMENTAL HISTORY (With reference to India)

Objectives

1. To know the various aspects of Eco-system and importance of Conservation.
2. To study the cultural tradition and colonial policy towards preservation of environment in India.
3. To analyse the various steps taken towards the preservation of forests in India.
4. To understand the dangers of Environmental threats due to various kinds of pollutions.
5. To study the activities of various movements engaged in Environmental protection.

UNIT- I :   Definition - Scope - Eco-system - Bondage between human civilization and Ecology, Nature's Balance, Preservation - Environment and Culture - Conservation — Green House Effect - Global warming - Ozone - Biodiversity.

UNIT-II :   Environment in the Indian Cultural Tradition - Colonial environment policy Forest Management.

UNIT-III :   Forest Management - Resistance to Forest Management: Kumaun and Garhwar's region - The Utar and forest Movements of 1921 - Social Protest in U.P., 1921-42 - Impact on Nationalism — Forest satyagraha — Karnataka.

UNIT-IV :   Environmental threats: Water Pollution - Air Pollution- Land Degradation - Hazardous Wastes - Industrial Pollution.

UNIT-V :   Environmental Movements —Chipko Movement — Protest against Narmada Project -Protective Measures - Govt.Legislations - Courts — Activists — Babha Amte -Metha Patkar .

References:

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ELECTIVE COURSE III
B) IDEAS IN HISTORY

Objectives :

1. To provide basic understanding of the concepts
2. To know the necessity of the study of the concepts
3. To understand the origin of the various political ideas.
4. To assess the relevance of various ideas to the current scenario.
5. To study the role of ideas in understanding the nature of history.

UNIT- I :   Causation in History - Crisis in History - Determinism in History

UNIT-II :   Positivism- Evolutionism- Dialectical Materialism - Historicism

UNIT-III :   Liberalism - Democracy - Nationalism - Socialism - Imperialism -International

   Peace - Ethics of Peace : Progress in the Modern Times

UNIT-IV :   Non-violence and Satyagraha- Communalism - Secularism

UNIT-V :   Modernism - Post Modernism - Structuralism - Post Structuralism – Globalism.

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3. E.H. Carr, What is History, Harmondsworth, 1977.

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8. Jerzy, Methodology of History, Reidal Publishing, Holland Co., (1976)

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Objectives :

1. To know the significance of parliamentary democracy
2. To know the importance of Nehru Era
3. To understand the origin of the various political ideas.
4. To assess the relevance of various ideas to the current scenario

UNIT- I :   **Polity I :** Partition and its impact – The making of Parliamentary Democracy-Architects of Modern India: Jawaharlal Nehru, India's Foreign Policy Lal Bahadur Sastri and Indira Gandhi - Emergency - General Elections of 1977 - J.Prakash Narayanan - Janata Government – Rajiv Gandhi - Coalition Politics and Governance – Movement towards state revolutionary: Tamil Nadu - Punjab - Kashmir - Assam Jharkhand - NEFA.

UNIT-II :   **Infrastructure and Science & Technology:**
Energy – Electricity subsector -Dams – Transport and Communication - Telecom Revolution **-** ISRO and Allied units - Achievements in Space Research - Nuclear Research- DRDO

UNIT-III :   **Economy :** Five Year Planning - Panchayat Raj - Agrarian Reform- Industrial Development-Green Revolution - White Revolution - Rolling plan - New Economic Policy and Globalisation.

UNIT-IV :   **Society & Culture I :** Educational Policy in Free India - Literacy Movement - Formal and Non-Formal Education – Population, Poverty and Unemployment Policy - Socio - Political Scenario - Reservation Policy and Mandal Commission - Communalism, Secularism and national integration -

UNIT-V :   Socio Economic Movements: Peasant Movement: Labour Movement – Tribal Movement – Jharkand – Chipko Movement – Changing status of women – Media and its impact.

References:
1. K.R. Acharya, (et.al.), Perspectives on Indian Government and Politics, Chand & Co., New Delhi, 1993.
2. D.D. Basu, Contemporary on the Constitution of India. Vol.1&2, Tata-Mcgraw Hill, New Delhi, 1990.
3. D.M. Bose, S.N. Sen and B.V. Subbarayappa.(eds.), A Concise History of Science in India. Indian National Science Academy, New Delhi, 1989.
4. Bipan Chandra (et.al.), India After Independence. Penguin, New Delhi, 1997.
5. Bipan Chandra, History of Modern India, Orient Blackswan, New Delhi, 2009
6. G. John Gilbert, Contemporary History of India, Anmol Publications, New Delhi, 2006
7. Satish Saberwal, Roots of Crisis: Interpreting Contemporary Indian Society. Sage, New Delhi, 1996.
8. Ramesh Thakur, The Government and Politics of India. Macmillan, Houndenville, 1995.
9. G. Venkatesan, History of Contemporary India 1947-2007, V.C. Publication, Sivakasi, 2010.
10. Bipan Chandra, History of Modern India, Orient Blackswan, First Edition, 2009.
11. "_____", India since Independence, Penguin India, New Delhi, 2008.
12. S.B. Jain, India's Foreign Policy and Non-Alignment, Anamika Publishers, New Delhi, 2000.
13. Jayantanuja Bandyopadhyaya, The Making of India's Foreign Policy, Third Edition, Allied publishers Pvt. Limited, Bangalore, 2003.
14. Hoveyda Abbas,, Ranjay Kumar and Mohammed Aftab Alam, Indian Government and Politics, Pearson Education India, New Delhi, 2010.
15. Pushpesh Pant, International Relations in the 21st Century, Seventh Print, McGraw Hill Education (India) Pvt. Limited, New Delhi, 2014.

CONSTITUTIONAL HISTORY OF INDIA

Objectives :

1. To know historical back ground of constitution
2. To study the unique features of the constitution
3. To understand the political scenario behind the origin of the constitution
4. To assess the relevance of various Acts pertaining to the emergence of Indian constitution

UNIT I : Regulating Act, 1773 - Pitt's India Act, 1784 – Charter Acts of 1793, 1813 and 1833

UNIT II : Act of 1858, Queen's Proclamation, Indian Council Acts of 1861 and 1892

UNIT III : Minto – Morely Reforms Act. 1909 – Montague Chelmsford Reform Act, 1919 – Simon Commission – Nehru Report – Jinnah's Fourteen Points - Round Table Conferences – Communal Award

UNIT IV : Indian Government Act, 1935 – August Offer – Cripps Mission – Formation of Constituent Assembly – Bhulabhai Desai and Liaquat Ali Pact – Wevell Plan – Rajagoplalachari Formula – Cabinet Mission – Mountbatten Plan – Indian Independence Act

UNIT V : Features of Indian Constitution Act of 1950 – Constitutional Amendments

References

1. R.C. Agarwal and Mahesh Bhatnagar, Constitutional Development and National Movement of India, S. Chand & Company Ltd., New Delhi, 2006.
2. Sumita Singh, Constitutional Development in British India, Pragun Publications, New Delhi, 1012.
3. M.V. Pylee, Constitutional Government in India, Asia Publishing, Bombay, 1967.
4. "------------', An Introduction to the Constitution of India, 5th Edition, Vikas Publishing House Pvt. Ltd., Noida, 2007.
5. Dharam Chand Gupta, Indian National Movement and Constitutional Development, Vikas Publishing House Pvt. Ltd., Noida, 1983.
6. A.C. Banerjee, Constitutional History of India, Vol. I, Mukherjee & Co, Calcutta, 1948.
7. Sibaranjan Chatterjee, The Governor in the Indian Constitution, Mittal Publication, Calcutta, 1973.
8. Illbert Courtenan, The Government of India, The Clarendon Press, Oxford, 1977.
9. Manik Lal Gupta, Constitutional Developments in India, Atlantic Publishers, New Delhi, 1989.
10. A.C. Kapoor, Constitutional History of India, S, Chand & Co, New Delhi, 1985.
11. A.B. Kieth, Constitutional History of India, Central Book Depot, Allahabad, 1961.
12. Jagdish Swarup, Constitution of India, Vol. 2, Modern Law Publication, New Delhi, 2006.
13. Pon Thangamani, Indian Constitutional History – A.D. 1773 to 1950, Ponnaiah Pathipakam, Chennai, 2001.
14. N. Rajagopala Aiyangar, The Government of India Act 1935.
15. Mahendra Kumar Talware, History of National Movement and Constitutional Development of India

ELECTIVE COURSE IV

A) TOURISM AND TRAVEL MANAGEMENT

Objectives :

1. To understand the concepts of tourism
2. To know the importance of accomodation
3. To study about the various travel agencies
4. To assess the importance of travel agencies to the development of Indian economy

UNIT I :   Meaning, Definition – Scope and Content of Tourism – Concept of Tourism – Purpose of Tourism –Kinds of Tourism – Basic Components of Tourism.

UNIT II :   Tourism as an Industry: Different types of Transport –Travel Formalities: Passport, Visa and Immigration – Customs formalities.

UNIT III :   Tourism and accommodation: Types of accommodation: Hotels – Youth Hostels and Dharmasalas – Importance of accommodation in Tourism Development.

UNIT IV :   Travel Agency operations- Day-to-Day operations – Origin and Growth – Modern Travel Agencies - Functions of Travel Agency – Travel Agency with Service Providers – Handling Client.

UNIT V :   Travel Intermediaries: Tour Operators – International Air Transport Association (IATA) – World Tourism Organization (WTO) – Travel Agent Association of India (TAAI) – Indian Association of Tour Operators (IATO) - Tourism Offices in India: Tourism Development Corporation of India (ITDC) – Tamil Nadu Tourism Development Corporation (TTDC) -

References

1. A.K. Bhatia, Tourism Development, Principles and Practice, Sterling Publishers Pvt. Ltd, New Delhi. 2002.

2. M.L. Singla, "Tourism and Hospitality Industry in India: An Appraisal, Journal of Hospitality Applications and Researt, BIT, Ranchi, 2007.

3. A.K. Raina and S.K. Agarwal, The Essence of Tourism Development: Dynamics, Philosophy and Strategies, First Edition, Sarup & Sons, New Delhi, 2004.

4. R.N. Kaul, Dynamics of Tourism, Vol.I, Sterling Publishers Pvt. Ltd, New Delhi, 1985.

5. Pragati Mohanty, Hotel Industry and Tourism in India, APH Publishing Corporation, New Delhi, 2008.

6. M.M. Anand, Tourism and Hotel Industry in India: A Study in Management, Practice-Hall of India, New Delhi 1976

7. Vijay Kumar Gupta, Tourism in India, Gian Publishing House, Delhi, 1987.

8. Pran Nath Seth, Successful Tourism: Fundamentals of Tourism, Sterling Publishers Pvt. Ltd, New Delhi. 2008.

ELECTIVE COURSE IV
B) JOURNALISM

Objectives :

1. To understand the concepts of journalism
2. To know the importance of press
3. To analyze importance of mass media to the society
4. To study the various press Acts

UNIT- I :   Nature and scope of Journalism – Growth of Journalism: Origin of news at global level – Origin of Indian Press – Indian freedom struggle and Press – Growth of press after independence.

UNIT-II :   Growth of press in Tamil Nadu: Origin of Tamil Journalism – Role of Tamil Press in the freedom struggle – Tamil journals in modern period   - Press laws – Press Council

UNIT-III :   Procedure for starting news papers and periodicals: clearance of Title for filling of Declaration – Application for news print – Supply of copies – Registration – Application for printing machinery – Specialized requirements – Annual Statement and annual report – Departments of Newspaper organization: Editorial division – Commercial division – Machinery division – Development division – Administrative bloc – Statistical division

UNIT-IV :   Reporting : Types of reporting: Predictable news – Unpredictable news – straight and explanatory news – Hard news – soft and hot news – investigative news – Sources of News – Components of news: 6 Ws – Methods of Reporting: Participating in the action - Observing the action – Asking questions or interview – Reading – Using Scientific Research Techniques – Methods of Obtaining news: Local Reporters – Correspondents – Special Reporters – Stringer and Liner – Radio and Television – Public Reports – News Agencies

UNIT-V :   Types of News: Government News – Court News – State Legislative and Parliamentary News – Public Meeting – Economic News – Scientific news – Sports – Editing: – Editor – News Structure: Headline – Lead – Body – Proof Reading.

Reference Book

1.   A.N. Ahuja, Theory and Practice of Journalism, Surjeet Publication, Delhi, 1984.

2.   David Wain Wright, Journalism Made Simple, Rupa & Co, London, 1981.

3.   Tony Harcup, Journalism: Principles and Practice, Third Edition, SAGE South Asia, 2009.

4.   "_____" The Ethical Journalist, SAGE South Asia, 2007.

5.   A.N. Ahuja, Theory and Practice of Journalism, Surjeet Publication, Delhi, 1984.

6.   David Wain Wright, Journalism Made Simple, Rupa & Co, London, 1981.

7.   A.M. Samy, Origin and Growth of Tamil Press, (Tamil), Navamani Pathipagam, Chennai, 1987.

8.   David Hoffman, Citizens Rising: Independent Journalism and the Spread of Democracy.

9.   Carole Fleming and Emma Hemmingway, An Introduction to Journalism 2006.

10. Vir Bala Aggarwal and V.S. Gupta, Handbook of Journalism and Mass Communicating.

11. R. Parthasarathy, Basic Journalism, Laxmi Publications (P) Ltd., 2000.

12. J. Natarajan, History of Indian Journalism, Part II of Government of India Press Communication, Publication Division, Delhi, 2000.

13. "---------------", Press and Politics in India, 1885-1905, Delhi, 1970.

14. Bob Franklim, Journalism Studies, 2006.

15. K. Kulathuran, Tamil Press (Tamil), Jeyakumari Store, Nagarcoil, 1975.

16. A.M. Samy, Origin and Growth of Tamil Press, (Tamil), Navamani Pathipagam, Chennai, 1987.

17. M.P. Gurusamy, Journalism, (Tamil), Guru Thenmozhi Publication, Dindigul, 2009.

ELECTIVE COURSE V

A) WOMEN STUDIES

Objectives :

1. To understand the concepts of feminism
2. To know the various theories of feminism
3. To study the legislations regarding the protection of women

UNIT- I :   Concept and Need for Women's Studies - Scope of Women's studies - Status of Women – Feminist Theories – kinds of Feminism: Liberal, Socialist, Marxist, Radical, Existentialist, Psycho analytical - Post and modern feminist thinkers

UNIT II :   Women's rights – UNO and Women's Rights _ Women's Rights Conferences – Conventions on all forms of discrimination against women - International Women's Year – Decade of Women 1975 – 85 - Feminism in India – Traditional Indian Society – Women in Vedic, Epic, Sangam and Muslim Periods.

UNIT III :   Social Reforms Movements in India – Government Policy – Center and Tamil Nadu on Women Status after 1947.

UNIT IV :   Women and Law – Laws regarding Child Marriage – Female Infanticide – Protection of Women law to abolish Sati.

UNIT V :   Changing role of Women in India – Socio, Economic and Political Challenges for women – Women and Work – Violence – Law and Media – Reservation.

References

1. Rachal Pienta, Taking Sides: Clashing Views in Women's Studies, McGraw-Hill Professional, New Delhi, 2013,

2. Susan Shaw and janet Lee, Women's Voices, Feminist Visions: Classic and Contemporary Readings, McGraw-Hill Professional, New Delhi 2011.

3. Inderpal Grewal and Caren Kaplan, An Introduction to Women's Studies: Gender in a Transnational World, 2nd Edition. McGraw-Hill Humanities Social, New Delhi, 2005.

4. Inderpal Grewal, Home Harem: Nation, Gender, Empire and the Culture of Travel, Cassel, 1996.

5. M.Mics, Patriarchy and Accumulation on a world Scale: Women in international Division of Labour, London, Zed 1986.

6. J. Ghosh "Gender concerns in Macro – Economic Policy EPW 30 April WS-2.

7. L. Dule (ed.), The Women and House hold in Asia, Series of Five volumes, Vol. I.

8. A. Singh A and Avitamen (ed.), Invisible hands, Sage Publication, New Delhi, 1987.

9. B. Agarwal (ed.), Structure of Patriarchy, New Delhi.

10. L. Dube and R Palsiwala (eds.), Structure and Strategies women, work & family in Asia, Sage Publication, New Delhi, 1989.

11. M. Krishnaraj and K Chanana (eds.), Gender and the House hold domain, Sage Publication, New Delhi, 1989.

12. K. Sardamoni, (ed) finding Household, Vol. 5, Sage Publication, New Delhi, 1992.

13. P. Uberoi, (ed.), State Sexuality and Social Reforms, New Delhi. 1996.

14. B. Cossman and R. Kapur (eds.), Subversive Site, Kali for Women, New Delhi, 1996.

15. Kanpur Ratna (ed) Feminist Terrains in Legal Domains, Kali for Women, New Delhi, 1996.

16. U. Butalia and T. Sarkar (ed.) Women and the Hindu Right, Kali for Women, New Delhi, 1996.

17. Hasan Zaya (ed): Forging Identities: Gender Communities and Multiple Patriarchies, EPW 23, Dec. 1995.

18. Agrawal Bina, Field of her own, Kalofar Women, New Delhi,

19. M. Mies M and V. Shiva – Eco feminism, , Kalofar Women, New Delhi, 1993.

20. "Feminifilation of Theory Debate", in EPW issues March 1995, June 3, 1995, June 17, 1995, July 11, 1995, Aug. 26, 1995, June 10, 1996,

21. K. Sangari, Politics of Possible, Tulika, New Delhi, 1999.

22. Chakravarti and K. Bangari (eds.), Myths & Markets, Manohar Publications, New Delhi, 1999.

23. CWDS – Collection of Papers on "Engendering Disciplines: Disciplining gender", Feb. 2001.

ELECTIVE COURSE V

B) GENERAL KNOWLEDGE AND CURRENT AFFAIRS

Objectives :

- To understand the functions of solar system
- To understand the significant features of constitution
- To study the importance of Indian economic plan
- To acquire the knowledge of science and technology

UNIT- I : **Solar System:** The Earth – Dimensions of Earth – Earth Motions – Earth's Atmosphere - Indian Geography: Monsoons - Mountain Ranges – Rivers - Types of Soils – Minerals – Crops – Forests –– National Highways and Railways – Airports and Harbours – National Wild Life Sanctuaries – Tribes in India.

UNIT-II : **Indian Constitution:** – Framing the Constitution – Preamble – Schedules – Amendments - Salient Features – Fundamental Rights and Duties – Directive Principles of State Policy – The President – Prime Minister - Parliament – Supreme Court – The Attorney General – Comptroller and Auditor General – Governor – State Legislature - Regional Issues.

UNIT-III : **Indian Economy:** Planning – Planning Commission – Role of National Development Council – Five Year Plans – Economic Policy – Agricultural and Industrial Development in India.

UNIT-IV : **Science and Technology in India:** Development – Nuclear Science – Space Research – Information Technology – Every day Science – Hygiene and Physiology.

UNIT-V : **Present day India and World:** Indian States – Census (2011) – Flag – Emblem – Indian Defense – Indian Labs – River Valley Projects - Art and Music – Awards in India and World – Sports – Major events in India and World – Who is Who – U.N.O

References:
1. Ashok Singh, Science and Technology, McGraw Hill Education India Pvt. Ltd, New Delhi, 2007.
2. Maniram Agarwal and Mohan K., *General Knowledge Digest and General Studies,* S.Chand & Company Ltd, New Delhi, 2014.
3. Madhav Khosla, The Indian Constitution, Jain Book Agencies, New Delhi, 2014.
4. M.V. Pylee, Our Constitution Government & Politics, Universal Law Publishing Co. Pvt. Ltd. Delhi, 2002.
5. Ramesh Singh, Indian Economy, Sixth Edition, McGraw Hill Education India Pvt. Ltd, New Delhi, 2015.
6. Kalpana Rajaram (ed), Development of Science and Technology, Spectrum Books Pvt. Ltd., New Delhi, 2014.
7. Year Books, Journals and News Paper: Manorama Year Book, General Studies, Competition Success Review, Science Today, India Today, News Papers, Current Affairs Quarterly issue, Made Easy Publication, General Knowledge Today, India's Daily E-Magazine etc.

BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.

Master of Human Resource Management (MHRM)

(Centre for Distance Education)

(For the candidates admitted from the academic year 2005-2006 onwards)

Scheme of Examinations - (Annual Pattern)

Year	Paper	Marks
I	Major Paper I – Principles of Human Resource Management	100
	Major Paper II – Organizational Behaviour	100
	Major Paper III – Counselling	100
	Major Paper IV – Industrial Relations and Labour Welfare	100
	Major Paper V – Human Resource Management	100
	Major Paper VI – Labour Legislation	100
II	Major Paper VII – Compensation Management	100
	Major Paper VIII – Organization Development	100
	Major Paper IX – Training and Development	100
	Major Paper X – Changing Management	100
	Major Paper XI – Performance Management	100
	Major Paper XII – Social and Organizational Psychology	100
	Project	100
		1300

PAPER I - PRINCIPLES OF HUMAN RESOURCE MANAGEMENT

Unit I

Human Resource Management – Definition – Objectives – Functions – Scope – HRM in India – Evolution of the concept – Environment of HRM – Measures to speed up growth – Human Resource planning.

Unit II

Career Planning Vs Manpower planning and succession planning – Career planning process – career development – concept of Job analysis – Process & Methods of Job analysis – Sources of Recruitment – Selection tests – Placement & Induction.

Unit III

Methods of Training – Principles of Executive development – concept of Objectives of Performance Appraisal – Appraisal of potential – Methods of Job evaluation – Wage & salary Administration – Employee welfare – Industrial Relations & Trade Unions – Employee Empowerment.

Unit IV

Evolution of management thought, Systems and contingency approach for understanding organizations, managerial process, functions, skills and roles in an organization; Social Responsibility of Business ; Communication, group decision making, Leadership.

Unit V

Understanding and Managing Individual behaviour – Personality, Perceptions, Values, Attitudes, Learning, Work Motivation, Individual decision making and problem solving; Understanding and managing group processes, Work stress.

Books for Reference

1.   Human Resource Management – Dr. C.B.Gupta – Sultan Chand & Sons.

2.   Human Resources & Personnel Management – K. Aswathappa – Tata McGraw Hill

3.   Personnel & Human Resource Management – P. Subba Rao – Himalaya Publishing

4.   Koontz, H and wechrich, H. Management, 10th ed., New York, McGraw Hill, 1995

5.   Luthans, F. Organizational Behaviour 7th ed., New York, McGraw Hill, 1995.

PAPER – II – ORGANIZATIONAL BEHAVIOUR

Objectives: The objectives of the course are:

1. To familiarize the participants with the behavioural patterns of human beings at individual and group levels in the context of an Organization, which in its turn is influenced by the environment enveloping it, so that.
2. The ability of the participants in the knowledge, Prediction and control of human behaviour in an Organization is enhanced.

Unit –I

History of Management Thought, Henri Faylos Principles of Management and Mintzberg's nature of managerial work.

Unit – II

Individual behaviour – personality: perception: learning, attitudes inter-personal behaviour – Group and inter-group behaviour.

Unit – III

Organization and the systems concept: Organization – theories: social Organization, Organizational rules; power authority and status. The Organization relation to its environment.

Unit – IV

Motivation and morale, leadership-nature, type and approaches, development of leadership including laboratory training and group dynamics.

Unit –V

Management of change: conflict Management. Organization Health, Development and Effectiveness. Management of culture, Cross Cultural Management.

SUGGESTED READINGS:

1. KASTAND ROSENZWEIG – Organization and Management.
2. KEITHDAVIS – Human Behaviour at work.
3. KAMALA CHOWDHRY & SUDHIR KAKKAR – Understanding Organization Behaviour.
4. ATHOD & COFFEY – Behaviour in Organizations.
5. HERSEY & BLANCHARD – Management of Organization Behaviour.
6. GIBSON & OTHERS – Organization – Structure Process and Behaviour.
7. EDGAR SCHEIN – Organization Psychology.
8. KATZ & KATHN – The Social Psychology of Organization.
9. ABRAHAM K KORMAN – Organizational Behaviour.

PAPER III – COUNSELLING

Unit I

Counselling – History of counselling – dimension of counseling – basics of counseling common criticisms - orientation models – problem focused models – work oriented models – welfare based models – organization change models - externally based models – internally based models.

Unit II

Multiple roles of counsellors – Counseling values Vs business values training for counsellors – ethical issues in counselling stress and counseling – impact of organizations – systematic approaches - organization culture different cultures and counseling.

Unit III

Preparation of counseling - assessing counseling - contracting for counseling – termination counseling - preparation of employee -assessment of employee- contracting / referring – engaging in counseling and termination counseling.

Unit IV

Training in ethical decision – making - making ethical decisions – ethical responsibilities for and to clients and organizational – employee counselors ethical responsibilities for and to themselves organizations ethical responsibilities.

UNIT V

Usefulness of evaluation – record keeping evaluation – formative and summative evaluation - different methods of counseling evaluation - counseling for improving performance.

REFERENCE BOOKS

1. Workplace counseling, Michael Carroll, Sage publications, 1999.

2. Introduction to counseling skills – texts and activities, Richarge welson – Jones, Sage publications, 2000.

3. Counseling and guidance – Narayanee, Rao, S. Tata Mc Graw Hill, 1992.

PAPER IV - INDUSTRIAL RELATIONS & LABOUR WELFARE

Unit I

Introduction to Labour Laws – Philosophy of Labour Law - Labour Law, Industrial Relations & Human Resource Management – Concept of Labour Law origin – objectives & classification of Labour Law.

Unit II

Industrial Relations Law: Industrial Disputes Act, 1947 – Trade Unions, Act – Industrial Employment (Standing orders) Act, 1946- Industrial Discipline & Misconduct – Procedure for taking Disciplinary action.

Unit III

The workmen's Compensation Act, 1923 – the employees' State Insmance Act, 1948- the employee provident fund Act, 1952 the payment of Gratuity Act 1972.

Unit IV

The Maternity Benefits Act, 1961 the Payment of Wages Act, 1948 The Payment of Bonus Act, 1966.

Unit V

The Factories Act, 1948 The Mines Act, 1952 – shops & Establishment Laws Plantation Labour Act 1951 – contract Labour (Regulation & Abolition) Act, 1986.

Boos for Reference:

1.   Elements of Industrial law – N.D. Kapoor – Sultan Chand & Sons.

2.   Industrial Organization Amridyasen – oxford, publications.

3.   Industrial law – Varma & Agarwal- Forward publishing co.

4.   Personal Management – Edwin b Flippo –Tata Mcgraw hill.

5.   Dynamics of Industrial Relations – Dr. c.B. Mamoria, Dr. Sathich Mamoria & S.C Gankar – Himalaya – publishing house.

PAPER V - HUMAN RESOURCE MANAGEMENT

Unit I

Introduction to Human Resource Management – Definition – Objectives **-** Functions – Scope – organization of HRM Department – Concept of HRD – Merger and Acquisition strategies in HRM – Job Analysis and Job Design.

Unit II

Human Resource Planning – HRP at different levels - Process of HRP – Sources and Techniques of Recruitment – Selection procedure – Tests – Interviews – Placement – Induction – Training & Development – Performance Appraisal – Career and succession planning.

Unit III

Wage &Salary Administration – Wage Boards & Pay Commissions – Wage Incentives – Bonus – Frieng Benefits – Types of Frienge Benefits – Employee Welfare – Safety & Healthy Measures – Grievance Procedure – Redresssal of Grievances.

Unit IV

Industrial Relations – Meaning & Characteristics of Industrial Relations – Parties to Industrial Relations – Nature of Trade Unions – Problems of Trade Union – Measures Strengthen Trade Union movement in India – Causes for Industrial Disputes – Settlement of Industrial Disputes.

Unit V

Collective Bargaining – Features – Pre – requisites of Collective Bargaining – Agreements at different levels – Collective Bargaining in India – Workers' participation in Management – Objectives - Forms of workers participation – Pre requisites for successful participation.

BOOKS FOR REFERENCE:

1. Human Resource Management – Dr. C.B. Gupta – Sultan Chand & Sons
2. Personnel & Human Resource Management – P. Subba Rao – Himalaya Publishing House
3. Human Resources & Personnel Management – K.Aswathappa – Tata McGraw Hill publishing Co. Ltd.
4. Personnel Management & Human Resources – C.S. Venkata Ratnam & B.K. Srivastava – TMPL.
5. Dynamics of Industrial Relations – Dr. C.B. Mamorio, Dr. Satish Mamoria & S.V. Gankar – Himalaya Publishing House.

PAPER VI - LABOUR LEGISLATION

Unit I

Introduction to Labour Legislation – Need for Labour Legislation – Constitutional framework of Labour Legislation – Objectives – Principles of State Policy – Labour Policy – Emerging issues & recent trends.

Unit II

Labour & Indian Constitution – Legislative powers of the Union & threats of Labour matters – Fundamental rights & directive principles of State policy – Labour Policy – Emerging issues & recent trends.

Unit III

International Labour Organisation – Objectives of the I.L.O. - Procedure for admission as a member – Structure of the I.L.O. – The Governing Body – The International & Labour Office – Finance of the I.L.O. – I.L.O. & Indian Labour Legislation.

Unit IV

The Factories Act, 1948 – The Employees' State Insurance Act, 1948 – Workmen's Compensation Act, 1923 – Payment of Wages Act, 1936 – Minimum Wages Act, 1936.

Unit V

Employees' Provident Fund Act, 1952 - The Payment of Gratuity Act, 1972 - The Industrial Disputes Act, 1947 - The Trade Unions Act, 1926.

BOOKS FOR REFERENCE:

1. Dynamics of Industrial Relations – Dr. C.B.Mamoria, Dr. Satish Mamoria & S.V. Gankar – Himalaya Publishing House.

2. Industrial Organisation – Anirdyasen – Oxford Publications

3. Industrial Relations & Labour Law – S.C. Srivasstaa – Vikas Publications.

4. Industrial Law – N.D. Kapoor – Sultan Chand & Sons

5. Personnel Management & Industrial Relations – Tripatho – Sultan Chand & Sons

6. Personnel Management – Edwin B. Flippo – Tata McGraw Hill.

PAPER VII - COMPENSATION MANAGEMENT

Unit I Introduction of compensation concepts & theories

Conceptual and theory related Compensation Management – Employees Satisfaction and Motivation issues in Compensation design – Establishing Internal, External and Individual equality.

Unit II Establishing pay variables & Incentives

Strategic importance of variable pay – Determination of Inter and Intra industry compensation differentials – Individual and Group Incentives.

Unit III Other Payments

Dearness Allowance – Emergence and Growth in India – Wage Incentive Plans for Blue-Collar workers and White-Collar workers – Incentives for Management Employees – Non-Monetary Incentives – Executive Compensation – Role of Fringe Benefits in reward systems

Unit IV Retirement Plans & Wage fixing Machineries

Retirement Plans including VRS/Golden Handshake Schemes – Scope and Role of Wage Boards and Pay Commission.

Unit V Collecting Bargaining and emerging trends

Issues in Indirect Compensation – Compensation systems in Multinational Companies and IT Companies including ESOP – Collective Bargaining system & Practice Strategies – Loan term Settlements and Productivity settlements. Tax implications – From employers point of view and employees point of view.

PAPER VIII - ORGANISATION DEVELOPMENT

Unit I

Organisation Development – Concept of OD – Nature & Scope of OD – Historical perspective of OD – Models & theories of planned change – Resistance to change – strategies for planning & implementing change.

Unit II

Managing the OD process : Diagnosis – Diagnostic practices – The Action Component – OD Interventions – The programme Management Component.

Unit III

OD Interventions – Effective Interventions – Overview of Interventions : Human Resource Interventions, Structural Interventions, Human Resource Management Interventions and strategic Interventions.

Unit IV

Key considerations & issues in OD : Issues in consultant – Client relationship – The future of OD - some Indian experience in OD.

Unit V

Implementation of OD – Assessment of OD – Utilisation & Application of Group work – Leadership for OD – HRD Applications – Learning processes in organization.

BOOKS FOR REFERENCE

1. Organisation Development – Behavioural Science & Innterventions for Organisation Improvement – Wendell L French & Cecil H Bell Jr. – PHI.
2. Organisational Behaviour – Robbins, Stephen – Hall India Pvt. Ltd.
3. Oranisation Development – Theory, Practice & Research – French Bell & Zawack – Universal Book Stall.
4. Organisation Development & Change – Thomas G. Cummings & Christopher G. Worley – Thoamsan South – Western.
5. Organisatin Development Intervention & Strategies S. Ramnarayan, T.V. Rao & Kuldeep Singh – Response Books.
6. Organisation Development It's Nature, origins & prospects – Waren G. Bennis.
7. The change Masters – Rosabeth Moss Kanter – Simon & Schaster.
8. Human Resource Development – Tripathi.
9. Organisational Behaviour – Luthans, Fred – Mc Graw Hill.

PAPER IX - TRAINING AND DEVELOPMENT

Unit I

Definition of Training – concept features – Significance role of training – Historical development of Training and Development - applying training to organizational effectiveness.

Unit II

Learning : Basic concepts - components of learning – Principles of Learning – Learning Theory - reinforcement Principle – Steps in Learning – E – Learning and technology.

Unit III

Training methods – Lecture Methods, Audio – Visual Aids, using films in Training – Programmed learning – Discussion Methods, Case Methods, Role play, Business, Games, In – Basket Exercises, Field Training – Techniques for Training.

Unit IV

Training Process – Assessing Training needs – Designing Training Programme – Preparation of Trainees – Implementation of Training – Evaluating Training and Development – Follow up Training.

Unit V

Career Development : Concepts – Stages - Career Development Programme – Executive development Programme – Executive development – Objective, Process - Employee development – Career Management – Computers in Training and Development – Emerging trends and Future Prospects in Training and Development.

REFERENCE :

1. Effectiveness Training – Systems, Strategies and Practices – P Nick Blanchard & James W. Thacker C 2nd Edition Pearson Education 2004.

2. Diagnosing Management Training and Development Needs concepts and Techniques – Milankuber and Joseph Prokopenko international Labour organization 1989 – Oxford and IBH Publishing Co.

3. Training Instruments for Human Resource Development - Udai Pareek (TMH).

4. Personnel Management and Industrial Relations – N.G. Nair, Latha Nair – s. chand Company Ltd., New Delhi C 1999).

PAPER X - CHANGING MANAGEMENT

Unit I

Basics of Change Management : Meaning, Nature and Types of Change – Change Programmes – Need for Change Management – Change as growth – Models of Organizational change – role of Human Resources in change Management.

Unit II

Process of Planned change – Responses to change - Resistance to change: Factors in Resistance to change - overcoming Resistance to change - change agents: role of change Agents, Key factors in Effective change Management.

Unit III

Tools for change – Force Field Analysis – TROPICS test approaches to managing organizational change : Lewin's three Step Model.

Unit IV

System approach to change systems autonomy and behavior the inventions Strategy model – cases in intervention – Total Project Management Model (TPMM).

Unit V

Change Management in Indian Context – Case Studies.

SUGGESTED READINGS:

1.Management of organizational Change K. Harogopal – Sage publications.

2.Competence and Organizational change – Hiry Fletcher – Kega Page.

3.Change Management: A Guide to effectiveness Implementation Robert Pattern – Sage Publications.

PAPER XI - PERFORMANCE MANAGEMENT

Unit I

Introduction – Definition, Concerns and Scope – Historical developments in Performance Management - Process for Managing Performance – Essence and implications of Performance Management – Critical appraisal Performance Management - Performance Management Vs Human Resource Management – Application of theories of motivation at workplace.

Unit II

Performance appraisal process – Methods for appraisal - Techniques of performance appraisal – Performance Feedback Interview - Performance appraisals and HR decisions - Problems of performance appraisal remedies.

Unit III

Monitoring and mentoring : Introduction - supervision – objectives and principles of Monitoring Process – Periodic reviews - problems solving - role efficacy.

Unit IV

Communication and Training in establishment and maintenance by performance Management system – Role of Leadership and changes in organizational effectiveness - Performance Management skills - Performance Management concepts to individual, Group and organization situations.

Unit V

High Performing Teams : Building and leading high performing Teams – Team oriented organizations – developing and Leading high performing teams - strategies for improving workplace productivity and performance – relationship between job satisfaction, organizational culture and other workplace variables.

REFERENCE

1.   T.V. Rao, Appraising and developing Managerial Performance, TV Rao Learning systems Pvt., Limited Excel Books, 2003.
2.   Prem Chadha : Performance Management, Macmillan India, New Delhi, 2003.
3.   "Performance Management : Concepts and skills and Exercises " by cardy Robert (PHI).
4.   Mamoria , C.B, : Personal management : Management of Human Resource, Mumbai, Himalaya Publishing House C1991).

PAPER XII - SOCIAL AND ORGANIZATIONAL PSYCHOLOGY

Unit I

Defining Social Psychology – History of Social Psychology - Methods of Social Psychology – Social Systems Behaviors and Attitudes – Value systems – Cultural Influence.

UNIT II

Introduction of organizational Psychology and its Basic concepts – Developing and Resolving Conflict – use of Threat – concern with Appearance – Trust and Distrust – Resolving Conflict – Value of Conflict.

UNIT III

Organization Structure – Common organizational Designs - new Design options Difference in Structure – Organization design and employee behavior – Organization value systems.

UNIT IV

Managing Assumptions and Strategies – Motivation Theories – Attitudes and Job Satisfaction – Morale and Monotony.

UNIT V

Groups and Group work – Group Dynamics – Processes – Group Effectiveness on the Individual - Group Influence on Individual Decisions – De Individuation : Getting lost in the Group.

REFERENCE BOOKS:

1.   Social Psychology by David Mers – Mc Graw Hill Publications.
2.   Psychology and Bernstein, Roy Srull and wickens – Houghton Mifflin Co.
3.   Understanding social Psychology – Worchel, Cooper and Goethals Brooks/ cole Publishing company.
4.   Industrial Psychology – P.K. Ghosh, M.B. Ghorpade Himalaya Publishing House.
5.   Work Psychology – John Arnold, Iran T. Robertson, Cary . copper Macmillan India Ltd.,

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Paper I - INDIAN PHILOSOPHY

Unit 1: a) Vedas – Naturalistic Polytheism, Henotheism, Monotheism, Monism
   b) Upanisads – Central Teachings of Upanisads – Brahman and Atman – World.
   c) Bhagavadgita – Karma Yoga – Bhakti Yoga – Jnana Yoga.

Unit 2: a) Theories of Causation – Nyaya, Sankhya and Advaita – A Critical Estimate.
   b) Theory of Evolution of the World – The Atomism of Nyaya, Vaisesika and Evolutionism of Sankhya.
   c) Theories of God – Nyaya, Sankhya and Yoga.

Unit 3: a) The Eight-fold path of Yoga system.

   b) The Eight-fold path of Buddhism – Nirvana.
   c) The Tri-Ratna theory of Jainism, The Metaphysical Views of Buddhism and Jainism – Reality and Self.
   d) A critical survey of Materialism.

Unit 4: a) Authority of the Vedas – Rituals – Purva Mimamsa.
   b) Vedanta – Reality – World – Soul – Release – Advaita, Visistadvaita and Dvaita Views.

Unit 5: Theories of Truth and Error (Khyativada) – A Critical Estimate.

BOOKS FOR REFERENCE:

1. Dasgupta, S.N., *A History of Philosophy* vols.I – V, MLBD, New Delhi.
2. Datta, D.M., & Chaterjee, S.C., *Introduction to Indian Philosophy*, Calcutta University Press, Calcutta, 1960.
3. Hiriyanna, M., *Outlines of Indian Philosophy*, George Allen and Unwin(India), 1973.
4. Hiriyanna, M., *Essentials of Indian Philosophy*, MLBD, New Delhi.
5. Mahadevan, T.M.P., *An Invitation to Indian Philosophy*, Arnold-Heinemann Publishers (India) Private Ltd., 1974.
6. Radhakrishnan, S., (ed.,) *History of Philosophy Eastern and Western*, vol. II, George Allen and Unwin Ltd., 1953.
7. Radhakrishnan, S., *Indian Philosophy*, Vols. I & II, George Allen and Unwin Ltd., 1966.
8. Sharma, C.D., *A Critical Survey of Indian Philosophy*, MLBD, New Delhi, 1976.

Paper II - WESTERN PHILOSOPHY

Unit 1: **GREEK PHILOSOPHY** -
    a) Socrates : His Problem, Method and Ethics.
    b) Plato: Theory of Ideas – Ethics – Politics.
    c) Aristotle: Metaphysics – Four Causes – Ethics.

Unit 2: **MEDIEVAL PHILOSOPHY** -
    a) St. Augustine: Theology – Evil – Ethics.
    b) St. Anselm: Proofs for the existence of God.
    c) St. Thomas Aquinas: Theology – Metaphysics – Ethics.

Unit 3: **RATIONALISM** -
    a) Descartes: Method – Proofs for the Existence of God – Substance – Mind–Body relation.
    b) Spinoza : Substance – Attributes of God – Modes – Psycho-physical Parallelism.
    c) Leibnitz: Monads – God – Pre-established Harmony – Best of all possible worlds.

Unit 4: **EMPIRICISM** -
    a) Locke : Rejection of Innate Ideas – Origin of Knowledge – Substance.
    b) Berkeley: Esse est percipi – Substance – God
    c) Hume: Rejection of Substances – Relation of Cause and Effect – Scepticism

Unit 5: a) Immanuel Kant: Copernicus Revolution – Synthesis of Empiricism and Rationalism
    b) Hegel : Absolute Idealism – Dialectical Method

BOOKS FOR REFERENCE

1. Frederick Copleston, S.J., A History of Philosophy, Vol. I to IX, Image Books, New York, 1985.
2. Fuller & Mcmurrin, *A History of Philosophy*, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1989
3. Jones, W.T... *A History of Western Philosophy*, Harcourt, Brace and World, Inc., New York, 1952 .
4. Masih, Y., *A Critical History of Western Philosophy*, MLBD, New Delhi, 1999.
5. Radhakrishnan, S., *A History of Philosophy Eastern and Western* vol. II, George Allen and Unwin Ltd., London, 1953.
6. Russell Bertrand, *A History of Western Philosophy*, George Allen and Unwin Ltd., London, 1946.
7. Thilly, F., *A History of Philosophy*, Central Book Depot, Allahabad, 1973. New York, 1985.
8. Will Durant, The Story of Philosophy, Ernest Benn Ltd., London, 1929.

Paper III - LOGIC AND SCIENTIFIC METHOD

Unit 1: Definition , Meaning, Nature and Scope of Logic — The Divisions of Logic — Nature of Science and Scientific Methods.

Unit 2: Words — Terms — Propositions — Four-fold Classification of Propositions

Unit 3: Inferences — Immediate Inferences — Opposition of Propositions — Eduction — Mediate Inferences — Categorical Syllogism — Hypothetical Syllogism — Disjunctive Syllogism — Fallacies.

Unit 4: Induction — Postulates of Induction — Types of Induction — Enumerative and Scientific Methods — Analogy — Sound and Unsound Analogy.
Hypothesis — Importance of Hypotheses — Verification and Proof of Hypothesis — Conditions of a Good Hypothesis — Hypothesis Distinguished from Fact, Theory and Law — False and Barren Hypothesis — Stages of Scientific Induction.

Unit 5: Observation and Experiment — The Material Grounds of Induction — Advantages of Observation and Experiment — Fallacies of Observation.

BOOKS FOR REFERENCE:

1. Basanthani, K.T., Introduction to Logic,
2. Bholanath Roy, Textbook of Deductive Logic, University of Calcutta, Calcutta, 1945.
3. Bholanath Roy, Textbook of Inductive Logic, University of Calcutta, Calcutta, 1945.
4. Cohen and Nagel, An Introduction to Logic and Scientific Method, Allied Publishers, Delhi, 1972.
5. Ganapathy, T.N., An Invitation to Logic, K.C. Desikan & Co., Booksellers and Publishers, Madras, 1973.
6. Morris R. Cohen and Ernest Nagal, An Introduction to Logic and Scientific Methods, Routledge and Kegan Paul Ltd., London, 1934.
7. Nandita Bandyopadhyay, The Concept of Logical Fallacies, Sri Hyamapada Battacharya, Calcutta, 1977.

Paper IV - ETHICS

Unit 1: Introduction — Nature and Scope of Ethics — The Relation of Ethics to Sociology, Politics.

Unit 2: Hedonism of J.Bentham and Utilitarianism of J.S.Mill
b) Ethical Theories of T.H.Green and F.H.Bradley .
c) Marxian Ethics
d) Ethics of Kant

Unit 3: a) Values — The Concept of Values — Intrinsic and Extrinsic Values — Classification of Values.
b) Rights and Duties
c) Moral Problems — Dowry, Divorce, Widow Remarriage, Conversion, Corruption, Abortion and Defection.
d) Theories of Punishment

Unit 4: Dharma — Varnashrama Dharma — Law of Karma – Prarabdhakarma – Sancitakarma – Agamikarma — Virtues – Truthfulness – Non-killing – Non-stealing – Celibacy – Non-attachment – Fearlessness.

Unit 5: Professional Ethics – Value and Function – Morals, Law – Distinction between Profession and Business. Medical and Legal Ethics – Ethics for Teachers and Students.

BOOKS FOR REFERENCE:

1. Balbir Singh, Principles of Ethics, S.Nahin & Co.,Delhi, 1971.
2. Hrian, Fundamentals of Ethics
3. Hill, T.E., Contemporary Ethical Theories
4. Mackenzie, Manual of Ethics
5. Srinivasacari, P.N., The Ethics of Gita
6. William Lillee, An Introduction to Ethics, Allied Publishers Ltd., Delhi, 1990.

Paper V - COMPARATIVE RELIGION

Unit 1: Comparative Religion – Definition, Nature, Scope and Objectives.

Unit 2: God and World in Hinduism, Islam, Christianity, Zoroastrianism, Judaism, Sikhism. :

Unit 3: Man in Hinduism, Islam, Christianity, Zoroastrianism, Judaism, Sikhism.

Unit 4: Evil and Suffering – Hinduism, Islam, Christianity, Zoroastrianism, Judaism, Sikhism.

Unit 5: Ethical Disciplines – Hinduism, Islam, Christianity, Zoroastrianism, Judaism, Sikhism.

BOOKS FOR REFERENCE:

1. Bouquet, A.C., Comparative Religion, Penguin Book, 1991.
2. Radhakrishnan, S., Indian Religions, Delhi Vision Books, 1985.
3. ...., East & West:Some Reflections, Allen & Unwin, London, 1955.
4. ...., Eastern Religion & Western Thought, DUP Delhi, 1984.
5. Tiwari, K.N., Comparative Religion, MLBD, Delhi, 1997.

Paper VI - CONTEMPORARY INDIAN PHILOSOPHY

Unit 1: General Characteristics of Modern Indian Philosophy – Religious Reform Movements – Arya Samaj and Brahma Samaj - Swami Vivekananda – Practical Vedanta – On Education Harmony of Religions.

Unit 2: Sri Aurobindo – The Integral Method – The Two Negations – Absolute – Involution and Evolution – Inconscient – Life – Mind – Supermind – Intuition – Caityapurusa – Gnostic Being – Maya – The Divine Life .

Unit 3: St. Ramalingar – A Social Reformer –Anmaneya Orumaippadu – Concept of Universal Religion – Embodied Immortality.

Unit 4: S.Radhakrishnan – Idealism – The Modern Challenges to Religion – Substitute for Religion – Religious Affirmation - Intuition and Intellect – Absolute – Maya – Individual.

Unit 5: Babasaheb Ambedkar – Views on Casteism – Self-respect – Religion and Morality – Democracy – Social Philosophy.

BOOKS FOR REFERENCE:

1. Aurobindo, Life Divine, The Sri Aurobindo Library, New York, 1949.
2. Basant Kumar Lal, Contemporary Indian Philosophy, MLBD., Delhi, 1987.
3. Bhattacharya, K.C., Studies in Philosophy
4. Datta, D.M., Chief Currents of Contemporary Philosophy, University of Calcutta, Calcutta, 1961.
5. Maitra, S.K., Introduction to Philosophy of Aurobindo
6. Mahadevan, T.M.P., & Saroja, Contemporary Indian Philosophy.
7. Naravane, V.S., Modern Indian Thought, Asia Publishing House, Bombay, 1964.Ramalingar, Thiru Arutpa
8. Radhakrishnan,S., An Idealistic View of Life
9. ---------------------, Recovery of Faith
10. Sharma, D.S., Hinduism Through Ages, Bharatiya Vidya Bhavan, Bombay, 1962.
11. Swamy Vivekananda, Complete Works, Vols. I-VIII, Advaita Asram, Calcutta, 1986.
12. Srivatsava, R.P., Contemporary Indian Idealism, MLBD., Delhi, 1973.
13. Prasad, R.C. Ambedkarism, MLBD, New Delhi, 1993.
14. Prem Prakash, Ambedkar- Politics and Scheduled Caste, Asish Publishers, New Delhi, 1993.

Paper VII - SAIVISM

Unit 1: Saivism — Characteristic features of Saivism- Different Schools of Saivism

Unit 2: Kasmir Saivism – The Absolute and Manifetations – Sakti – Self – Bondage and Liberation.

Unit 3: Sivadvaita of Srikantha – Brahman and the World – Jiva – Maya – Release –Means – Nature

Unit 4: Vira Saivism – History and Literature of ViraSaivism – Conception of God – Linga, Bhakti, Soul, Satsthla – Ethics

Unit 5: Saivasiddhanta –Pati, Pasu and Pasa – Bondage and Liberation.

BOOKS FOR REFEREVCE

1. Suryanarayana Sastri, S.S, Sivadvaita of Srikantha
2. Malladeve Virasaivism
3. Nandimath,S.C A Hand book of Virasaivism
4. Bhandarkar, R.G, Vaisnavism,Saivism and other minor Religions
5. Dasgupta, S.N., A history of Indian Philososphy Vol V
6. S.Radhakrishnan, S., Indian Philosophy (relevant portions only)
7. Baskaran, N., Umapathy Sivachariyarin Tiruvarutpayan (Tamil), University of Madras, Chennai, 1994.
8. Devasenapathi, V.A., Saiva Siddhanta as expounded in the Sivajnana Siddhiyar and Its six commentaries, University of Madras Publication
9. Pandey, K.C., An Outline of History of Saiva Philosophy, MLBD., Delhi, 1986.
10. Pandit, B.N., Dr., History of Kashmir Saivism, Utpal Publications, Kashmir, 1990.
11. Violet Paranjothi, Saiva Siddhanta, Christian Literature Society, Madras.

Paper VIII - POLITICAL PHILOSOPHY

Unit 1: Nature and Scope of Political Philosophy – State – Definition and characteristics of State – Theories of the Origin of State – Social contract theories of Thomas Hobbes, Locke and Rousseau.

Unit 2: Plato – The Ideal State — Aristotle – Nature and End of State. Sovereignty – Monistic and Pluralistic Theories –Laski's views.

Unit 3: Rights – Definition - Kinds of Rights – Theories of Rights. Liberty – Definition – Kinds – Liberty and Equality –Equality and Law.

Unit 4: Political Ideologies – Socialism, Syndicalism, Fascism and Communism

Unit 5: Democracy – Characteristics – Merits and Demerits – Internationalism – World Government and UNO.

BOOKS FOR REFERENCE:

1. Sabuine – History of Poliical theory
2. George Catlin – History of Political Philosophors
3. Rober h.Murray – The History of Political Science
4. B.R.Bhandari – History of European Political Philosophy
5. H.J.Laski – Grammar of Politics
6. ---------- -- The State in Theory andPractice
7. Francis w.w Goksi - Recent Political Philosophers
8 . Barkar,E – Principles of Social and Political Theory

Paper IX - GANDHIAN PHILOSOPHY

Unit 1: Gandhiji's Idealism – God – Man – World

Unit 2: Man and Society – Bread Labour – Svadesi – Removal of
Untouchability – Sarvodaya

Unit 3: Ethical Principles – Ahimsa – Satya – Asteya – Brahmacarya –
Aparigraha – Fearlessness – Self-purification – Anasakta Karma–
Rebirth and Immortality – Problems of Evil and Freedom of Will.

Unit 4: Religion – Man's Religious Prayers – Rama nama – Unity of Religions –
Tolerance –Religion and Politics.

Unit 5: Man's Destiny – God is Truth and Truth is God - Satyagraha –
Ahimsa as means to destiny – Moksa (Liberation)

BOOKS FOR REFERENCE:

1. Gandhi, M.K., Non-violence in War & Peace, 2 vols. Navajeevan
   Publications, Ahamedabad.
2. Horsburg, H.J.N., Non-violence and Aggression,
3. Kantilal Shah, Vinoba on Gandhi, Ch.9 & 10,
4. Mahadevan, T.K., Truth and Non-violence, Gandhi Peace Foundation,
   Delhi.
5. Richard B. Gregg, The Power of Non-violence, Navajeevan Publications,
6. Theo P. Lentz, Towards a Science of Peace,
7. Yogendra Singh, Traditions of Non-violence,
8. Devadoss, T.S., Philosophy of Sarvodaya, University of Madras,

10

ELECTIVE: PHILOSOPHY OF YOGA

Unit 1: History of Yoga – Indus Valley Civilization – Vedas, Upanisads, Bhagavadgita, Tantras, Buddha and Jain Literatures, Tamil Siddhas, Tirumular's Tirumantiram – Modern Trends in Yoga.

Unit 2: Nature, Scope and Aim of Yoga – Various Systems of Yoga – Astanga Yoga, Hatha Yoga, Tantra Yoga, Mantra Yoga, Laya Yoga, Kundalini Yoga, Raja Yoga, Karma Yoga, Bhakti Yoga, Jnana Yoga –
A General Survey of Patanjali Yogasutra.

Unit 2: Yoga Psychology – Modifications of Citta – Five Kinds of Modifications – Mind and Body relation to Self.

Unit 3: Asanas – Importance and Utility –
  a) Standing Postures – Ardhakati Cakrasana, Katicakrasana, Padahastasana, Trikonasana, Parivrtta Trikonasana, Parsvakonasana, Vrksasana.

  b) Sitting Postures – Padmasana, Vajrasana, Pascimottanasana, Vakrasana, Matsyendrasana, Baddhakonasana, Yogamudra.

  c) Lying Postures – Bhujangasana, Salabhasana, Dhanurasana, Cakrasana, Sarvangasana, Halasana, Matsyasana, Savasana or Santi asana.

Unit 4: Pranayama – Kinds of Pranayama – Satkriyas – Mudras – Cinmudra, Adimudra, Brahmamudra, Sanmukhimudra, Viparitakaranimudra – Bandhas – Jalandara, Uddiyana, Mula and Maha Bandhas – Meditation,Siddhis and its Classification.

Unit 5: Health Disorders and Yoga Treatment – Physiological, Psychological and Ecological Causes for Health Disorders – Major Health Disorders – Asthma – Arthritis – Sinusitis – Spondulitis – Ulcers – Hypertension – Nervousness – Diabetes – Yogic Treatment of Disorders.

BOOKS FOR REFERENCE:
  1. Andiappan, R., Arokya Vazhvu (Tamil), Bharati Publishers, Chennai, 1995.

2. Dasgupta, Yoga Philosophy, MLBD, New Delhi

3. Iyengar, B.K.S., Light on the Yoga Sutras of Patanjali, Harper Collins Publishers India, New Delhi, 1993.

4. ...., Light on Yoga,

5. Joshi, K.S., Yoga and Nature Cure Therapy, Sterling Publishers, New Delhi, 1993.

6. Swami Prabhavananda, Patanjali Yoga Sutras, Ramakrishna Math, Chennai, 1953.

7. Swami Satyananda Saraswati, Asana Pranayama Mudra Bandha, Yoga Publishing Trust, Munger, Bihar, 1996.

8. Swami Abhedananda, Yoga Psychology, R.K.Vedanta Publishers, Chennai.

9. Swami Satyananda saraswathi, Meditations, Monghyr, Bihar Schools of Yoga, 1987

BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI 620 024
Master of Social Work (MSW) Programme under CBCS
(Applicable to the candidates admitted from the academic year 2016-2017 onwards)

Semester	Course details	Course Code	Course title	Inst. Hrs/ Week	Credits	Exam Hrs.	Marks		
							CIA	UE	Total
I	Core Course-I	CC-I	Introduction to Social Work and Society	6	4	3	25	75	100
	Core Course-II	CC-II	Social Case Work	6	4	3	25	75	100
	Core Course-III	CC-III	Social Group Work	6	4	3	25	75	100
	Core Course-IV	CC-IV	Field Work Practice	6	4	3	40	60	100
	Elective Course I	EC-I	Counselling: Theory and Practice	6	4	3	25	75	100
			Total	**30**	**20**				**500**
II	Core Course-V	CC-V	Community Organisation and Social Action	6	5	3	25	75	100
	Core Course-VI	CC-VI	Social Work Research and Social Statistics	6	5	3	25	75	100
	Core Course-VII	CC-VII	Human Growth and Personality Development	6	5	3	25	75	100
	Core Course- VIII	CC -VIII	Field Work Practice	6	5	3	40	60	100
	Elective Course -II	EC-II	Human Resource Management	6	4	3	25	75	100
			Total	**30**	**24**				**500**
III	Core Course-IX	CC-IX	Social Welfare Administration, Social Policies, and Social Legislations	6	5	3	25	75	100
	Core Course-X	CC-X	Specialisation – I*	6	5	3	25	75	100
	Core Course-XI	CC-XI	Specialisation – II*	6	5	3	25	75	100
	Core Course-XII	CC-XII	Field Work Practice	6	5	3	40	60	100
	Elective Course-III	EC-III	Corporate Social Responsibility	6	4	3	25	75	100
			Total	**30**	**24**				**500**
IV	Core Course-XIII	CC-XIII	Specialisation – III*	5	5	3	25	75	100
	Core Course-XIV	CC-XIV	Field Work Practice	5	5	3	40	60	100
	Elective Course-IV	EC-IV	Disaster Management	5	4	3	25	75	100
	Elective Course-V	EC-V	Block Placement (Internship)	5	4	3	40	60	100
	Research Project	RPW	Research Project Work	10	4	3	Evaluation 80 Viva 20		100
			Total	**30**	**22**				**500**
			GRAND TOTAL		**90**				**2000**

* SPECIALISATIONS

A.   COMMUNITY DEVELOPMENT

Specialisation Paper	Course Number	Course Code	Course Title
Specialisation Paper I	Core Course-X	CC-X a	Rural Community Development
Specialisation Paper II	Core Course-XI	CC-XI a	Tribal Community Development and Project Management
Specialisation Paper III	Core Course-XIII	CC-XIII a	Urban Community Development

B. MEDICAL AND PSYCHIATRIC SOCIAL WORK

Specialisation Paper	Course Number	Course Code	Course Title
Specialisation Paper I	Core Course-X	CC-X b	Community Health
Specialisation Paper II	Core Course-XI	CC-XI b	Medical Social Work
Specialisation Paper III	Core Course-XIII	CC-XIII b	Psychiatric Social work

C. FAMILY AND CHILD WELFARE

Specialisation Paper	Course Number	Course Code	Course Title
Specialisation Paper I	Core Course-X	CC-X c	Women and Child Welfare
Specialisation Paper II	Core Course-XI	CC-XI c	Welfare of the Youth and Aged
Specialisation Paper III	Core Course-XIII	CC-XIII c	Demography and Family Welfare

D. HUMAN RESOURCE MANAGEMENT (HRM)

Specialisation Paper	Course Number	Course Code	Course Title
Specialisation Paper I	Core Course-X	CC-X d	Human Resource Development
Specialisation Paper II	Core Course-XI	CC-XI d	Labour Welfare and Industrial Relations
Specialisation Paper III	Core Course-XIII	CC-XIII d	Organisational Behaviour

12. Work Load: The equating formula for the work load of social work teachers shall be as follows:

One   hour of P.G. lecture   : 1 ½

Field Work (including field supervision)
Correction of field work report and   : 1 ½   hours per week per student
Individual & Group Conferences

Research Thesis/Dissertation (Project Report)   : 2 hours per week per student
Guidance and Supervision

Continuous Internal assessment (including tests,
QP setting, and valuation, assignment   : 2 hours per week per student
correction, seminar supervision, etc,)

Course Title: INTRODUCTION TO SOCIAL WORK AND SOCIETY

Semester No   :   I
Core Course   :   I
Course Code   :   CC-I

Introduction:
This course aims at introducing the learners to the critical enquiry of the history and ideologies concerning Social Work and to help the learners to understand fundamental objectives of social work profession, its values, and ethics as linked to contemporary ideology for social change.

Objectives:
1.   To develop an insight into the historical context of origin and development of social work profession.
2.   To impart social and religious ideologies of India for ensuring change.
3.   To cultivate an understanding of the theoretical framework of the subject.
4.   To imbibe an idea about the social structure and social problems.
5.   To infuse a philosophical foundation and value base of social work profession.

 I. Social Work: Concept, Definition, and Historical development of Social Work in UK, USA, and India; Concepts: Social Service, Social welfare, Social Security, Social Defense, Social Justice, Social Development, and Social Reform. **Socio-religious thoughts of India:** Hinduism – four values, Buddhism, Jainism, Sikhism, Christianity- Supreme value of man, concept of love and service, and Christian missions; Islamism: Basic beliefs, values; Islamic religion and cultural system; **Social Reform movements** in India- its impacts and role of Brahma Samaj, Ariya Samaj, Prarthana Samaj, Ramakrishna mission, Theosophical society, Bakthi movements, and D.K. Movement.

II. Social Work as a Profession: Nature and scope, objectives; philosophy and principles, functions, values and ethics. Social work education: as a profession, professional values, training; skills, tools and techniques, professional social work and voluntary social work, professional associations in social work; problems faced by social work professionals in India.

III. Methods of Social Work: Social case work – social group work – community organisation – social work research – social welfare administration – social action – field of social work: family and child welfare, women welfare, youth welfare, community development (rural, urban & tribal), medical and psychiatric social work, correctional social work, and labour welfare.

IV. Theories & Approaches (basic/overview only): Role theory, problem solving theory, and gestalt theory. systems theory, ecological theory, communication theory, existential approach, radical and Marxist perspective of social work, feminist approach; relevance and scope of eclectic/integrated approach to social work practice, role of social worker in remedial, preventive, and developmental models and as an instrument of change and development; modern Indian social thoughts of: Vivekananda, Aurobindo, Tagore, Gandhi, Ambedkar and EVR Periyar.

V. Concept of Society: Community association, institution, social groups, culture and its elements, social stratification, social processes, social change – social movements and social control; concept of urbanisation, industrialisation, modernisation – social disorganisation – social institutions – family, marriage, religion, economic, educational, and political institutions. Social movements: tribal, women liberation, Telangana, SNDP movement, and Naxalbari movement (salient features like reason, leadership, and its effects on the society)

References:

Albrecht, Gary L. Encyclopedia of Disability (4 Volumes), Sage , Oaks. 2006

Banks, Sara (1995) Ethics and Values in Social Work: Practical Social Work Series, Macmillan, London.

Bhushan,Vidya & Sachdeva, D.R. An Introduction to sociology, Kitalmahal, Allahabad. 1995

Chowdhry, Dharam Paul. *Introduction to Social Work: History, Concept, Methods, and Fields*. Atma Ram, 1964.

Congress, E.P. Social Work Values and Ethics, Nelson-Hall, Chicago, 1998

Desai,M. Curriculum Development on History of Ideologies for Social Change and Social Work, TISS, Mumbai. 2000

Fink A.E. The fields of social work, Henry Hold, New York. 1974.

Fried Lander, A.W. Introduction to social work, Prentice Hall, New Jersey, 1974

Gangrade, K.D. Dimensions of Social Work in India, Marwah, New Delhi, 1976

Hans Nappaul. *The study of Indian Society.* S.Chand & Co, 1972.

Jacob K.K. Social Work Education in India (ed), Himanshu pub .New Delhi.1994

Jacob, K. K. *Social Work Education in India:(retrospect and Prospect)*. Himanshu Publications, 1994.
Kinduha, S.K. Social work in India, Sarvodaya Sahitya Samaj, Rajasthan, 1965

Payne, Malcom. Modern Social Work Theory: a critical introduction, Macmillan, Hound mills, 1991.

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Srinivas, Mysore Narasimhachar. "Caste in modern India and other essays."*Caste in modern India and other essays*.1962.

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Course Title: SOCIAL CASE WORK

Semester No   :   I
Core Course   :   II
Course Code   :   CC - II

Introduction:
This course aims to develop simple to complex skills of working with individuals and families in various situations (like crisis, preventive, and developmental) and settings.

Objectives:
1. To understand case work as method of Social Work and to understand values and principles of working with individuals and families.
2. To develop the ability to critically analyse problems of individuals and families and factors affecting them.
3. To enhance the understanding of the basic concepts, tools, and techniques in working with individuals and families in problem solving and in developmental work.
4. Develop appropriate skills and attitudes to work with individuals and families.
5. Develop the ability to reflect on 'self' as person and grow as a professional social worker

I. Case Work: Concepts, objectives/purpose/its importance; nature and scope, historical development; components; values and principles of case work practice; socio-cultural factors affecting the case work practice in India; relationship with other methods of social work, and skills in social case work.

II. Case work process:
Intake: meaning, steps, referral- types, and stages. **Study:** Meaning, tools used/procedure followed in the study process: interviewing: types, purpose, skills, techniques, and principles of interviewing; home visits & reaching out, collateral contacts & relationship. **Assessment:** Social Diagnosis: meaning, types, and models. **Treatment/Intervention:** meaning, objectives, goals and goals setting & treatment planning, principles, models, types, and techniques (supportive/environmental manipulation, reflective/ practical help or material help & direct treatment/ counselling). **Evaluation:** meaning, purpose/objectives, types, methods/techniques/instruments, difference between appraisal, monitoring, and evaluation; **Termination**: meaning, reaction to termination, decision to terminate, and planning for termination. **Follow-up**- meaning, purpose, and types.

III. Case Worker-Client Relationship: meaning, purpose/needs/significance, and elements/components; characteristics of professional relationship: empathy, transference and counter transference, resistance, sustaining the relationship, non-possessive warmth, genuineness and self-disclosure; principles of client-worker relationship; obstacles in client worker relationship. **Case Work and Communication:** meaning, purpose, importance, principles, elements in communication process, types, importance of listening, observing and feedback, communication barriers and ways to overcome them; importance of interpersonal communication in case work.

IV. Approaches to Practice: psychosocial, problem solving, crisis intervention; behaviour modification, functional and development of an eclectic model for practice. **Recording in Case Work**: meaning, sources and types-process record- person oriented and problem oriented records and its components; summative record, etc; principles of recording, uses, and maintenance of record.

V. Application of Social Case Work in different settings & Clientele groups: medical and psychiatric settings- mentally retarded shelter homes; mental rehabilitation center, de-addiction

and detoxification centers, mental health & community based rehabilitation, role of social workers in hospital settings, family and child welfare settings: family, child guidance clinic, schools, geriatric care & aged and the terminally ill; case work practice in community settings including self-help groups, industries and correctional institutions; problems and limitations and role of case worker in various settings; professional self; conflict and dilemmas in working with individuals and family.

References:
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Smalley, Ruth Elizabeth. *Theory for social work practice*. New York: Columbia University Press, 1967.

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Course Title: SOCIAL GROUP WORK

Semester No   :   I
Core Course   :   III
Course Code   :   CC - III

Introduction:
This course aims at developing the understanding of group work as a method, developing skills for intervention and gaining knowledge of the scope of this method in various settings

Objectives:
1. Appreciate the importance of groups in the life of an individual and develop awareness about the specific characteristics of group work and its contributions as a method of social work intervention.
2. To gain knowledge about group formation and use of a variety of group approaches and to understand concepts, dynamics, and models.
3. To develop knowledge of the principles, skills, and techniques to be used by the social worker in group.
4. To develop a beginning awareness of the various programme media and skills of programme planning.
5. To identify the various situations and settings where the method could be used in the context of social realities of the country.
6.

I. **a. Social group:** definition, characteristics, types of groups-social group and social group work group; and functions of a group. **b. Phases of group formation:** forming, storming, norming, performing, adjourning, mourning/grieving, basic human needs met by groups at different stages of group development and group goals. **c. Group process:** bond, acceptance, isolation, rejection, sub-group formation, and newcomers in the group, expectation, withdrawal, behaviour contagion, conflict and control; classification of group process: basic, structural, locomotive, and molar. **d. Group dynamics**-meaning, definition, functions, and basic assumptions of group dynamics.

II. a. Social group work: concepts-assumptions, purpose, goals, principles, and values of group work, and historical development of group work; group work as a method of social work and its relation to other methods of social work. **b. Group work process:** Intake and study: selection of members, composing group, orienting the members, preparing the environment, goal setting, motivation, use of home visits, and collateral contacts. **c. Assessment**- preparing for group work, first meetings-interviewing, ground rules for group work meetings, group roles and responsibilities, group meetings, **d. Intervention/treatment:** problem identification, making them work, dealing with difficulties within the group, group presentations, group work evaluation-meaning and its place ingroup work. **e. Evaluation:** steps in-group work evaluation and criteria for good group work and checklist for group work evaluation, v. Termination- reaction to termination and vi. Follow up.

III. a. Group work supervision: concepts, need, tasks, types, purpose, and functions, techniques and conditions for good supervision. **b. Leadership in group:** concepts, definition, characteristics, functions, qualities of leader, types and theories of leadership; training for leadership; sociometry and sociogram; **c. Group work for team building**: meaning, purpose, situational leadership in team building

IV. a. Models and approaches: social goal model, remedial and reciprocal model; group therapy/group psychotherapy/ therapeutic /social treatment, development group and task-oriented

group, etc. **b. Group work recording**: meaning, purpose, types and principles of group work recording, scope, problems, and limitations of group work practice in Indian settings; role of group worker in various settings.

V. **a. Programme planning**: meaning and definition of programme, principles and process of programme planning and the place of agency in programme planning. **b. Programme laboratory**-values and techniques: games, singing, dancing, dramatics, street play, puppetry, group discussions, parties, excursion, psychodrama, socio-drama, role play, brain storming, camping-planning and conducting camps; stages of group development and use of programme for group development: orientation stage, working stage, termination stage, programme planning, implementation, and evaluation **c. Group work settings and practice**: application of group work method in different settings; community settings, medical and psychiatric settings: hospitals, de-addiction, physical and visual and mentally challenged, family and child welfare settings and the aged homes, schools, correctional institutions, industries, and skills of a group worker.

References:

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Nicolson, Paula, Rowan Bayne, and Jenny Owen. *Applied psychology for social workers*. Palgrave Macmillan, 2006.

Siddiqui, H. Y. *Group Work: Theories and Practices*. Rawat Publications, 2008.

Course Title: FIELD WORK PRACTICE

Semester No   :   I
Core Course   :   IV
Course Code   :   CC – IV

Introduction:
Social work practice is designed to provide a variety of opportunities to develop and enhance professional practice skills through, orientation, observation visits, rural/tribal camps, etc.

1. Orientation: A detailed instruction about field work, objectives importance of field work. Orientation provides information regarding: (1) the importance and place of the practice in the social work education and (2) the purpose, functions, and ethics in professional practice

2. Observation Visits:
The purpose of the observation visits is to acquire skills of systematic observation and to develop a spirit of inquiry; to understand society's response to social problems through various services, understand and appreciate, to develop the ability to critically evaluate the initiative of voluntary and government programmes, and to develop an appreciation of social work intervention in these programmes.

A minimum of 10 visits to different social agencies with at least two settings pertaining to each field of specialisation.
Suggested field:
Health Setting: Hospitals, de addiction centres, community health extension projects, district mental health programmer /projects, etc
Educational Setting: Formal schools, non formal / adult education centres, etc.
*Community Services***: Community projects, self help groups, successful youth clubs and mahalir mantrams, environment groups, skill development centres, etc.
Services for special groups**: like differently abled, destitute, elderly- both institutional and non institutional
Criminal Justice system: observation homes, jails, etc.
Civic Administration Centres-: municipal, panchayat union, panchayat etc.

3. Rural /Tribal Camps provide opportunities to experience rural life, analyse rural dynamics, and observe the functioning of local self government and voluntary agencies. This experience helps peer participation in planning for activities for own group and for the local people. It helps to carry out, evaluate, and report the experience. It also helps the social trainees in planning, organising, budgeting, mobilising, implementing and evaluating the projects to be implemented during the camps besides expose their histrionic talents. The camps should be for a minimum of seven days organised by the Social Work students on a self supporting basis.

4. **Group awareness project** on social issues / problems – Minimum of 15 days to be allotted for this purpose. A minimum of two programmes should organised by the group. Each group must comprise of 3-5 students. One programme must be rural based. Suggested themes such as anti – dowry campaign, HIV/AIDS awareness, gender sensitisation, alcoholism, and drug awareness, etc. could be considered.

NORMS FOR SOCIAL WORK PRATICUM
I Semester Field Work:
1. Field work orientation and agency visits- a minimum of 10 visits to different social agencies with at least two settings pertaining to each field of specialisation. – 10 marks.

2. Rural camp for a minimum of seven days organised by the social work students on a self supporting basis and group awareness project. – 15 marks.

3. Group awareness project on social issues / problems – minimum of 15 days to be allotted for this purpose. Each group to be organise a minimum of two programmes. Each group should comprise of three to five students. One programme should be rural based. Suggested themes such as anti – dowry campaign, HIV/AIDS awareness, gender sensitisation, alcoholism, drug awareness, etc. can be considered – 15 marks.

Evaluation   : Total Marks – 100
Internal Evaluation   - 40 marks

     A. Filed Orientation visits (10marks)
     (i) Observational Skills   - 3.5 marks
     (ii) Reporting   - 3.5 marks
     (iii) Attendance for field work   - 3   marks
               ----
               10 marks

     B. Rural / Tribal Camp (15 marks)
     (i) Individual Participation   - 5 marks
     (ii) Initiative and Leadership   - 5 marks
     (iii) Community Involvement   - 5 marks
               ----
               15 marks

Group Awareness Project (15 marks)

     (i) Organising Ability & Team Work - 5 marks
     (ii) Resource Mobilisation   - 5 marks
     (iii) Social Relevance   - 5 marks
               ----
               15 marks

External Evaluation – (60 marks)
External examiner to be appointed by the University as is for project. One examiner may be appointed for every 15 students.
Break up of marks is as follows:
1. Theoretical Knowledge   - 15 marks
2. Practice Skills   - 15 marks
3. Mobilising Resources   - 10 marks
4. Communication and Presentation - 10 marks
5. Reporting   - 10 marks
               ----
               60 marks

Course Title: COUNSELLING: THEORY AND PRACTICE

Semester No   :   II
Elective Course :   I
Course Code   :   EC - I

Introduction:
Counselling help is called upon in developmental, preventive, facilitative, and crisis situations throughout the life span during different phase/stages and various life events. The courses aim to equip learners with skills of counselling and understanding of various approaches in various settings.

Objectives:
1. To develop a holistic understanding of counselling as a tool for help.
2. To acquire knowledge of various approaches, their theoretical under-pinning for goals, values, processes, and techniques.
3. To develop skills of application to real life situations.
4. To develop the ability to recognise and synthesise attitudes and values that enhance investment of self in the counsellor's role.
5. To develop the ability to use the tools/scales in various settings.

I. Introduction to Counselling: Meaning, Definition, Need and importance of counselling and professional counselling.

Basic principles of counselling: participation, individualisation, confidentiality, communication, acceptance, self confidence, self awareness, and other principles governing the counselling relationship.

II. Theories of counselling: Psychoanalytic, adlerian, client centered, behavioural approach, rational emotive, reality, gestalt, transactional analysis, cognitive behavioural therapy, and eclectic theories.

III. Counselling process: Interview and it significance in counselling – use of observation in counselling and understanding of emotions in counselling.

IV. Types of counselling: individual and group counselling, family counselling, marital counselling, student counselling, and industrial counselling.

Techniques of group counselling, strategies and structure – barriers to effective counselling sessions; counselling evaluation.

V. a. Components of effective counselling : counsellor's skills – Role and functions of the counsellours in schools, industries, family, hospital, and rehabilitation institution.
b. Application of test (only for practice not for examination)

The following standardised tests must be practiced in counselling settings:
Personality, intelligence, interpersonal relations, stress, anger, self esteem, anxiety, assertiveness, depression, adjustment, and mental health.

References:

Feltham, Colin, ed. *Controversies in psychotherapy and counselling*. Sage, 1999.

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SEMESTER II

Course Title: COMMUNITY ORGANISATION AND SOCIAL ACTION

Semester No   :   II
Core Course   :   V
Course Code   :   CC-V

Introduction:
Community organisation as method of social work practice is seen as a means to facilitate communities towards self-directed change. It takes as its basis, the inequalities in society manifested through processes of marginalisation, discrimination or disempowerment of groups, which have resulted in the loss control over resources, be they tangible or intangible. The strategies of CO practice being addressed as part of the course covers a range of different ideologies, from those people initiated and those that are initiated by the elite. CO is seen as a means as well as an end, where collective process sustains the community's capacity to bring about change.

Objectives:
1. To understand the different aspects of a community, its functions, and problems
2. To understand the critical elements of community organisation process
3. To enhance the critical understanding of models and strategies for CO
4. To develop attitudes conducive to participatory activities for a civil society
5. To gain knowledge on the various techniques and skills of community organisation & social action and to develop the basic skills to apply for those in the community.

I. Community: meaning, types, and characteristics; community power structure minority groups; **community dynamics**: integrative and disintegrative processes in the community.
leadership: definitions, types and qualities; leadership in different types of communities, theories of leadership, symbols and rituals, apathy and prejudice and individual predisposition; community power structure and political organisations in the community; factions and sub-groups; minority groups.

II. Community Organisation: concept, definition, objectives, philosophy, approaches, principles and skills; community organisation as method of social work; community welfare councils and community chests; **models** of community organisation; **community participation**: concept, imperatives, types, constraints, methods and techniques; components of community work and community relation.

III. Methods of community organisation: Planning, education, communication, community participation, collective decision making, involvement of groups and organisations, resource mobilisation, community action, legislative and non-legislative promotion, co-ordination, community organisation as an approach to community development.

IV. Phases of community organisation: study, assessment, discussion, organisation, action, evaluation, modification, continuation and community study; **intervention strategies** in community settings: awareness building, organising, activating, people's participation, negotiating, lobbying, and resource mobilisation, resolving group conflicts, programme planning and service delivery, developing human resource, and monitoring and evaluation; **application of community organisation** in different settings: rural, urban, tribal, and target groups: children, youth, women, aged; community organisation in emergencies like fire, flood, drought, famine, earthquake, and war; community organisation at local, state, and national level.

V. Social Action: Concept, objectives, principles, methods and techniques; social action as a method of social work; social action and social reform; scope of social action in India;

enforcement of social legislation through social action; **Approaches**: rights based approach and advocacy based approach; **Strategies**: preparation of carefully worded statement of policies, preparation of carefully analysis of pending legislations, individual consultation with key legislators on the implication of pending measures , persuasion of influential organisation to support or oppose pending legislation and creation of ad hoc citizens committee composed of people of great influence or prestige**; Radical Social Work**: meaning, techniques; role of Paulo Freire and Saul Alinsky Marx; Gandhi, Jayaprakash Narayan, and Vinoba Bhave; community organisation as a para-political process and role of social worker in community organisation and social action.

References:

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Course Title: SOCIAL WORK RESEARCH AND SOCIAL STATISTICS

Semester No   : II
Core Course   : VI
Course Code   : CC-VI

Introduction:
This course will equip learners to utilise and conduct research as service managers to improve services, evaluate and develop new services, to develop intervention methods, strategies, techniques, and also to be an active consumer of other research.

Objectives:
1. Develop an understanding of scientific approach to human enquiry in comparison to the native or common sense approach in various aspects and its process.
2. To understand major research strategies, meaning, scope, and importance of social work research.
3. To develop an ability to see the linkage between the practice, research, theory, and their role in enriching one another.
4. To develop attitudes favourable to the judicious integration practice, research and theory, and to develop skills for the use of library and documentation services for research.
5. To develop the ability to conceptualise, formulate, and conduct simple research projects (includes   basic research skills such as conceptualisation of a research strategy and problem, writing a research proposal, developing tools for collecting data, use of sampling strategies, data collection methods, processing, presentation, analysis interpretation, writing research report, etc.).

I. Research, Types and Approaches:
Research: concept, objectives, characteristics, ethics, and qualities of good researcher; **social research**: meaning and objectives; **social work research**: meaning, scope, importance, limitations in social work research, and difference between social research and social work research; **scientific method**: meaning, characteristics, and process of scientific inquiry; relationship between theory method & fact; **types of research**: pure, applied, and action research; participatory and evaluation research; **research approaches**: qualitative research: meaning, scope, characteristics, strategies, sampling and design, types of qualitative research: ethnography, focus group discussion, life history and content analysis; use, limitations, and obstacles in qualitative research, **quantitative research**: meaning, type, difference between qualitative and quantitative research.

II. Problem Formulation:

Selection of problem: criteria and sources; surveying the field; **literature review** and developing the bibliography: purpose; using library and internet, library ethics, abstracting and plagiarism; **defining the problem**: need and significance of the problem; basic research questions: meaning and importance; research objectives; **theory:** meaning and use; inductive and deductive theory construction; **concepts, indicators, and variables:** meaning; types of variables; formal and operational definitions; **measurement:** meaning, levels of measurement ; nominal ordinal, interval, and ratio; **hypothesis**: meaning, sources, characteristics, functions and types; assumptions and limitations; attributes of a sound hypothesis; hypothesis testing; level of significance; critical region; Type-I and Type-II errors.

III. Design and Sampling:

Research design: meaning and types- exploratory, descriptive, diagnostic, experimental, and single subject research designs; **universe and sampling:** meaning, need, principles, types and techniques, and advantages and disadvantages; **tools/instrument:** steps involved in tool construction; validity and reliability: meaning and types; use of scales (developed by WHO/ILO, etc.), scaling procedures (thurston, likert, bogardus, and semantic differentials): interview guide, code book, pilot study, and pre-test; **sources of data**: primary and secondary data.

IV. Methods of data collection:

Methods: quantitative- interview- meaning and types; questioners: meaning and types; participatory and rapid appraisal techniques; **qualitative**- in-depth interview, observation and types and document review; mixed and multi method & triangulation; **data processing**; transcription, data processing; presentation of data: tabular and graphical presentation; **data analysis:** univariate, bivariate, and multivariate analysis; interpretation: meaning, techniques, and precautions; **report writing:** content and format; mechanics of writing research reports and precautions; research abstracts; **footnotes, referencing, and bibliography:** meaning and differences; methods of referencing; **preparation of research project proposal**; agencies involved in social work research.

V. Social Statistics
Statistics- meaning, use, and its limitations in social work research; **measures of central tendency**: arithmetic mean, median, and mode; **dispersion**: range, quartile deviation, standard deviation and co-efficient of variation; **tests of significance**: "t" test, f test and chi-square test; **correlation**: meaning, types, and uses; Karl Pearson's coefficient of correlation and rank correlation; **computer applications**: use and application of computer in social work research with special reference to excel, etc.

References:

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Course Title: HUMAN GROWTH AND PERSONALITY DEVELOPMENT

Semester No   : II
Core Course   : VII
Course Code   : CC-VII

Introduction:

This course aims to introduce learners to the development of the individual across the life span with an ecological perspective. It also provides an them with an understanding human development and behaviour besides theoretical inputs.

Objectives:
1. Develop an overall understanding of the principles of growth, their relevance, and application to behaviour at various phases in life.
2. To understand the role of hereditary and environmental influences in growth and development.
3. To understand interactional nature of growth and behaviour at various stages in life: infancy, childhood, adolescence, youth, adulthood, and old age.
4. To develop sensitivity towards needs, developmental tasks, and health status along with the need for developmental programmes for the same.
5. To apply the information on growth, development and health in social work practice in general and individuals, groups, and communities in particular.

I. Psychology: definition, scope, application in various fields; introduction to schools of psychology; relevance of psychology for social workers.

II. Human growth and development: meaning, stages of development: pregnancy and child birth - infancy – babyhood-childhood-adolescent – adulthood – middle age – old age.

III. Learning: nature, definition and types; theories of Pavlov and Skinner; remembering and forgetting.

Motivation: concept of instinct: motives for survival – meaning and definition; types and characteristics of motives; hierarchy of motives; conscious and unconscious motivation.

Adjustment: concepts of adjustment and maladjustment; stress; frustration; conflict: nature and types;

Coping mechanisms: nature and types; mental health, and community mental health.

IV. Perception and attitudes: perception space, depth, auditory, and visual attention;
attitude: nature of attitudes, stereotypes, and prejudices, formation of attitudes, and attitude change.

Personality: definition and structure; theories of personality: trait and type theories; important concepts of the contributions of Freud, Jung, Adler, Maslow, and Ericson;

factors influencing personality development: heredity & environment; socialisation process.

V. Social Psychology and its applications: Collective behaviour: nature and reasons for collective behaviour, and manifestations of collective behaviour.

Psychological testing: personality, attitude, and intelligence.

References:

Anastasi, Anne. "Psychological testing ." (1968).

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Course Title: FIELD WORK PRACTICE

Semester No   :   II
Core Course   :   VIII
Course Code   :   CC - VIII

Concurrent field work is an ongoing learning practice and an opportunity to develop interventions skills in real life situations.

1. Concurrent field work - agency placement in generic setting of practice such as schools/old age homes/counselling centres/rehabilitation settings, etc. to initiate and participate in direct delivery
2. The placement will be for a minimum duration of 30 Field Work days for 2 days per week/semester.
3. Importance to be given for the practice of Social Work methods. Each student is expected to conduct case work with a minimum of 3 clients, group work with at least 2 groups, and organise one community based programme.

Norms for Evaluation

Evaluation: Internal   : 40 marks

1. Case Work Practice   - 10 marks
2. Group Work   - 10 marks
3. Community Programme   - 10 marks
4. Reporting   - 5 marks
5. Attendance   for field work   - 5 marks
                                                 ----
                                                  40 marks

External (60 marks)

1. Theoretical Knowledge   - 20 marks
2. Practice Skills   - 20 marks
3. Mobilising Resources   - 10 marks
4. Communication and Presentation   - 10 marks
                                                 ----
                                                  60 marks

Course Title: HUMAN RESOURCES MANAGEMENT

Semester No   : II
Elective Course   : II
Course Code   : EC II

Introduction: This course is aimed at enlightening the students on the management of human resources and related aspects.

Objectives:
1. To teach the students about management.
2. To enlighten the students on human resource management.
3. To inform the students about human resource functions.
4. To teach students about wage and salary administration.
5. To enlighten the students about industrial social work.

I.   Management: Concept, elements, principles and functions of management; management thoughts: Henry Fayol, F.W.Taylor, and Peter Drucker.

II.   Human resource management: Definition, scope, evolution, and functions. Human resource policy: Formulation and implementation; duties, responsibilities, and qualities of human resource manager and challenges for the 21st century.

III.   Human Resource functions: Human resource planning, recruitment, selection, induction and placement, promotion, transfer, job analysis, training, performance appraisal; discipline and disciplinary procedure, personnel records and personnel research; HR audit.

IV.   Wage and salary administration: job evaluation: definition, objectives; methods, advantages and limitation; wage and salary administration: nature and purpose, process of wage determination, wage structure and principles; theories of wages: concepts of wages, wage differentials – financial and non-financial incentives.

V.   Industrial social work: meaning, scope, and relevance; application of social work methods in the industrial sector; labour problems and industrial counseling in industries and working with the families of industrial workers: meaning, scope, relevance, advantages and disadvantages.

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1. Agarwal, Rameshwar Dayal, ed. *Dynamics of Personnel Management in India: a Book of Reading*. Tata McGraw-Hill, 1973.

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Semester III

**Course Title: SOCIAL WELFARE ADMINISTRATION, SOCIAL POLICIES, AND
                SOCIAL LEGISLATIONS**

Semester No   :   III
Core Course   :   IX
Course Code   :   CC - IX

Introduction:
This course aims at helping the learner to understand management process and developing
administrative skills and also to understand the learners to how policy is a link between
constitutional principles and legislative actions and to understand the concept of social
development.

Objectives:
1. To acquire knowledge of the basic process of registering, managing, and administrating
    welfare agencies in the context of social work profession.
2. To acquire skills to participate in management, administrative process, and programme
    delivery.
3. To develop the ability to see the relationship between policy and programmes and to
    analyse the process as applied in specific settings and specific programmes.
4. To gain knowledge on policy analysis and policy formulations and to study social policies,
    plans, legislations and programmes so as to be able to interpret, enforce, and challenge
    them.
5. To understand critically the concept and content/indicators of social development

I. Social Welfare Administration: meaning and definition of social welfare administration and
social work administration; purpose, historical development; principles, functions, and areas
(policy making, planning, personnel, supervision, office administration, budgeting, finance, fund
raising, accounting, auditing, purchase and stock keeping, record maintenance, co-ordination,
public relation, monitoring and evaluation, and research, annual report); social welfare
administration at national, state, and local levels; CSWB (Central Social Welfare Board), state
social welfare board, directorate of social welfare, and handicapped welfare.

II. Social Welfare Programme and Agencies: evaluation of social welfare in India; voluntary
social work, social agencies: meaning, definition, type and models of NGO's; roles of NGO's in
national development; governmental schemes on social welfare; agency registration: methods,
advantages, preparation of byelaws, memorandum of association, rules, regulation, and registration
procedures; registration of societies and trusts: governing board, committees. executives; qualities,
functions, and role.

III. Social Policy: definition, need, evolution and constitutional base; sources and instrument of
social policy, policies regarding Other Backward Castes (OBCs), Scheduled Castes (SCs),
Scheduled Tribes (STs), and de-notified communities; policies and programmes for women,
children, aged, and handicapped; development and implementation of programmes for weaker
sections.
IV. Social Legislation: Definition, its roles as an instrument of social change, constitutional basis
for social legislation: Fundamental Rights and Directive Principles of state Policy.

V. Laws Related to Marriage: Hindu, Muslim, Christian, and personal laws relating to marriage; divorce, minority, and guardianship; adoption, succession, and inheritance; legislation relating to social problems such as prostitution, juvenile delinquency, child labour, untouchability, physical, and mental disabilities.

Note: Emphasis must be given to the Salient features and effects of the various social legislations mentioned in the unit.

References:

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Course Title: RURAL COMMUNITY DEVELOPMENT

Semester No   : III
Specialisation Paper   : I a
Core Course   : X
Course Code   : CC- X a

Course Objectives:
1. To enable students to understand rural realities.
2. To develop sensitivity and commitment for working with rural communities.
3. To impart knowledge about the governmental and voluntary efforts towards rural community development.
4. To equip students with specific skills and techniques of working with rural communities.

I. Rural Community: meaning, characteristics; types of villages; scope of studying the rural community and its relation to social work; **rural social structure** and constraints to rural development; **rural organisation and rural development** - school, co-operatives, village panchayat, youth club, women's club, self-help groups etc.; **rural problems**: poverty, illiteracy, unemployment, problems related to agriculture (land holding, productivity, marketing), and community health.

Community Development: meaning, objectives, scope, principles, process, models; methods; earlier experiments in rural developments - Sriniketan experiment, Gurgaon experiment, marthandam experiment, Baroda experiment, Firkha development scheme, Etawa pilot project, Nilokheri experiment, Gandhian constructive programmes; community development during post launching period: national extension services and various phases of cd; **rural extension**: concept, characteristics, philosophy, objectives, principles, approaches, and methods and limitations; **approaches to rural community developmen**t: Tagore, Gandhi and C. Subramaniam, etc.

II. Rural Development Administration: history, structure- central - state, district and block levels and functions, **panchayat raj institutions** (PRI): origin & evolution; philosophy, new panchayat raj system- 73rd amendment and its salient features, structure of PRIs; powers of Gram Sabha; features of Tamil Nadu Panchayat Act, 1994; constitution of village panchayats, panchayat union and district panchayat; elections to PRIs, reservation for women, SC/STs, administration of PRIs, taxes and levies; assigned and shared revenues, grants: government of India finance commission, state finance commission, development grants under various schemes; powers of PRIs in implementation of RCD programmes, **rural development agencies**: council for advancement of people's action and rural technology (CAPART), national institute of rural development (NIRD), national bank for agriculture and rural development (NABARD), regional rural banks (RRB), district rural development agency (DRDA); statistics related to rural development; training of PRI functionaries.

III. Social Development: definition, approaches and indicators; social development in India: historical and social context of development in India; pre and post independence period and government measures and five years plan in India; development sectors: agriculture, and cooperation, and education and health; **agriculture and rural development**: share of agriculture in the national income, agriculture as a source of livelihood, employment, raw materials, capital for development and manpower; agrarian and land reforms, green white and yellow revolution; **cooperatives and rural development**: meaning, principles, objectives, functions, structure, and performance of rural credit and non-credit cooperatives; registration procedures of cooperative societies; **education and rural development**: universalisation of primary education: problems;

adult education-meaning, history, strategies and programmes – social education, workers education, farmers training and functional literacy and non-formal education; national literacy mission; **health** and rural development.

IV Communication and Rural Development: meaning, scope, channels and stages of communication, methods communication: interpersonal communication, group communication and mass communication; skills of communication: questioning, reinforcing, listening, reflecting and exploring, theories and models of communication; transactional analysis and conflict resolution; barriers in communication; communication and its role in rural development, satellite instructional television experiments (site): aims and objectives; use of media in communication; mass media: exhibition, film, press, radio, TV and traditional local folk media: puppet shows, drama, street play, folk songs and folk dances; use of talks, meetings, conferences, camps; campaign; communication through leaflets, pamphlets, bulletins, circulars, posters and notice boards; **community participation**: meaning, elements, base, principles and obstacles in community participation; participatory communication – concept, and methods, use of communication for community participation; participatory communication for rural development.

V. **Rural Development Programmes**: **Area based Programmes**- drought prone area programme (DADP), hill area development programme (HADP), tribal area development programme (TADP), command area development programme (CADP), wasteland development programme, desert development programme (DDP), watershed development programme, intensive agriculture area programme (IAAP) and high yield variety programme (green revolution blue white and yellow revolution), hariyali , MP's area development programme; MLA's area development programme; etc.; **target based programmes**: IRDP, TRYSEM, NREP, RLEGP, JR, Indira Awaas Yozana, millions wells scheme, Swarna Jayanthi Grama Swarajgar Yojana (SJGSY), employment assurance scheme, new life, etc; employment guaranty legislation – its salient features- mahatma Gandhi national rural employment guarantee scheme. **welfare programmes**: minimum needs programme, noon meal scheme - development of women and children in rural areas (DWCRA) - integrated child development scheme (ICDS), Tamil Nadu integrated nutrition programme (TNINP), antyodaya programme, annapoorana scheme, programme of rural health and total sanitation; five year plans and strategies for rural development, and role of social workers, concept of provision of urban infrastructure in rural areas (PURA), role of voluntary organisation in rural community development, problems and limitations.

Note: while setting question paper, emphasis must be given only on the objectives, strategies, target (physical & financial) & achievements of various programmes mentioned in unit –v

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Course Title: COMMUNITY HEALTH

Semester No   : III
Specialisation Paper : I b
Core Course   : X
Course Code   : CC-X b

Introduction: The purpose of this course is to inform the students about the various aspects concerning community health.

Objectives:
  1. To inform the students about health and hygiene and related aspects.
  2. To enlighten the students about diseases and occupational health.
  3. To teach students about the health care delivery system.
  4. To make the students aware about health education.
  5. To inform students about health work in the community.

I. Health and Hygiene: Health, Primary Health Care and Public Health; Concepts and definition, factors influencing health; Social and Preventive Medicine, Levels of disease prevention, comprehensive health indicators – vital health statistics; Community Mental Health and Community Psychiatry. **Nutrition and Health:** Nutrient Groups: Functions, sources and requirement; Caloric requirements for different age groups; Balanced diet, Malnutrition, Deficiency diseases, prevention of Nutrition problems. **Hygiene:** Personal, food and Environmental hygiene; Relationship between health and hygiene; Environmental pollution; Living conditions: housing, sanitation, waste disposal and their influence on health.

II. Diseases and Occupational Health: Major Communicable diseases: Symptoms, Etiology, Transmission, Prevention and Treatment of : Leprosy, Tuberculosis, STD, HIV, Polio, Malaria, Cholera and Typhoid. Immunisation schedule for children. **Major Non-communicable diseases**: Cancer, Diabetes, Hypertension, Asthma, Cardiac disorders. **Occupational Health**: Occupational Health hazards, Common Occupational diseases.

III . Health care delivery system: Mental Hygiene movements, trends in Community Mental Health, Public health model of mental health prevention and promotion. **School Health**: Helping teachers identify problems of physical and mental health, making appropriate referrals, involving and motivating teachers and children; Involvement of Voluntary Agencies. **Health care delivery system** at the National and State levels, primary health centre, models of community health. **Salient features of legislations related to health:** MTP ACT (Amendment), 2002, Mental Health Act 1987, Factories Act 1949, ESI Act 1948; Allocation for Health care in IX Five Year Plan; Health Policies 2003

IV. Health Education: Meaning and importance, Principles of health education, Techniques and strategies for various community groups, Family Planning: Importance and Techniques; Use of Audio- Visual Aids and Mass Media; First Aid : Concept and methods of dealing with victims of accidents and health education in hospital and rural/slum/ tribal areas.

V. Health work in the community: Major health problems related to women and children; Socio-cultural practices, beliefs and myths influencing community health; Assessing community health needs, Mobilising core groups; community participation: Principles and practice of Community

Participation, Training of multi purpose workers in community health programmes **Social Work Intervention** in relation to: Immunisation, nutrition, family planning, maternal and child health, environmental issues (hygiene, pollution and sanitation), accident prevention, suicide prevention, alcoholism and drug abuse prevention.

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Course Title: WOMEN AND CHILD WELFARE
Semester No   : III
Specialisation Paper : I c
Core Course   : X
Course Code   : CC-XI c

Introduction: The main purpose of the paper is to highlight the issue of women and child welfare including the laws that are in place to protect them.

Objectives:
1. To inform the students about the demographic profile of women in India.
2. To enlighten the students on women's welfare and development.
3. To teach students about the issues concerning children.
4. To make students aware about the problems of children.

I. Demographic profile of women in India: changing role and status of women in India; role differences of women in joint and nuclear families; position of women in tribal, rural and urban areas; status of women with reference to health, education, employment and political **problems of women**: gender bias, child marriage, dowry, widowhood, desertion, divorce, destitution, educational backwardness, discrimination in employment; problems of employed women and mothers; problems of unmarried mothers; delinquency, prostitution, trafficking in women and girls; theories on violence against women.

II. Women's welfare and Development: historical development of women welfare; indicators of women development; central and state government policy on women; government of India schemes for women's development; national commission for women, institutional and non-institutional services for women; **women and law**: legislations relating to women; legal and constitutional rights, marriage, divorce, and property rights; labour laws for women; family violence, family courts, **women empowerment:** meaning, characteristics of an empowered women; role of self help groups in women empowerment; feminism; women's movement abroad and in India, India's five year plans- policies, and strategies and programmes.

III. Child: meaning, demographic profile of children in India – rural & urban, its place in family and society; status of girl child; concept of socialisation; factors influencing socialisation; role of family in socialisation; parental socialisation during childhood and adolescence; role of peers in socialisation, role of school in socialisation; impact of television on children.

IV. Problems of Children: childhood diseases and immunisation; behaviour disorders of children; causes, consequences and prevention of child malnutrition, nutritional disorders, neglected children and abused children, child workers, child trafficking, child prostitution, HIV/AIDS affected and infected children; children with disabilities, school dropouts; school social work: concept, need, objectives, and functions.

V. Child Welfare in India:
U.N. charter of children rights; institutional services; constitutional safe guards; five year plans-policies; place of institutional care: scope and limitation, national and international institutions and its role in child welfare; child labour- policies, constitutional and legislative provisions and programmes at national and international level; **child welfare programmes**: non- institutional

care: organisation and functions of crèches, day care center, sponsorship programme, foster- care, adoption, recreation services; integrated child development schemes; services for children in need of special care; exceptional children neglected and abused children; child guidance services.

References:

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Course Title: HUMAN RESOURCES DEVELOPMENT

Semester No   : II
Specialisation Paper   : I d
Core Course   : X
Course Code   : CC – X d

Introduction: The aim of this course is to ensure that the students gain an understanding of human resources development and its related aspects.

Objectives:
1. To introduce the students to the concept of human resource development and related aspects.
2. To teach students about performance appraisal.
3. To inform students about training and development as a part of human resource development.
4. To make students aware about the trends in human resource development.
5. To enlighten students on the concept of leadership.

I. Human Resources Development: HRD- concept , objectives, components, process, and mechanism for HRD, principles in designing HRD system; pre requisites for successful HRD programmes; human resource planning (HRP) : meaning, historical development, importance; subsystems and elements; process; HRD at different levels; areas of HRD; HR information system, demand and supply of human resources, HR planning in new and ongoing organisations; investment approach to HR planning, HR planning process; coordination with corporate and other plans.

II. Performance Appraisal: meaning, approaches to performance appraisal, methods / techniques of appraisal system, importance, purpose and limitation; potential appraisal: meaning, scope and importance, latest trends in potential appraisal; 360 performance appraisal; management by object; stress management and conflict at work place: meaning, causes and consequences, strategies for reduction of stress; conflict: meaning, types of conflict and management of conflict

III. Training and Development: meaning, need, importance, types: on the job and off the job training, training effectiveness, evaluation of training programme; **career planning and performance counseling**: meaning and steps involved; career development: steps importance and problems, succession planning; performance counselling: conditions for effective counseling, process involved.

IV. HRD Trends: job rotation, job enlargement, job enrichment. Quality of work life, total quality management (TQM) human resource information system: meaning and importance; ISO 9000 series, competency management meaning & importance; People capability, maturity, model – meaning and importance.

V. **Leadership:** concept, leadership and management-difference, styles, skills, teamwork, decision-making and steps; theories of leadership, motivation: concept, motivation skills and theories of motivation: drive theory, incentive theory, opponent process theory, optimal level theory.

References:

Bhatia, B. S., and G. S. Batra. *Human Resource Development*. Vol. 6. Deep and Deep Publications, 2001.

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Semester No   : III
Specialisation Paper   : II a
Core Course   : XI
Course Code   : CC-XI a

Introduction: The aim of this course is to enable students to understand the problems of tribal people and also to gain an understanding of project management.

Course Objectives:
1. To enable students to understand the unique nature of tribal culture.
2. To develop sensitivity and commitment for working with tribal community.
3. To provide knowledge on the government and voluntary efforts towards tribal development.
4. To equip students with specific skills and techniques of working with tribal communities.

I. Tribes: definition, concept, characteristics of the tribal community; nomadic and de- notified tribes; history of Indian tribes and tribes in Tamil Nadu; regional distribution of tribes and Nehru's Panchsheel principles of tribes; social system of tribes: socio economic conditions; cultural and religious aspects; status of women: dress, food, & marriage-polygamy, polyandry, dormitory marriage; status of children; tribal leadership and political participation -local, state, and national levels.

II. Tribal Development Administration: administrative stricture at central, state, and district levels; hill development councils; functions of tribal development blocks/agencies; constitutional provisions for the protection of tribes; research and training in tribal development, role of voluntary agencies in tribal development.

III. Tribal Problems and Programmes: child marriage, poverty, ill-health, illiteracy, sexually transmitted diseases and acquired immune deficiency syndrome, exploitation and atrocities on tribes; immigration and its related problems; lack of infrastructure facilities and amenities; tribal resettlement and rehabilitation and its related problems; tribal movements and tribal revolt, naxalbari movement. tribal development programmes: tribal development policies, tribal area development programme; hill area development programmes; tribal sub-plans, forest land cultivation, need and importance of social work practice in tribal areas, application of social work methods in tribal development, problems in implementation of tribal development programmes.

IV. Introduction to project Management: concept, objectives, principles, scope, importance and methodology; micro and macro level planning; project dimensions: identification and formulation; detailed project report (DPR); project appraisal: technical, economic and financial feasibility; participatory development (participatory planning and participatory rural appraisal (PRA), participatory management and participatory evaluation).

V: Planning and Management of Project Implementation: activity planning, network analysis, monitoring of development projects: management information system, project evaluation: programme evaluation and review technique (PERT) and critical path method (CPM); resource mobilisation: techniques of fund raising; statutory requirements for the formation of society and trust; foreign contribution regulation act; special provisions related to income tax exemption for development organisations.

References:

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Course Title: MEDICAL SOCIAL WORK

Semester No   : III
Specialisation Paper   - II b
Core Course   : XI
Course Code   : CC-XI b

Introduction: The aim of this course is to introduce the students to medical social work and to highlight its specific aspects.

Objectives:
1. To introduce the students to the concept of medical social work and related aspects.
2. To inform the students about the Psychological, Social and economic implications of illness and disability.
3. To enlighten the students about hospital as a formal organisation.
4. To make students aware of Impairment, Disability, and Handicap.
5. To highlight the specific needs and problems of patients and their families.

I. Medical social work: definition, concept, objectives, its nature, need and scope; the roles and functions of a medical social worker; historical development in India and abroad; medical sociology and its relevance to medical social work practice; practice of social work methods in hospital settings: their need and importance in working with patients and families: scope and limitations of practice.

II. Psychological, social and economic implications of illness and disability: for the patient and his family; concepts of patient as a person, patient as a whole, the psychosomatic approach; multidisciplinary team work: need, importance, and principles; role of social worker as a member of the team.

III. The hospital as a formal organisation: its goals, technology, structure and functions, departments, administrative procedures, implications of hospitalisation for the patient and his family; medical social work department: staffing, organisation and functions; extension services; public relations.

IV. Impairment, Disability and Handicap: causes, types and classification of physical handicaps: orthopedic disability, visual handicap, aural impairment and speech disability; psychosocial problems and implications for each specific handicap and role of the medical social worker in intervention; physical medicine, physiotherapy and occupational therapy: objectives and types; rehabilitation: definition, concept, principles, and process; role of the medical social worker in rehabilitation planning, resource mobilisation, and follow-up.

V. Specific needs and problems of patients and their families: need for assistance and role of the medical social worker in the following settings: outpatient unit, intensive care unit, pediatric ward, maternity ward, abortion clinic, family planning centre, std clinic, HIV clinic, orthopedic department, cardiology department, blood bank, TB sanatorium and cancer hospitals, training of the volunteers to work with the chronically ill in the community, and special focus on rural/tribal areas.

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Hubschman, Lynn. *Hospital social work practice*. Praeger Publishers, 1983.

Pattison, Harry Archibald, ed. *The handicapped and their rehabilitation*. Thomas, 1957.

Course Title: WELFARE OF THE YOUTH AND THE AGED

Semester No : IV
Specialisation Paper : III c
Core Course : XI
Course Code : CC-XI c

Introduction: The purpose of this course is to highlight the issue of welfare of the youth and aged.

Objectives:
1. To introduce the students to the concept of youth and youth as a special category.
2. To enlighten the students on the youth movement in India.
3. To inform students about youth welfare.
4. To talk teach students about the issues being faced by the aged.
5. To highlight the existing services for the aged.

I. Youth: concept, demographic profile in rural and urban; youth in Indian society: a historical over view of their role; process of socialisation of Indian youth; aspirations of the youth in contemporary Indian society; role of youth in social change and national development; **youth as special category**: basic needs of youth: problems of youth in relation to family life; social relation, education, recreation, leisure, recreation, employment, sex, marriage, political status, adjust mental problem of the youth.

II. Youth Movement in India: YMCA, YWCA, SFI, DYFI and other youth movements of various political parties in India, ideologies of youth movements and its role in nation building; youth unrest; need for youth policy in India; **youth work**: concept, objectives, approaches to youth work in tribal, rural and urban areas: training programmes.

III. Youth Welfare: definition and scope: philosophy and evolution of youth welfare programmes in India; services for student youth: education, physical education, sports, recreation; vocational guidance, youth services, bharath scouts and guides, national services scheme, community and social service scheme, national cadet corps, youth festivals and youth camp; student counselling; need, services, for non-student youth; non-formal education for school drop outs; nehru yuvak kendra, vishwa yuva kendra, youth welfare programmes under government and voluntary agencies; organization by and for youth, -youth policies, strategies and programmes in India's five year plans.

IV. Aged: definition, types, demographic profiles; aging population in rural and urban gerontology; theories of aging; dimension of aging; changing status of the aged in India society; problems of the aged- health, family, social relation and employment; perspective on the population of aging in India; retirement as a social and economic event; family, social, economic and religious life of retired people.

V. Services for the aged: geriatric services in India; social work and social services and the aged; family social work with the aged; social welfare services for the aged; old age social security measures in India and other countries; physical activity, rehabilitation and community linkage programme; gerentophenotime-an aging reversal agent; national and international agencies for aged welfare, policies, strategies and programmes for the elderly in India's five year plans.

References:

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Course Title: LABOUR WELFARE AND INDUSTRIAL RELATIONS

Semester No   : III
Specialisation Paper   : II d
Core Course   : XI
Course Code   : CC-XI d

COURSE OBJECTIVE:

To familiarise students with the concepts of industrial relations and the current industrial relations scenario in India.

Objectives:
1. To highlight the issue of labour welfare.
2. To inform students about the labour legislations in India.
3. To enlighten students about social security legislations.
4. To introduce students to the concept of industrial relations.
5. To highlight the issue of industrial conflict.

I. Labour welfare: an introduction on Indian constitution - unorganised labour sector in industry and agriculture - problems faced by unorganised labour sector - constitutional safeguards to unorganised labour - judicial activism (case laws); concept, scope, principles, theories, origin and growth of labour welfare in India; types of welfare; labour problems: absenteeism addiction, indebtedness, family distress and social work intervention; labour welfare programmes: safety, health and hygiene, occupational diseases, crèche, canteen, credit society, worker's education labour welfare officer: status, role, duties and functions; labour welfare agencies in India and international

II. Labour legislations in India: factories act 1948; the plantation labour act 1951; Indian mines act 1952, apprentices act 1961; labour relations legislations : the trade union act 1926, industrial disputes act 1947; Tamil Nadu shops and establishment act 1947, Tamil Nadu industrial establishment (national and festival holidays) act 1951; employment legislations: industrial disputes act 1947, the industrial employment (standing orders) act 1946, employment exchanges (compulsory notification of vacancies) act 1959, employment of children act 1938.

III . Social Security Legislations: workmen's compensation act 1923, employees' state insurance act 1948; employee's provident fund act 1952 including the pension scheme 1995; the maternity benefit act 1961, payment of gratuity act 1972; **wage legislations**: the payment of wages act 1936, the minimum wages act 1948, the payment of bonus act 1965, the equal remuneration act, 1976; the Tamil Nadu payment of subsistence allowance act and case laws.

IV. Industrial Relations: definition, meaning of industrial relations, characteristics of a good industrial relations system - changing profile of industrial workers – labour in constitution – administration of labour department. **ILO** – history, aims, objectives, structure and functions, social security measures, achievements, influence of ILO on Indian industrial relations - labour welfare practices in India; **trade unionism** – history, objectives, problems faced, recognition – trade union movement in India – employer federation, collective bargaining : methods, issues, problem and settlement.

V. Industrial Conflict: standing orders, industrial disputes, settlement machineries, industrial peace and harmony, industrial conflict types, causes, consequences, grievance, discipline, domestic enquiry – recent trends; **industrial democracy – workers participation**: objectives schemes, methods – participation schemes in industries in India - quality circles – quality of work life.

References:

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Saxena, R. C. *Labour Problems and Social Welfare*. Jai Prakash Nath, 1963.

Srivastava, Suresh C. *Industrial relations and labour laws*. Vikas Publishing House Pvt Ltd, 2007.

Course Title: FIELD WORK PRACTICE

Semester No   : III
Core Course   : XII
Course Code   : CC-XII

    a. To be based on the student's specialisation
    b. Agency placement for a minimum of 30 days for two to three days per week/semester
    c. Content of Field work to be finalised between the concerned department and the placement agency according to the field of specialisation.

Guidelines for Community Development Specialisation
    1. Exposure to DRDA/Panchayat Union and Panchayat administration
    2. Orientation to community based surveys/PRA
    3. Organise at least two need based community programmes
    4. Practice of Social Work methods in Community Settings (Rural/Tribal areas)
    5. Knowledge of CD programmes.

Guidelines for Medical and Psychiatric Social Work Specialisation
    1. Practice of Social Case Work with at least five clients
    2. Practice of Social Group Work with at least two groups
    3. One Community based programme.

Guidelines for F & C Welfare Specialisation
    1. Exposure to family and child welfare programmes
    2. Practice of social work methods – practice of social case work with at least five clients
    3. Practice of social group work with at least two groups
    4. One community based programme.

Guidelines for HRM Specialisation
    1. Exposure to welfare measures and programmes in industries.
    2. Orientation to IR activities/Trade Union
    3. Understanding of Organisation profile/Organisational Culture
    4. Knowledge of labour legislations.

1. Agency placement in generic settings of practice such as schools/old age homes/counselling centres/rehabilitation settings etc.
2. The placement will be for a minimum duration of 30 field work days for two days per week/semester.
3. Importance to be given for the practice of social work methods. Each student is expected to conduct case work with a minimum of three clients, group work with at least two groups, and organise one institutional/ community based programme (trainees of all specialisations).

Evaluation: Internal   : 40 marks

1. Case Work Practice   - 10 marks
2. Group Work   - 10 marks
3. Awareness Programme   - 10 marks
4. Reporting   - 5 marks
5. Attendance   for field work   - 5 marks

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                                     40 marks
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External (60 marks)

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1. Theoretical Knowledge            - 20 marks
2. Practice Skills                  - 20 marks
3. Mobilising Resources             - 10 marks
4. Communication and Presentation   - 10 marks
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                                     60 marks
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Course Title: CORPORATE SOCIAL RESPONSIBILITY

Semester No   : III
Elective Course   : III
Course Code   : EC-III

Introduction: The aim of this course is to introduce the students to the concept of corporate social responsibility and its related aspects.

Course objectives
1. To understand the scope and complexity of corporate social responsibility (CSR).
2. To gain knowledge on the impact of CSR implementation on corporate culture, particularly as it relates to social issues
3. To acquire skills to frame CSR policies and practices appropriate to the Indian workplace

I: Social Responsibility: corporate social responsibility – meaning, definition and scope of CSR – evolution of CSR – CSR, sustainability, public private partnerships, corporations' role in climate change, supply chain responsibility, stakeholder engagement, cause and social marketing, environmental responsibility, socially responsible investing, sustainability reporting, transparency and human rights; CSR as economic development and CSR in cultural context.

II: Stakeholders and Perspectives - interest groups related to CSR – tools of CSR – business benefits of CSR.

III: Designing a CSR policy – factors influencing CSR policy – managing CSR in an organisation – role of hr professionals in CSR – global recognitions of CSR- ISO 14000 - SA 8000 - AA 1000 - codes formulated by UN global compact – UNDP, global reporting initiative.

IV: Implementing CSR – CSR in the marketplace – CSR in the workplace – CSR in the community – CSR in the ecological environment – case studies: lifebuoy soaps' swasthya chetna, itc's e-choupal venture, titan industries limited, TATA power; tools for communicating CSR (skill building): social media, films and reports and developing strategic partnerships

V: CSR in India: an overview of CSR rules under companies Act, 2013 legal provisions and specifications on CSR – TCCI (TATA council for community initiatives), TATA model on CSR – national CSR hub, TISS Mumbai – success and failure with CSR initiatives – CSR awards in India – role of social workers in CSR

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Savitz, Andrew. The Triple Bottom Line. Jossey-Bass, 2006

Tapscott, Don and David Ticoll. The Naked Corporation: How the Age of Transparency Will Revolutionize Business. Free Press, 2003.

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Semester IV

Course Title: URBAN COMMUNITY DEVELOPMENT

Semester No   : IV
Specialisation Paper : III a
Core Course   : XIII
Course Code   : CC-XIII a

Introduction: The aim of this course is to enable students to grasp the various issues concerning urban community development.

Course Objectives:

1. To enable students to understand the unique nature of urban community.
2. To develop sensitivity and communication for working with urban poor.
3. To provide knowledge on the government and voluntary efforts towards urban development.
4. To equip students with specific skills and the techniques of working with urban communities.

I. Urban Community: meaning, characteristics, rural urban linkages and contrast; city - meaning, classification, trends in urbanisation process.

II. Urbanisation & Urbanism: meaning, theories of urbanisation, characteristics of urbanism, slums – definition, approaches, theories and classification and culture of slums; urban problems: housing, drug addiction, juvenile delinquency, prostitution, and pollution.

III. Urban Community Development: definition, concept, objectives and historical background; approaches, principles process and methods of urban community development, welfare extension projects of central social welfare board, urban development planning: legislation related to urban development: urban land ceiling act, town and country planning act, nagarpalika act and Tamil Nadu slum clearance and improvement act) community planning, and community participation.

IV. Urban Development Administration: national, state and local levels; structure and functions of urban development agencies: urban services and urban deficiencies; metropolitan development authorities, Housing and Urban Development Corporation (HUDCO) and United Nations Centre for Human Settlement (UNCHS); housing board, role of voluntary agencies in urban development.

V. Urban Development Programmes: five year plans and urban development; Madras Urban Development Projects (MUDP) I & II; Tamil Nadu Urban Development project (TNUDP); Urban Basic Services Programmes (UBSP), Nehru Rozgar Yojana (NRY), etc. Tamil Nadu Slum Area (clearance and improvement) Act 1971, and problems in implementation of urban community development programmes; role of development worker – application of social work methods in urban development.

References:

Clinard, Marshall Barron. *Slums and community development: experiments in self-help*. Vol. 8. New York: Free Press, 1966.

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Course Title: PSYCHIATRIC SOCIAL WORK

Semester No   : IV
Specialisation paper : III b
Core Course   : XIII
Course Code   : CC XIII b

Introduction: The purpose of this course is to introduce the students to the concept of psychiatric social work and various other issues covered under it.

Objectives:
1. To introduce the students to the concept of psychiatric social work**.**
2. To highlight the historical development of psychiatric social work.
3. To make students aware about psychiatric illnesses.
4. To throw light on therapeutic intervention in psychiatric illness.
5. To inform students about the scope of psychiatric social work practice.

I. Psychiatric Social Work: definition and concept, historical development in India and abroad; current status as a field of specialisation.; case work, group work, and community organisation in the psychiatric services; limitations and difficulties faced in psychiatric social work practice; psychiatric epidemiologist in India.

II. Historical development of Psychiatry as a Field of Specialisation: attitudes and beliefs pertaining to mental illness in ancient, medieval and modern times; concepts of normality, abnormality and mental health; classification of mental illness: diagnostic statistical Manual (DSM) iii-R ; international classification of diseases (ICD); psychiatric assessment: interviewing, case history taking; sources of intake, mental status examination; formulation of psychosocial diagnosis.

III. Psychiatric Illness: neuroses, psychoses, organic and functional, culture bound syndromes, personality disorders, sexual deviations, alcoholism and drug dependence; mental handicap: definition, classification, clinical types and causes, cerebral palsy: clinical types, causes, associated disabilities; epilepsy: definition, types, causes, management; ageing: biological, social and psychological problems; suicide: causes, indications, prevention; childhood disorders: behaviour disorders; eating, elimination, sleep and speech disorders; childhood psychoses: autism, schizophrenia; scholastic backwardness: symptoms, causes and management; attention deficit disorders.

IV. Therapeutic Intervention in Psychiatric Illness: psycho education, cognitive therapy, group psychotherapy, family therapy, marital therapy: scope and types; behaviour therapy: principles and techniques, ECT, chemotherapy, psychosurgery and mega vitamin therapy; occupational therapy (purpose and concept).

V. Scope of Psychiatric Social Work practice: roles and functions of a psychiatric social worker with regards to the problems of patients and their families in:
1) psychiatric OPD'S   2) psychiatric specialty clinics 3) de-addiction centres, 4) child guidance clinics; rehabilitation of psychiatric patients: role of the social worker in rehabilitation - planning, mobilisation, reintegration of the patient in the family and community; principles and models of psychiatric rehabilitation; role of the psychiatric social worker in team work. concepts of : therapeutic community, partial hospitalisation, day care centers, half way homes, sheltered workshop and transitory homes; national mental health programme; district mental health programme.

References:

Carson, Robert C., James N. Butcher, and James C. Coleman. *Abnormal psychology and modern life* . Scott, Foresman & Co, 1988.

Denzin, Norman K. *Treating alcoholism: An alcoholics anonymous approach*. Vol. 46. Sage Publications, Inc, 1987.

Dickerson, Martha Ufford. *Social work practice with the mentally retarded*. Free Pr, 1981.

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Course Title: DEMOGRAPHY AND FAMILY WELFARE

Semester No   : IV
Specialisation Paper   : III c
Core Course   : XIII
Course Code   : CC-XIII c

Introduction:

This course is to promote understanding of the changing norms of the social system and development opportunities throughout its cycle. It also aims to develop skills in identifying scope for reform and positive awareness for need of healthy family unit.

Objectives:

1. Understand the changing norms of the institution of family and variations in them with reference to the family social ecology.

2. Understand the dynamics of family interactions and developmental tasks through the family life span.

3. Develop positive attitude to support understanding the need of a healthy family unit.

4. Understand the demographic aspects of family in India. Family planning, family size preference and various approaches to family welfare planning.

I. Family and Marriage: origin and evolution of family and marriage; ideology of family rights and responsibilities,; normative family and marriage functions; social change and changes in family and marriage functions; implications for the family and its members; dual earners families, single parent families, female headed households, childless families; family interactions; family development and family life cycle; family assessment: methods and its implications.

II. Demographic aspects of the family in India; social in equalities and fertility behaviour, trends of population growth; factors affecting population growth; consequences of population explosion; sources of demographic data, vital statistics: population structures and projection; theories of population.

III. **Family Planning**: scope, concept of eligible couple and child protection rate; importance of population control; family welfare planning and five years plans; objectives, targets and achievements, population policy, population education and sex education; physiology of reproduction: reproductive anatomy and physiology, menarche and menopause, fecundity, fertility, treatment of infertility; adoption.

IV. Family Size preference and contraceptive behaviour- methods of contraception: conventional and modern methods- male and female; temporary methods; behavioural methods; mechanical contraceptives; chemical contraceptive; semi-permanent methods: abortion and I.U.C.D; permanent methods: vasectomy and tubectomy, advantages and disadvantages, medical termination of pregnancy act.

V. Approaches to family welfare planning: welfare approach, clinical, extension and educational approach and cafeteria approach; training and research in family welfare planning; mass media of

communication; national and international agencies of family welfare planning services; social work techniques in promoting parenthood.

References:

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Course Title: ORGANISATIONAL BEHAVIOUR

Semester No   : IV
Spceialisation Paper   : III d
Core Course   : XIII
Course Code   : CC XIII d

Introduction:

Organisational behaviour focuses on developing an understanding of the individual and group level factors that influence employee attitudes and behavior at work.

Objectives:

1. To know themselves and be able to recognise individual differences in others.
2. To understand OB theories that influence individual and group behaviour – perception, attitude formation, motivation, role theory etc.
3. To understand how to form effective work teams.
4. To understand how to change individual's attitude and motivation.
5. To understand how to build effective team leadership.

I. Focus and Purpose of OB : definition, need and importance of organisational behaviour nature and scope – framework – organisational behavior – models; **individual behaviour**: personality – types – factors influencing personality – theories; learning: learning process – learning theories – organisational behaviour modification; attitude: characteristics – components – formation; perception: importance – factors influencing perception; motivation – importance – types – effects on work behavior.

II. Group Behaviour: organisation structure – formation – groups in organisations – influence – group dynamics – emergence of informal leaders and working norms – group decision making techniques – interpersonal relations – communication – control – Hawthorne studies; **leadership and power** – meaning – importance – leadership styles – theories – leaders vs. managers – source of power – power centers – power and politics.

III. Dynamics of Organisational Behaviour: concept of organisational culture and climate – factors affecting organisational climate; job satisfaction – determinants – measurements; organisational change – importance – change process – resistance to change – managing change; organisational effectiveness – perspective and application of transactional analysis.

IV. Organisational Dynamics: leadership; process, styles, types and theories; Fiedler's contingency model, managerial grid, Redding's groups in organisation: nature, cohesiveness, performance, norms and work design for group (power, status, authority) and group dynamics; human engineering - man, machine system, human factors engineering and its applications: structural design, job design and work design, Hawthorne experiments; employee counselling; Japanese style of management and its applicability.

V. Organisational Development: concept, characteristics – objectives process/phases, theory and practice, interventions: quality circles; organizational change: process, resistance to change, planning and implementation & theories of change.

Reference:

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Prasad L.M., *Organisational Behaviour*, New Delhi, S.Chand & Co. 1996.

Robbins, Stephen P., Organizational *behavior: Concepts, controversies, and applications*. New Jersey, Prentice Hall, 1991.

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Course Title: **FIELD WORK PRACTICE**
Semester No   : IV
Core course   : XIV
Course Code   : CC-XIV

Objectives:

a. To be based on the student's specialisation
b. Agency placement for a minimum of 30 days for two to three days per week/semester
c. Content of Field work to be finalised between the concerned department and the placement agency according to the field of specialisation.

General Guidelines for Community Development
1. Exposure to DRDA/Panchayat Union and Panchayat administration
2. Orientation to community based surveys/PRA
3. Organise one need based community programme
4. Practice of Social Work methods in Community Settings (Rural/Urban Slum/Tribal areas)
5. Knowledge of CD programmes.

General Guidelines for Medical and Psychiatric Social Work Students
1. Practice of Social Case Work with at least five clients
2. Practice of Social Group Work with at least two groups
3. One Community based programme.

General Guidelines for F & C Welfare Specialisation
1. Exposure to family and child welfare programmes
2. Practice of social work methods – practice of social case work with at least five clients
3. Practice of social group work with at least two groups
4. One community based programme.

General Guidelines for HRM Students
1. Exposure to welfare measures and programmes in industries.
2. Orientation to IR activities/Trade Union
3. Understanding of Organisation profile/Organisational Culture
4. Knowledge of labour legislations.

Evaluation (Concurrent Field Work for Semester IV)

Internal Evaluation – 40 marks

1. Practice of Social Work Methods	- 10 marks
2. Contribution to the Agency	- 10 marks
3. Understanding the Agency and its Functional services	- 10 marks
4. Attendance	- 5 marks
5. Reporting	- 5 marks
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	40 marks

External Evaluation – 60 marks

1. Understanding of the agency and its services	- 15 marks
2. Theoretical Knowledge	- 15 marks
3. Practice Skills	- 20 marks
4. Communication & Presentation	- 10 marks
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	60 marks

Course Title: DISASTER MANAGEMENT

Semester   : IV
Elective Course   : IV
Course Code   : EC-IV

Introduction:
Disaster management is a process of pre disaster prevention, preparedness, education, and preparedness. It is important for Social Workers to learn this as they are involved in providing psychological assistance to survivors.

Course Objectives:
   a. To understand ecosystem equilibrium and disequilibrium
   b. To develop skills to analyse factors contributing disaster
   c. To develop an understanding of the process disaster of disaster
   d. To develop skills to participate in disaster management
   e. To develop an understanding of the social worker's role in the team for disaster management.

I. Disaster & Types:
a. Disaster: definition, dimensions of disaster, progress in vulnerability.

b. Types of disaster: *Water and climate related:* Floods and drainage management, droughts, cyclones, tsunami, tornadoes, hurricane, hailstorms, cloudburst, snow avalanches, heat and cold waves, thunder and lightening.
Geological related: Earthquakes, landslides, mudflows, sea erosion, dam bursts and dam failures, mine fires.
Chemical, industrial and nuclear related: road, rail transportation accidents including waterways – boat capsize, mine flooding, major building collapse, serial bomb blasts, festival related disasters, electrical disasters, fires, forest fires, mine flooding, oil spills, village fires.; *biological related:* biological disasters, epidemics, cattle and bird epidemics, pest attacks, food poisoning.

II. Phases:
a Phases of disaster (rescue, relief, rehabilitation, rebuilding). Rescue, relief phase: Need assessment, rescue and relief provisions by Army, Police, Fire services, Panchayat Raj institutions. Psychological first aid, health camps, relief center, water and sanitation issues, epidemic breakages in camps, climatic changes and seasonal variations; humanitarian concerns in relief provision; management of relief experts, volunteers, materials, equipment; standard operation procedure to deal with trigger mechanism.

b. Crisis and emergency management: government response system in disasters – central, state, district, taluk disaster management cell; trigger mechanisms – l1, l2, l3 levels of determination of disaster; BIRMS – Basic Initial Response Management Steps.

c. Communication systems during disasters: HAM (help all mankind) radio promotions, police wireless network, SMS, mobile services, satellite communications; warning systems in disasters.

IV. Impact of disaster:

a. Impact :
Physical, social, economic, and psychological impact of disasters.
 mpact on the individual, family, and community.

b. Compensation:
Compensation and legal issues among the disaster survivors.
Assessment of damage.
Providing compensation.
Corruption in compensation.

c. Housing support.
Housing and materialistic support for the disaster survivors.
Town planning after a major disaster.
Maintaining minimum standard

d. Livelihood and community micro planning:
Impact of disaster on livelihood and economic activities.
Livelihood options for the vulnerable groups
Creating self-sustenance among the disaster survivors.

IV. **Issues in disaster**:
a. Gender issues in disaster: Special needs of the women, increased vulnerability, problems of the women and care provisions; special issues of the women in human made disaster; role of the women organisations and government; special needs of the men groups and vulnerable men. working with PRI for Psychosocial care of the men.

b. Children in disaster:
Special needs of the children, adolescents and the vulnerable groups; role of child care personnel for the children affected by disaster. (Teachers/ICDS); empowering caregivers after the disaster; methods of working with children affected by disaster; community care vs. institutional care after the disaster for the vulnerable/ destitute children; foster caring of the destitute children after the disaster.

c.Disaster mental health and psychosocial care:
Psychological impact of disaster in different phase ;behavioural disorders subsequent to disasters including PTSD; methods of providing psychosocial care to the disaster survivors; principles of psychosocial care; techniques of providing psychosocial care; normalization model; needs of the special groups in disaster and psychosocial care.

d. Capacity building:
Capacity building: of governmental, non governmental, community based organizations, and the local community, spectrum of care, inter sectoral and coordinated care provision between organisations, disaster preparedness, disaster sub-culture, disaster resilience role of social workers in disaster services.

b. Policies and role of government sectors: role of state, central government, UN agencies, international organisations and NGOs, in disaster management services, India disaster management plan, quality assurance in disaster management – sphere, national health policy on disaster management, disaster survivors and human rights

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Narayanan, H.S., Sathyavathi, K., Nardev, G. and Thakrar, S (1987) Grief reactions among bereaved relatives following a fire disaster in a circus, NIMHANS Journal, 5(1), 13-21.

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Parasuraman, S. (Ed), Organisation and Administration of Relief and Rehabilitation following Marathwada Earthquake, Mumbai: Tata Institute of Social Sciences., 1993

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Sekar, K., Gargi, B., Subhasis, B., Jayakumar, C., Kishore, KVK. Tsunami – Psycho social care for children. NIMHANS, Bangalore, 2005 (English, Tamil, Telugu, Hindi)

Sekar, K., Sayani, P., Gargi, B., Subhasis, B., Jayakumar, C., Kishore, KVK. Tsunami – Psycho social care by community level workers. NIMHANS, Bangalore, 2005 (English, Tamil, Telugu, Hindi).

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Course Title: **BLOCK PLACEMENT (Internship)**

IV Semester
Elective Course - V
Course Code No: EC-V

Introduction:
This time is to be designed for the learner to integrate theory and practice to enhance competencies of social work practice and experience self in that role.

The internship must be for a minimum of one month in an organisation related to the candidate's specialisation.

Objectives:

   a. Develop enhanced practice skill and integrate learning.
   b. Develop greater understanding of reality situations through involvement in day to day work.
   c. Develop appreciation of other's efforts and develop sensitivity to gaps in the programme.
   d. Enhance awareness of self in the role of a professional social worker.

Evaluation:
40 marks   - Internal
30 marks   - Agency Evaluation
30 marks   - Viva-Voce by External Examiner

(**Note:** Common viva-vice for concurrent field work and Block placement at the end of IV semester with 30 marks)

Course Title: **RESEARCH PROJECT WORK**
IV Semester
Course Code: RPW

A learner should prepare and submit dissertation, under the guidance of a faculty The learner is to engage meaningfully in the process of problem formulation, review of literature related to the study, preparing the research proposal, choosing an appropriate research strategy and developing instruments of data collection, collecting the data, processing, analysing and interpreting the data and preparing the research report.

The length of the research report may be between 60-75 pages and not exceeding 100 pages

Assessment
Evaluation
Viva Voce

1. PROJECT REPORT EVALUATION (Both Internal & External)

    I. Plan of the Project   - 20 marks

    II. Execution of the Plan/collection of   - 45 marks
        Data / Organisation of Materials /
        Hypothesis, Testing etc and
        presentation of the report.

    III. Individual initiative   - 15 marks

2. Viva-Voce / Internal& External   - 20 marks

TOTAL   **- 100 marks**

Course Structure under CBCS for Master of Social Work (MSW)
(Applicable to the candidates admitted from the academic year 2016 – 2017 onwards)
SEMESTER PATTERN - REGULATIONS for affiliated colleges

1. Name of the course:
Bharathidasan University under choice based credit system (CBCS) is offering a two year MSW (Master of Social Work) degree course (Semester Pattern) in Social Work to be conducted in the University Department of Social Work with provision for a research project in the second year. The term credit is used to describe the quantum of syllabus for various programmes in terms of hours of study. Core and elective courses are a set of compulsory courses required for each programme. The minimum credit requirement for a two-year master's programme is 90

2. Eligibility for Admission:
A person who has passed any degree of this University or an examination of any other University accepted by the Bharathidasan University as equivalent thereto shall be eligible.

3. Selection procedure:
The selection of candidates will be made based on the marks obtained from the qualifying examinations.

4. Duration of the course:
The course for the degree of Master of Social Work shall consist of four semesters, two in the first year and two in the second year.

5. Semester Examination:
For the purpose of these regulations, the academic year shall be divided into two semesters, the first being from 1st July to 31st December and the second from 1st January to 30th June. Candidates who have failed in the University examination of any subject or subjects for the first, second, and third semesters will be permitted, to appear in each failed subject(s) in April/May and November/December.

A candidate should get registered for the first semester examination. He/she shall register for the subsequent semester examinations only after registering for the previous semester examinations.

6. Course features: The programme consists of core courses (CC) and elective courses (EC), distributed among the four semester periods. The courses include concurrent fieldwork practice, block placement, and research thesis work.

7. Field Work:
a) Field Work requirements include:
1. 100 % field work attendance
2. Appropriate code of conduct
3. Fulfilling the workload norms as prescribed by the department
4. Regular and timely submission of field work reports
5. Regular attendance of the field work Conference
b) Field work methodology:
Theory classes and field work are arranged on a concurrent basis. On concurrent field work days, there will be no classroom lectures and on such days students will report to the field work agencies. Field work may commence with orientation visits to selected welfare agencies followed by placement of students in field work agencies. The agencies selected for the field work programme should have a well defined practice training programme, willingness to give facilities

for the training of students, and a policy of maintaining high standards of service through application of the methods of Social Work.

c) Block field work (internship):
The block field work training is a mandatory requirement of a master degree in Social Work. After the fourth semester examinations, the students shall undergo a minimum of one month on the job training in an agency with respect to the field of specialisation of the students, with the approval of the department.

8. Research project work:
Every candidate shall be required to complete a research project on a topic related to his/her field of specialisation. Candidates shall select the topic of the research in consultation with the faculty supervisor. Each candidate shall submit one copy of his/her research project report in the prescribed format by the first week of March during the fourth semester.

9. Evaluation:

S.N	Components	Internal (CIA)		External (UE)		Total	
		Passing Minimum	Maximum	Passing Minimum	Maximum	Passing Minimum	Maximum
1	Theory	10	25	30	75	50	100
2	Practical/ Field Work	16	40	24	60	50	100
3	Research Project Work	**Dissertation** = 80 marks (passing min. 32 marks) **Viva** = 20 marks (passing min. 08 marks)				50	100

Separate passing minimum is prescribed for Internal **(CIA)** and External **(UE)**

The passing minimum for Internal (CIA) shall be 40 % out of 25 marks (i.e.10 marks)
The passing minimum for External (UE) shall be 40 % out of 75 marks (i.e. 30 marks)
The passing minimum for Internal Field Work (CIA) shall be 40 % out of 40 marks (i.e.16 marks)
The passing minimum for External Field Work (UE) shall be 40 % out of 60 marks (i.e. 24 marks)
The passing minimum for Dissertation valuation shall be 40% out of 80 marks (i.e. 32 marks)
The passing minimum for project viva shall be 40% out of 20 marks (i.e. 08 marks)

The total passing minimum of each course in MSW shall be 50% out of a total 100 marks (i.e. 50 marks)

10. SCHEME OF EXAMINATION
Note:
No. of Core Courses   : 14   4 courses x 4 credits   = 16
                                               10 courses x 5 credits   = 50
No. of Elective Courses   : 5   5 courses x 4 credits   = 20
Project Work   : 1   1 course x 4 credits   = 04
                                               Total Credits   = 90

M.A. English Syllabus under CBCS
(Applicable to the candidates admitted from the academic year 2016-2017 onwards)
updated on 21-12-2017

Sem ester	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks Int	Marks Ext.	Total
I	Core Course – I (CC)	Language and Linguistics	6	4	3	25	75	100
	Core Course – II (CC)	Modern Literature – I (1400 – 1660)	6	4	3	25	75	100
	Core Course – III (CC)	Modern Literature – II (1660 – 1798)	6	4	3	25	75	100
	Core Course – IV (CC)	Indian Writing in English	6	4	3	25	75	100
	Elective Course–I (EC)	Grammar, Rhetoric and Writing	6	4	3	25	75	100
		Total	**30**	**20**				**500**
II	Core Course – V (CC)	Modern Literature – III (1798 – 1832)	6	5	3	25	75	100
	Core Course – VI (CC)	Modern Literature – IV (1832 – 1945)	6	5	3	25	75	100
	Core Course – VII(CC)	Shakespeare	6	5	3	25	75	100
	Core Course – VIII(CC)	Literary Criticism	6	5	3	25	75	100
	Elective Course – II (EC)	Communicative Studies and Mass Media	6	4	3	25	75	100
		Total	**30**	**24**				**500**
III	Core Course - IX (CC)	American Literature	6	5	3	25	75	100
	Core Course – X (CC)	Theory of Comparative Literature and Classics in Translation	6	5	3	25	75	100
	Core Course – XI (CC)	Literary Theory	6	5	3	25	75	100
	Core Course – XII (CC)	Research Methodology	6	5	3	25	75	100
	Elective Course – III (EC)	Asian Literature in English	6	4	3	25	75	100
		Total	**30**	**24**				**500**
IV	Core Course - XIII CC)	New Literatures in English	6	5	3	25	75	100
	Core Course – XIV CC)	Translation: Theory and Practice	6	5	3	25	75	100
	Elective Course IV	Single-Author Study – Rabindranath Tagore	6	4	3	25	75	100
	Elective Course V	* English Literature for UGC Examinations	6	4	3	25	75	100
	Project Work Viva voce 20 marks Dissertation 80 marks		6	4	--	--	--	100
		Total	**30**	**22**	**--**	**--**	**--**	**500**
		Grand Total	**120**	**90**				**2000**

* Separate Question Paper Pattern for English Literature for UGC Examinations - Refer in syllabus

Core Papers   -   14
Elective Papers   -   5
Project   -   1

Note:

1. Theory: Internal   -   25 marks   External   -   75 marks
2. Project :   100 marks
          a) Dissertation   : 80 marks
          b) Viva voce   : 20 marks
3. Separate passing minimum is prescribed for Internal and External

   a) The passing minimum for CIA shall be 40% of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% of 75 marks (i.e. 30 marks)
   c) The passing minimum is 50 % in the aggregate

Core Course – I
Language and Linguistics

Objectives:

To provide learners an insight into the nature of language

To familiarise learners with the discourse of linguistics and to expose them to theoretical and practical manifestations of linguistics

To enable learners to understand the nexus between literature and society

Unit-I: Language History and the Process of Language Change
> The Origins of Language
> Development of Gesture, Sign, Words, Sounds, Speech and Writing
> Core Features of Human Language, Animals and Human Language

Unit-II: Nature of Language
> Pure Vowels, Diphthongs and Consonants
> Language Varieties: Dialects, Idiolect, Pidgin and Creole
> Language and Gender, Language and Disadvantage

Unit-III: Linguistic Form
> Morphology, Grammar, Syntax
> Saussurean Dichotomies: Synchronic and Diachronic Linguistics
> Semantics, Pragmatics

Unit-IV: Branches of Linguistics
> Structural Linguistics, Sociolinguistics, Psycholinguistics, Neurolinguistics, Applied Linguistics

Unit-V: Applied Linguistics
> Stylistics and Discourse Analysis: Relationship between Language and Literature, Style and Function, Poetic Discourse, Narrative Discourse and Dramatic Discourse
> Language Disorders: The Brain and Language Organisation, Aphasia, Dyslexia, Dysgraphia, Clinical Syndromes
> Lexicography: Monolingual Dictionary, Interlingual Dictionary, Structure and Equivalences, Problems of Intertranslatability, General and Special Purpose Dictionaries

Books for Reference:

Aitchison, J. *Linguistics: An Introduction*. London: Hodder & Stoughton, 1995.

Atkinson,M., Kilby,D. & Rocca,I. *Foundations of General Linguistics*. London: George Allen & Unwin, 1982.

Radford, A.et al. *Linguistics: An Introduction.* UK: Cambridge University Press,1999.

Wardhaugh, R. *An Introduction to Sociolinguistics*. Massachusetts: Blackwell, 1986.

Yule, G. *The Study of Language*. 4[th]edn. Cambridge: CUP, 2014.

Core Course – II
Modern Literature - I (1400 - 1660)

Objectives:

To introduce learners to the evolution of English poetry – Chaucer's period

To expose learners to the salient features of metaphysical poetry

To introduce learners to the origin of English essays

To make learners understand the features of tragedy, romantic tragedy, revenge play and comedy of humours of Shakespeare's predecessors

Unit – I (Poetry)

Geoffrey Chaucer	: "A Scholar from Oxford" from *The Prologue to the Canterbury Tales*
Edmund Spenser	: "Epithalamion"

Unit – II (Poetry)

John Donne	: "The Flea"
Andrew Marvell	: "To His Coy Mistress"
George Herbert	: "The Pulley"
Henry Vaughan	: "The Retreat"

Unit – III (Prose)

Francis Bacon	: "Of Truth," "Of Death," "Of Adversity"
The Bible	: Chapters 5 to 7 from the Gospel according to Matthew

Unit – IV (Drama)

Christopher Marlowe	: *The Jew of Malta*
John Webster	: *The White Devil*

Unit – V (Drama)

Thomas Kyd	: *The Spanish Tragedy*
Ben Jonson	: *Every Man in His Humour*

Books for Reference:

Bacon, Francis, and F G. Selby. *Bacon's Essays, Ed. with Introductions and Notes*. London: Macmillan, 1927.

Barton, Anne. *Ben Jonson, Dramatist*. Cambridge: Cambridge UP, 1984.

Bennett, Joan. *Five Metaphysical Poets: Donne, Herbert, Vaughan, Crashaw, Marvell*. Cambridge England: UP, 1964.

Daiches, David. *A Critical History of English Literature*. London: Secker & Warburg, 1960.

Donne, John, and Frank Kermode. *The Poems of John Donne*. New York: Heritage Press, 1970.

Levin, Harry. *Christopher Marlowe: The Overreacher*. London: Faber, 1961.

Minnis, A J. *The Cambridge Introduction to Chaucer*. N.p., 2014.

O'Neill, Judith. *Critics on Marlowe*. Coral Gables: U of Miami P, 1970.

Reeves, James. *A Short History of English Poetry, 1340-1940*. New York: Dutton, 1962.

Core Course – III
Modern Literature - II (1660 - 1798)

Objectives:

    To expose learners to the changing trends in English poetry from Milton to Pre-Romantics

    To make learners understand the prose allegory of the Restoration period and varied prose works of the Age of Pope

    To make learners know the salient features of anti-sentimental comedy and Restoration comedy

    To introduce learners to the emergence of the English novel during the Age of Transition

Unit – I (Poetry)

    John Milton   : *Paradise Lost* Book I

Unit – II (Poetry)

    John Dryden   : "Mac Flecknoe"

    Alexander Pope   : "The Rape of the Lock"

    Robert Burns   : "The Cotter's Saturday Night"

    William Blake   : "The Poison Tree"

Unit – III (Prose)

    John Bunyan   : *The Pilgrims Progress*

    Addison and Steele   : From *The Spectator*

                     "Of the Club" (Steele)

                     "Sir Roger at Church"(Addison)

    Jonathan Swift   : *Battle of the Books*

Unit – IV (Drama)

    Richard Brinsley Sheridan   : *The School for Scandal*

    William Congreve   : *The Way of the World*

Unit – V (Fiction)

    Daniel Defoe   : *Robinson Crusoe*

    Oliver Goldsmith   : *The Vicar of Wakefield*

Books for Reference:

Danielson, Dennis R. *The Cambridge Companion to Milton*. Cambridge: Cambridge UP, 1989.

Ford, Boris. *The New Pelican Guide to English Literature: - - a Guide for Readers. - 1984. - 544 S.* Harmondsworth: Penguin Books, 1983.

Humphreys, A R. *The Augustan World: Society, Thought, and Letters in Eighteenth-Century England*. New York: Harper & Row, 1963.

Morwood, James, and David Crane. *Sheridan Studies*. Cambridge: Cambridge UP, 1995.

Walker, Hugh. *English Satire and Satirists*. New York: Octagon Books, 1965.

Willey, Basil. *The Seventeenth Century Background: Studies in the Thought of the Age in Relation to Poetry and Religion*. Garden City: Doubleday, 1953.

Core Course – IV
Indian Writing in English

Objectives:

To enable learners to appreciate the changing trends, from Romantic to realistic, in Indian literature in English from pre to post-Independence era

To make learners aware of Indian sensibility in the representative works

Unit – I (Poetry)

Toru Dutt	: "Our Casuarina Tree"
Kamala Das	: "A Hot Noon in Malabar"
Nissim Ezekiel	: "The Professor"
A. K. Ramanujan	: "Obituary"
Keki. N. Daruwalla	: "The Epileptic"
R. Parthasarathy	: "River, Once"

Unit – II (Prose)

Jawaharlal Nehru	: "Through the Ages" (Chapter V of the *Discovery of India)*
Dr. S. Radhakrishnan	: "The World Community"

Unit – III (Drama)

Girish Karnad	: *The Fire and the Rain*
Mahesh Dattani	: *Tara*

Unit – IV (Fiction)

Mulk Raj Anand	: *Two Leaves and a Bud*
Raja Rao	: *The Cat and Shakespeare: A Tale of India*
R.K. Narayan	: *The Guide*

Unit – V (Fiction)

Kamala Markandaya	: *Nectar in a Sieve*
Anita Desai	: *Cry, the Peacock*
Shashi Deshpande	: *That Long Silence*

Books for Reference:

King, Bruce. *Modern Indian Poetry in English*. Delhi: Oxford UP, 1987.

King, Bruce. *Three Indian Poets: Nissim Ezekiel, A. K. Ramanujan, Dom Moraes*. Madras: Oxford UP, 1991.

McLeod, A L, and R K. Narayan. *R.K. Narayan: Critical Perspectives*. New Delhi: Sterling Publishers Private Ltd, 1994.

Mehrotra, Arvind K., ed. *An Illustrated History of Indian Literature in English*. New Delhi: Permanent Black, 2003.

Mukherjee, Meenakshi. *The Perishable Empire: Essays on Indian Writing in English*. New Delhi: Oxford UP, 2000.

Mukherjee, Meenakshi. *The Twice Born Fiction; Themes and Techniques of the Indian Novel in English*. New Delhi: Heinemann Educational Books, 1971.

Naik, M K. *Aspects of Indian Writing in English: Essays in Honour of Professor K. R. Srinivasa Iyengar*. Delhi: Macmillan, 1979.

Srinivasa, Iyengar K. R. *Indian Writing in English*. London: Asia Pub. House, 1962.

Tharu, Susie J, and K. Lalita. *Women Writing in India: 600 B.C. to the Present*. New York: Feminist P at the City U of New York, 1991.

Elective Course – I
Grammar, Rhetoric and Writing

Objectives:

To enable learners to understand the basics of grammar

To provide learners with the basics of rhetoric

To help learners write effective paragraphs and essays

To expose learners to various forms of discourse

Unit – I

Phrases – Clauses – Kinds of Sentences – Patterns of Sentences – Transformation of Sentences – Vocabulary – Punctuation

Unit – II

Definition of Rhetoric – Three Elements of Rhetoric: Presentative, Representative and Elaborative – Rhetorical Situation: Grammar, Logic, Aesthetics and Ethics – 5 Cannons of Rhetoric: Inventive, Arrangement, Style, Memory and Delivery – Art of Discourse

Unit – III

Topic Sentence, Paragraph Unity: Coherence and Flow, Methods of Developing Paragraphs, Discourse Markers

Unit – IV

Structure of an Essay: Beginning, Middle and Closing, Tight and Loose Organization

Unit – V

Four Kinds of Discourse: Exposition, Argumentation, Description, Narration

Books for Reference:

Boulton, Marjorie. *The Anatomy of Prose*. London: Routledge & Paul, 1954.

Miriam, Joseph, and Marguerite McGlinn. *The Trivium: The Liberal Arts of Logic, Grammar, and Rhetoric: Understanding the Nature and Function of Language*. N.p., 2002.

Weston, Anthony. *A Rulebook for Arguments*. Indianapolis: Hackett Pub, 2009.

Yáñez-Bouza, Nuria. *Grammar, Rhetoric and Usage in English: Preposition Placement, 1500-1900*. Cambridge: Cambridge UP, 2015.

Core Course – V

Modern Literature - III (1798 – 1832)

Objectives:

To familiarize learners with the characteristics of Romantic poetry

To acquaint learners with the unique qualities of the essays of Lamb and Hazlitt

To make learners aware of the characteristics of Scott's and Jane Austen's novels

Unit – I (Poetry)

William Wordsworth	: "Lines Composed a Few Miles above Tintern Abbey"
S.T. Coleridge	: "Kubla Khan"
Walter Scott	: "The Lady of the Lake"

Unit – II (Poetry)

John Keats	: "Ode on a Grecian Urn"
P. B. Shelley	: "The Cloud"
Lord Byron	: "Youth and Age"

Unit – III (Prose)

Charles Lamb	: "A Dissertation upon a Roast Pig"
William Hazlitt	: "On Reading Old Books"

Unit – IV (Drama)

P. B. Shelley	: *Prometheus Unbound*

Unit –V (Fiction)

Jane Austen	: *Emma*
Walter Scott	: *Ivanhoe*

Books for Reference:

Abrams, M H. *English Romantic Poets. Modern Essays in Criticism.* London: Oxford UP, 1967.

Bowra, C M. *The Romantic Imagination.* Cambridge: Harvard UP, 1949.

Butler, Marilyn. *Romantics, Rebels, and Reactionaries: English Literature and Its Background, 1760-1830.* New York: Oxford UP, 1982.

Kettle, Arnold. *An Introduction to the English Novel: Vol. II.* London etc.: Hutchinson's U Library, 1953.

King-Hele, Desmond. *Shelley: His Thought and Work.* Teaneck N.J.: Fairleigh Dickinson UP, 1971.

Kirkham, Margaret. *Jane Austen, Feminism and Fiction.* London: Athlone Press, 1997.

Lamb, Charles, and Ernest D. North. *The Wit and Wisdom of Charles Lamb.* Folcroft: Folcroft Library Editions, 1974.

Prickett, Stephen. *Coleridge and Wordsworth: The Poetry of Growth.* Cambridge: Cambridge UP, 1970.

Reeves, James. *A Short History of English Poetry, 1340-1940.* New York: Dutton, 1962.

Wasserman, Earl R, and John Keats. *The Finer Tone: Keats' Major Poems.* Baltimore: John Hopkins Press, 1953.

Wright, Andrew. *Jane Austen's Novels: A Study in Structure.* New York: Oxford UP, 1953.

Core Course – VI

Modern Literature – IV (1832 - 1945)

Objectives:

To enable learners to understand the spirit of Victorian England and its influence on poetry

To help learners appreciate the revolution brought about through Aesthetic Movement and anti-Victorian Movement in poetry, drama and novel during the Age of Hardy

To expose learners to various aspects of the works of T.S. Eliot

Unit – I (Poetry)

Matthew Arnold	: "The Scholar Gypsy"
Robert Browning	: "Fra Lippo Lippi"
Alfred Tennyson	: "Tithonus"

Unit – II (Poetry)

W. B. Yeats	: "The Second Coming"
G. M. Hopkins	: "The Pied Beauty"
T. S. Eliot	: Section V "What the Thunder Said?" from *The Wasteland*
W. H. Auden	: "The Shield of Achilles"
Wilfred Owen	: "The Strange Meeting"

Unit – III (Prose)

Thomas Carlyle	: "Hero as a Man of Letters"
John Ruskin	: "Of Queens' Gardens"
E. M. Forster	: "Notes on the English Character"

Unit – IV (Drama)

T. S. Eliot	: *Murder in the Cathedral*
G. B. Shaw	: *The Apple Cart*
Harold Pinter	: *The Birthday Party*

Unit – V (Fiction)

Charles Dickens	: *Great Expectations*
Thomas Hardy	: *Far from the Madding Crowd*
D.H. Lawrence	: *The Rainbow*

Books for Reference:

Batho, Edith C, Bonamy Dobrée, and Guy Chapman. *The Victorians and After, 1830-1914*. London: Cresset, 1962.

Cecil, David. *Early Victorian Novelists: Essays in Revaluation*. London: Constable & Co., Ltd, 1934.

Colin Clarke. ed. *D.H. Lawrence: The Rainbow and Women in Love*. London: Macmillan, 1979.

Gassner, John. *An Anthology. Introduction to the Drama*. New York: Holt, Rinehart and Winston, 1963.

Gransden, K W. *E.M. Forster*. New York: Grove Press, 1962.

Leavis, F R, and Q D. Leavis. *Dickens, the Novelist*. New York: Pantheon Books, 1971.

M. Esslin. *The Theater of the Absurd*. London: Eyer & Spottiswoode, 1964.

Malins, Edward G. *A Preface to Yeats*. New York: Scribner, 1974.

Martin, Jay, and T S. Eliot. *A Collection of Critical Essays on "The Waste Land."* Englewood Cliffs: Prentice-Hall, 1968.

R. Corrigan. *Theatre in the Twentieth Century*., New York: Grove Press, 1961.

Smith, Stan. *The Cambridge Companion to W.H. Auden*. Cambridge: Cambridge UP, 2004.

Core Course –VII
Shakespeare

Objectives:

To expose learners to the development of linguistic, social, psychological and existential skills through a few representative plays of Shakespeare

To make learners understand the characterization, dramatic and poetic techniques of Shakespeare

Unit – I

Macbeth

Unit – II

As You Like It

Unit – III

Richard II

Unit – IV

The Tempest

Unit – V

Shakespearean Theatre and Audience
Shakespearean Fools and Clowns
Shakespearean Women
Supernatural Elements in Shakespearean Plays
Shakespearean Soliloquies
Shakespeare as a Sonneteer and a Narrative Poet

Books for Reference:

Bowers, Fredson. *Elizabethan Revenge Tragedy: 1587-1642*. Gloucester: Peter Smith, 1959.
Bradley, A C. *Shakespearean Tragedy: Lectures on Hamlet, Othello, King Lear, Macbeth*. London: Macmillan and Co, 1905.
Charlton, H B. *Shakespearean Comedy*. London: Methuen, 1938.
Ford, Boris. *The Age of Shakespeare*. Harmondsworth: Penguin Books, 1982.
Knight, G W. *The Imperial Theme: Further Interpretations of Shakespeare's Tragedies, Including the Roman Plays*. London: Methuen, 1951.

Core Course – VIII
Literary Criticism

Objectives:

        To help learners develop literary sensibility and critical thinking

        To make learners understand a wide range of literary texts, literary history and literary criticism

        To introduce learners to a variety of critical approaches to perceive the paradigm shift through the critical texts from Plato to T.S. Eliot

Unit I

Plato	: *The Ion* (679-681)
	The Republic (681-685)
Aristotle	: *On Poetics* (686-696)
Horace	: *The Art of Poetry* (696-700)
Longinus	: *On the Sublime* (706-708)
	(Extracts from *The English Critical Tradition* Vol.2 by S. Ramaswami and V. S. Sethuraman)

Unit II

Philip Sidney	: *Apology for Poetry*

Unit III

John Dryden	: *An Essay on Dramatic Poesie*
Dr. Johnson	: *Preface to Shakespeare*

Unit IV

William Wordsworth	: *Preface to the Lyrical Ballads*
S. T. Coleridge	: *Biographia Literaria* Chapter XIV

Unit V

Matthew Arnold	: *The Study of Poetry*
T. S. Eliot	: *Tradition and the Individual Talent*

Books for Reference:

David Daiches: *Critical Approaches to Literature*, 2nd ed., Hyderabad: Orient Longman, 2001.

Enright, D J, and Chickera E. De. *English Critical Texts: 16th Century to 20th Century*. Delhi: Oxford UP, 1983.

Harry Blamires: *A History of Literary Criticism*, Delhi: Macmillan, 2001.

Humphrey House: *Aristotle's Poetics*, Ludhiana: Kalyani Publishers, 1970.

M.A.R. Habib: *A History of Literary Criticism: From Plato to the Present*, Oxford: Blackwell, 2005.

M.S. Nagarajan: *English Literary Criticism & Theory: An Introductory History*, Hyderabad: Orient Longman, 2006.

Patricia Waugh: *Literary Theory & Criticism: An Oxford Guide*, Delhi: OUP, 2006.

S, Ramaswami, and Sethuraman V. S. *The English Critical Tradition: An Anthology of English Literary Criticism*. Vol. 2 Macmillan India Limited, 2000.

Elective Course – II
Communication Studies and Mass Media

Objectives:

    To introduce learners to different types of communication

    To expose learners to the functions of mass media and mass culture and popular culture

    To make learners understand various aspects of mass media

Unit – I

    Definition of Communication – Verbal and Non-verbal Communication – Elements of Communication – Models of Communication – Barriers to Communication – 7 Cs of Communication

Unit – II

    Differentiation between 'language' (generic) and 'a language' (individual) – Purposes of Language – Persuading, Questioning, Directing, Providing Aesthetic Pleasure, Informing – Context of Communication – Intrapersonal, Interpersonal, Small group, Organization, Academic, Public, Intercultural

Unit –III

    Mass Media – Definition and Classification – Functions – Agenda Setting – Reality Defining and Constructing – Social Control – Distribution of Knowledge – Mass Media Theory – Information Age

Unit – IV

    Mass Culture and Popular Culture – Mass Communication and Social Change – Mass Communication and Culture – Morals and Decency

Unit – V

    The Rise of Mass Media - Media Diversity and Its Benefits – Types of Mass Media – Print Media – Electronic Media – New Age Media (Mobile, Internet) Media and Its Effects – E-Publishing – Photo Journalism – Blog Writing

Books for Reference:

Allan and Barbara Pease. *The Definitive Book of Body Language*, New Delhi: Munjal Publishing House, 2005.

Corner, John, and Jeremy Hawthorn. *Communication Studies: An Introductory Reader*. London: E. Arnold, 1993.

D.M. Silviera. *Personal Growth Companion*. New Delhi: Classic Publishing,1996.

Dan Laughey. *Key Themes in Media Theories*. New Delhi: Rawat Publication, 2008.

De Fleur, M. *Theories of Mass Communication*, 2nd Edition, New York; David Mc Kay, 1970.

 J. S. Yadava & Pradeep Mathur. *Issues in Mass Communication*: The Basic Concepts, Kanishka Publishers, Delhi, 2008.

Kumar, Kewal J. *Mass Communication in India*, New Delhi: Jaico Books, 2013.

McQuail, Denis. *Mass Communication Theory: An Introduction*. London: Sage Publications, 1983.

Shymali Bhattacharjee. *Media and Mass Communication: An Introduction*, Kanishka Publishers, Delhi, 2005.

Tubbs, S. L. and Moss, S. *Human Communication: Principles and Contexts*, New York: McGraw Hill, 2007.

Zeuschner, R. *Communicating Today*, Boston: Allyn and Bacon, (Chs. 5, 17), 2002.

Core Course – IX

American Literature

Objectives:

To introduce learners to significant aspects in various genres of American literature

To help learners get acquainted with the richness of American literature through representative works of poets, essayists, playwrights and novelists

Unit – I (Poetry)

Edgar Allan Poe	: "The Raven"
Walt Whitman	: "When Lilacs Last in the Dooryard Bloom'd"
Emily Dickinson	: "Because I Could Not Stop for Death"
Robert Frost	: "Birches"

Unit – II (Poetry)

Hart Crane	: "Poem: To Brooklyn Bridge"
e. e. cummings	: "The Grasshopper"
Wallace Stevens	: "The Emperor of Ice-Cream"
William Carlos Williams	: "Yachts"
Sylvia Plath	: "Daddy"

Unit – III (Prose)

Ralph Waldo Emerson	: "Self-reliance"
Henry David Thoreau	: "Where I Lived and What I Lived for?" from *Walden Pond*
John F. Kennedy	: "Inaugural Address" (Presidential Inauguration of John. F. Kennedy on January 20, 1961 at Washington, D.C)

Unit – IV (Drama)

Eugene O'Neill	: *Emperor Jones*
Arthur Miller	: *All My Sons*

Unit – V (Fiction)

Mark Twain	: *Huckleberry Finn*
Ernest Hemingway	: *For Whom the Bell Tolls*

Books for Reference:

Cunliffe, Marcus. *American Literature to 1900*. New York: P. Bedrick Books, 1987.

Matthiessen, F O. *American Renaissance: Art and Expression in the Age of Emerson and Whitman*. N.p., 1941.

McMichael, George L, and Frederick C. Crews. *Concise Anthology of American Literature*. New York: Macmillan, 1985.

Spiller, Robert E. *Literary History of the United States*. New York: Macmillan, 1963.

Core Course – X
Theory of Comparative Literature and Classics in Translation

Objectives:

To expose learners to the scope, methodology and application of the theories in comparative literature

To help learners understand the thematology and genre studies

To make learners know a few representative classics in translation

Unit – I

Definition and Theory of Comparative Literature – Scope, Methodology, Application – National Literature – Comparative Literature – French and American School

Unit – II

Influence and Imitation – Epoch, Period, Generation – Thematology, Comparing Works on the Basis of Themes – Genres, Comparing Works on the Basis of Form

Unit – III

Literature and Society, Literature and Religion, Literature and Psychology – Comparative Literature in India

Unit – IV

G.U. Pope	: Three Chapters from the translation of *Tirukkural*:
	"Compassion"
	"Veracity"
	"Hospitality"
Aesychylus	: *Agamemnon*
Goethe	: *The Nearness of the Beloved*

Unit – V

Franz Kafka	: "Metamorphosis"
Leo Tolstoy	: "How much Land Does a Man Require?"
Omar Khayyam	: *The Rubaiyat*

Books for Reference:

Bhatnagar, M K. *Comparative English Literature*. New Delhi: Atlantic Publishers and Distributors, 1999.

George, K M. *Comparative Indian Literature*. Trichur: Kerala Sahitya Akademi, 1984.

Pawar S. *Comparative Literary Studies: An Introduction*. Duckworth N.p., 1973.

Weisstein, Ulrich. *Comparative Literature and Literary Theory: Survey and Introduction*. Bloomington: Indiana UP, 1974.

Wellek, René, and Austin Warren. *Theory of Literature*. New York: Harcourt, Brace, 1993.

Core Course – XI
Literary Theory

Objectives:

To introduce learners to literary theory from the beginning of the twentieth century to the present day

To help learners apply theory in the analysis of literary texts

To enable learners to understand a wide range of theoretical perspectives to enhance their appreciation of literary texts

Unit- I

New Criticism, Semiotics, Formalism

Unit-II

Structuralism, Poststructuralism, Deconstruction

Unit-III

Modernism, Postmodernism, New Historicism and Cultural Materialism, Magical Realism

Unit-IV

Feminism, Neo – Feminism, Queer Theory, Ecocriticism, Marxism, Neo – Marxism, Colonialism, Postcolonialism

Unit-V

Intertextuality,
Phenomenology, Hermeneutics, Reader-Response Criticism,
Narratology, Discourse Analysis, Stylistics

Books for Reference:

Abrams M.H, Harphman Geoffrey. *A Handbook of Literary Terms*. New Delhi: Cleanage, 2007.

Barry, Peter. *Beginning Theory: An Introduction to Literary and Cultural Theory*. Manchester: Manchester UP, 2009.

Culler, Jonathan. *Literary Theory*. New Delhi: Oxford UP, 2011.

Said, Edward W. *Orientalism*. London: Vintage Books, 1979.

Showalter, Elaine. *Towards a Feminist Poetics. Twentieth Century Literary Theory*. Ed. K.M. Newton. London: Macmillan, 1988.

Habib, M.A.R, *A History of Literary Criticism: From Plato to the Present,* USA: Blackwell Publishing, 2005.

Core Course – XII
Research Methodology

Objectives:

To expose learners to philosophy of research
To enable learners to use different research sources and document them
To make learners know the format of research and mechanics of writing

Unit I

Definition of Research – Types of Research – Literary and Scientific Research – Philosophy of Research, Preliminary Study, Choosing a Viable Topic, Primary and Secondary Sources

Unit II

The Modern Academic Library, Research Sources: Printed and Electronic Including Web Sources, Digital Library Sources, Identifying the Right Sources, Compiling Working Bibliography. Evaluating the Sources

Unit III

Taking Notes and Collecting Materials
Thesis Statement, Working Outline, Preparing Samples,
Writing Drafts – Revising the Outline and Drafts
The Introduction and the Conclusion – the Main Chapters: Clarity, Unity, Coherence, Emphasis, Interest, Point of view

Unit IV

The Format of the Thesis, Preparing the Final Outline and Final Draft– Organizing Principles and Methods of Development, Plagiarism, Converting the Working Bibliography to List of Works-Cited, Abbreviations, Proof Reading

Unit V

Language and Style of Thesis Writing: General principles – Kinds and Suitability of Style, Style Sheet Conventions, Documentation: Parenthetical Documentation, Foot Notes, End Notes
The Mechanics of Writing: Spelling, Punctuation, Quotations, etc.

Books for Reference:

Gibaldi, Joseph. *MLA Handbook for Writers of Research Papers*. 7th Edition, 2009.
Moore, Robert H. *Effective Writing*. New York: Holt, Rinehart and Winston, 1965.

Objectives:
> To familiarize learners with Asian writers in English
> To make learners aware of various Asian cultures through representative texts of Asian Literature in English

Unit – I (Poetry)

Bei Dao (Chinese)	: "Moon Festival"
Balkrishna Sama (Nepali)	: "The Song"
Faiz Ahmed Faiz (Pakistani)	: "When Autumn Came"

Unit – II(Prose)

Lafcadio Hearn (Japanese)	: "Mosquitoes"
J. Vijayatunga (Sri Lankan)	: "Village Goes Town"

Unit – III(Drama)

Frank Chin (Chinese)	: *The Year of Dragon*
Zeami Motokiyo (Japanese)	: *Hogoromo [The Feather Mantle]*

Unit – IV(Short Story)

Sunethra Rajakarunanayake (Sri Lankan)	: "SMS"
Lu Hsun (Chinese)	: "A Little Incident"
Zawgyi (Myanmar)	: "His Spouse"

Unit – V(Fiction)

Kamila Shamsie (Pakistani)	: *Kartography*
Kyung-sook Shin (Korean)	: *Please Look After Mom*

Books for Reference:

Azim, Firdous, and Niaz Zaman. *Galpa: Short Stories by Women from Bangladesh*. Dhaka: Rachana, Writers.ink, 2006.

Ganesan.S. *Asian Voices: An Anthology of Asian Writings in English.* Chennai: New Century Book House, 2015.

Shamsie, Muneeza. *And the World Changed: Contemporary Stories by Pakistani Women*. N.p., 2008.

Tyler, Royall. Ed. & Trans. *Japanese No Dramas*. London: Penguin Books, 2004.

Wijesinha, Rajiva. *Bridging Connections: An Anthology of Sri Lankan Short Stories*. New Delhi: National Book Trust, 2007.

Core Course – XIII
New Literatures in English

Objectives:

To make learners familiarize with writers of new literatures

To enable learners to appreciate various cultures

Unit – I (Poetry)

David Diop	: "Africa"
Wole Soyinka	: "Telephone Conversation"
Judith Wright	: "Fire at Murdering Hut"
A.D. Hope	: "Australia"

Unit – II (Poetry)

Archibald Lampman	: "A January Morning"
F.R. Scott	: "The Canadian Authors Meet"
Margaret Atwood	: "Journey to the Interior"
Leonard Cohen	: "If It Were Spring"

Unit – III (Prose)

Stuart Hall	: "Cultural Identity and Diaspora"
Chinua Achebe	: "Marriage is a Private Affair

Unit – IV(Drama)

Wole Soyinka	: *The Swamp Dwellers*
Tomson Highway	: *Dry Lips Oughta Move to Kapuskasing*

Unit – V(Fiction)

Adele Wiseman	: *Crackpot*
Margaret Laurence	: *Stone Angel*

Books for Reference:

Oyekan Owomoyela. *A History of Twentieth-Century African Literatures*. University of Nebraska Press, 1993.

Irele, Abiola. F.*The African Imagination: Literature in Africa and the Black Diaspora*. Oxford University Press, 2001.

David I. Ker. *The African Novel and the Modernist Tradition*. Peter Lang Publishing, 1998.

Parekh, Pushpa Naidu and Siga Fatima Jagne. *Postcolonial African Writers: A Bio-Bibliographical Critical Sourcebook*. Greenwood Press, 1998.

Andrew Taylor. *Reading Australian Poetry*. Queensland: U of Queensland P 1987.

Malcolm Ross. *"Introduction". Poets of the Confederation*. Toronto: McLelland and Stewart, 1960.

John W. Garvin. ed. *"Archibald Lampman". Canadian Poets and Poetry*. Toronto, Ontario: McClelland, Goodchild & Stewart. 1916.

Gary Geddes. ed. *Fifteen Canadian Poets*. Toronto: Oxford University Press, 2001.

Birney, Earle. ed. *Twentieth-Century Canadian Poetry: An Anthology*. Toronto: Ryerson Press, 1953.

Angela, McRobbie. *Stuart Hall, Cultural Studies and the Rise of Black and Asian British Art*. 2016.

Panofsky, Ruth. *The Force of Vocation: The Literary Career of Adele Wiseman*. University of Manitoba Press. 2006.

Core Course – XIV
Translation: Theory and Practice

Objectives:
> To familiarize learners with the history and theories of translation
> To introduce learners to the techniques involved in translation of literary and non-
> literary texts
> To enhance the employability of the learners as translators

Unit – I
> A Brief History of Translation and Translation Theory, Aspects of Translation Theory

Unit – II
> Types of Translation Procedure, Communicative and Semantic Translation

Unit – III
> Translation Procedures, Translation Process and Synonymy, Translation and the Meta Lingual
> Function of Translation

Unit – IV
> Linguistics and Translation, Theories of Translation, Equivalence in Translation, Problems in
> Translation – Untranslatability

Unit – V
> Translation Practice in Tamil and English – Proverbs and Prose Passages

Books for Reference:

Bassnett, Susan. *Translation Studies*. London: Methuen, 2002.

Malmkjær, Kirsten, and Kevin Windle. *The Oxford Handbook of Translation Studies*. Oxford: Oxford
UP, 2011.

Munday, Jeremy. *Translation: An Advanced Resource Book*. Taylor & Francis, 2004.

Newmark, Peter. *Approaches to Translation*. Oxford: Pergamon Press, 1981.

Venuti, Lawrence. *The Translation Studies Reader*. New York: Routledge, 2004.

Objectives:

To initiate learners into the study of Tagore's works and his narrative techniques
To expose learners to the aspects of Indian civilization and culture with reference to Tagore

Unit – I (Poetry)

Gitanjali– Verses II, VIII, IX, XIX, XXXI, XXXV, XXXVI, XLI, XLV, L, LI, LXII, LXXVI, LXXXVI, XC

Unit – II (Prose)

From *The Religion of Man*
"Man's Universe" (Chapter – I)
"The Creative Spirit" (Chapter – II)

Unit – III (Drama)

Sacrifice
The King and the Queen

Unit – IV (Short Stories)

"Kabuliwala"
"Subha"
"My Lord, The Baby"

Unit – V (Fiction)

Gora

Books for Reference:

Banerjee, Hiranmay. *How Thou Singest of My Spirit! A Study of Tagore's Poetry* 1961.
A.C. Bose. *Three Mystic Poets.* School and College Book Stall, 1945.
Radhakrishnan, S. *A Centenary Volume Rabindranath Tagore 1861-1961*. New Delhi: Sahitya Akademi, 1992.
Dhoomketu. *Gitanjali Bhavanuvad*. Ahmedabad: Gurjar, 2007
Dutta, Krishna and Robinson Andrew.eds. *Rabindranath Tagore: An Anthology*, London: Macmillan Publisher Ltd. 1997.
Ghosh, Sisir Kumar. *Rabindranath Tagore.* New Delhi: Sahitya Akademi, 2005.
Iyengar, Srinivasa. R.K. *Rabindranath Tagore.* Bombay: Popular Prakashan, 1965.
Kripalani, Krishna. *Modern Indian Literature*. Bombay: Niramal Bhatkal. 1968.
Radhakrishnan, S. *The Philosophy of Rabindranath Tagore*. London: MacMillan, 1919.

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Elective Course – V

<u>English Literature for UGC Examinations</u>

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Objectives:

      To help learners have a wide range of knowledge in literature – poetry, prose, drama, short story and novel

      To help learners prepare for UGC Eligibility tests for JRF and Assistant Professorship

Unit – I

      Chaucer to Shakespeare

      Jacobean to Restoration

Unit – II

      Romantic Period

      Victorian Period

Unit – III

      Modern Period

      Contemporary Period

Unit – IV

      American Literature

      New Literatures in English (Indian, Canadian, African, Australian)

      English Language Teaching

      Translation Studies

Unit – V

      Classicism to New Criticism

      Contemporary Theory

Books for Reference:

D, Benet E., and Samuel Rufus. *NET. SET..GO… English*. N.p., 2014.

Masih, K. Ivan. et.al. *An Objective Approach to English Literature: For NET, JRF, SLET and Pre-Ph.D. Registration Test*. New Delhi: Atlantic Publishers, 2007.

Time : 3 hrs   Max : 75 Marks

<u>There are 75 multiple choice questions. Attempt all the 75 questions</u>   (75 x 1 = 75 marks)

Each multiple choice question has 4 alternative responses marked (a), (b), (c), or (d). Tick the right responses against each item.

1. Queen Isabella is a character in _____
    a.Richard II   b. Richard III   c. Edward II   d. none of these

2. One of the following poems is not written by A.K. Ramanujan
    a.”The Snakes” b.”The Striders”   c.”Breaded Fish” d.”Philosophy”

3. Which metrical foot is the opposite of an iamb?
    a. dactyl   b.trochee   c.anapaest   d.spondee

4. The poem "To Brookiyn Bridge" opens with the image of _____ flying above the girders of the bridge
    a. an eagle   b.a sparrow   c. a seagull   d.a dove

5. Who says that Shakespeare was not of an age but for all time ?
    a. Dr. Johnson   b.Dryden   c. Ben Jonson   d.T.S. Eliot

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI -620024
M.A Sanskrit Syllabus under CBCS
(For the candidate admitted from the academic year 2016-17 onwards)

Seme ster	Course	Course Title	Ins. Hrs /week	Cred it	Exam Hrs	Marks		Total
						Int	Ext	
I	Core Course – I (CC)	Classical Poetry नैषधीयचरितम् (१ सर्गः) of श्रीहर्षः	6	4	3	25	75	100
	Core Course – II (CC)	Classical Prose कादम्बरीसङ्ग्रहः of कृष्णमाचार्यः	6	4	3	25	75	100
	Core Course – III (CC)	Drama पाञ्चरात्रम् of भासः	6	4	3	25	75	100
	Core Course – IV (CC)	Lyrics नारायणीयम् of नारायणभट्टः	6	4	3	25	75	100
	Elective Course – I (EC)	Ayurveda आयुर्वेदोपदेशः vol. - २ Ed. Rajeshwara Sharma	6	4	3	25	75	100
		Total	**30**	**20**	--	--	--	**500**
II	Core Course – V (CC)	Etymology निरुक्तम् of यास्कः	6	5	3	25	75	100
	Core Course – VI (CC)	Poetics –I प्रतापरुद्रीयम् of विद्यानाथः	6	5	3	25	75	100
	Core Course – VII (CC)	Vedanta –I विवेकचूडामणिः of शङ्कराचार्यः	6	5	3	25	75	100
	Core Course – VIII (CC)	Scientific Literature	6	5	3	25	75	100
	Elec. Course –II (EC)	**Didactic Lyric -** नीतिशतकम् of भर्तृहरिः	6	4	3	25	75	100
		Total	**30**	**24**	--	--	--	**500**
III	Core Course – IX (CC)	Poetics – II काव्यप्रकाशः of मम्मटः	6	5	3	25	75	100
	Core Course – X (CC)	Grammar सिद्धान्तकौमुदी of भट्टोजि दीक्षितः	6	5	3	25	75	100
	Core Course – XI (CC)	Yoga योगसूत्राणि of पतञ्जलिः	6	5	3	25	75	100
	Core Course – XII (CC)	Nyaya तर्कसंग्रह-दीपिका of अन्नंभट्टः	6	5	3	25	75	100
	Elec. Course –III (EC)	Philosophical Traditions षड्दर्शनसमुच्चयः of हरिभद्रसूरिः	6	4	3	25	75	100
		Total	**30**	**24**	--	--	--	**500**

IV	Core Course – XIII (CC)	Samkhya सांख्यकारिका of ईश्वरकृष्णः	6	5	3	25	75	100
	Core Course – XIV (CC)	Poetics –III ध्वन्यालोकः (1,2) of आनन्दवर्धनः	6	5	3	25	75	100
	Elective Course – IV (EC)	Vedanta-II यतीन्द्रमतदीपिका of श्रीनिवासः	6	4	3	25	75	100
	Elective Course – V (EC)	Citra Kavyam & Prosody पादुकासहस्रम् - चित्रपद्धतिः -२० श्लोकाः of वेङ्कटनाथः श्रुतबोधः of कालिदासः	6	4	3	25	75	100
	Project	Dissertation - 80 + Viva -20	6	4	--	--	--	100
		Total	**30**	**22**	--	--	--	**500**
		Grand Total	**120**	**90**				**2000**

Note:

Project	:100 Marks
Dissertation	: 80 Marks
Viva Voice	: 20 Marks

Core Papers	-	14
Elective Papers	-	5
Project	-	1

Note:

1. Theory Internal   25 marks   External   75 marks

2. Separate Passing Minimum is prescribed for Internal and External

   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The Passing minimum not less than 50 % in the aggregate

References / Text Books contain the following details :

   I.   Name of the Author
   II.   Title of the Book
   III.   Name of the Publisher
   IV.   Year

Core Course – I
Classical Poetry - नैषधीयचरितम् (१ सर्गः) of श्रीहर्षः

Objective	**:**	**To impart good language skill by introducing a tough classical work**
Unit- I	**:**	Introduction to Mahakavyas, Sri Harsa – verses 1-25
Unit – II	**:**	verses 26-50
Unit-III	**:**	verses 51-75
Unit- IV	**:**	verses 76-100
Unit- V	**:**	verses 100-146

Prescribed book: Naishadiiyacaritam of SriHarsa
Pub. Nirnayasagar Press, Bombay 1952

Core Course – II
Classical Prose - कादम्बरीसङ्ग्रहः (Till अच्छोदसरः) of कृष्णमाचार्यः

Objective	**:**	**To give a good exposure to Classical Prose**
Unit- I	**:**	Introduction to Prose Romances in Sanskrit, Kadambari of Bana Bhatta आसीदशेषनरपति .... मृगया कोलाहलध्वनिरुदचरत्।
Unit – II	**:**	आकर्ण्य च .... उज्जयनी नाम नगरी।
Unit-III	**:**	यस्यां च निशि निशि ... द्विगुणतरमुत्सवमकारयत्।
Unit- IV	**:**	अतिक्रान्ते च … विह्वला हि राजप्रकृतिः।
Unit- V	**:**	आलोक्य तु ... अच्छोदं नाम सरं दृष्टवान्।

Prescribed book: Kadambarisangraha by Pandit R.V. Krishnamacharya
Published by : Smt. R.P. Rajam, 10, L.I.C. Colony,
Chennai - 85

<div align="center">

Core Course – III

Drama - पाञ्चरात्रम् of भासः

</div>

Objective	**:**	**To provide an introction to simple but innovative plays in Samskrit**
Unit- I	**:**	Introduction to Sanskrit plays, Bhasa – date & works, Pancaratram –story in Mahabharatam
Unit – II	**:**	Act –I of Pancaratram
Unit-III	**:**	Act –II of Pancaratram
Unit- IV	**:**	Act –III of Pancaratram
Unit- V	**:**	Deviations in story & characters in the play from Mahabharatam

Prescribed book: Pancaratram of Bhasa Samskrita Sahitya Sadana, Mysore.1958

<div align="center">

Core Course – IV

Lyrics- नारायणीयम् - दशक १-५ of नारायणभट्टः

</div>

Objective	**:**	**Aims at proving an insight into a great & popular Samskrit Lyric**
Unit- I	**:**	Introduction to Sanskrit Lyrics, Narayaniyam – I Dasakam
Unit – II	**:**	Narayaniyam – II Dasakam
Unit-III	**:**	Narayaniyam –III Dasakam
Unit- IV	**:**	Narayaniyam –IV Dasakam
Unit- V	**:**	Narayaniyam –V Dasakam

Prescribed book: Narayaniyam of Narayana Bhatta, Sriram Publishers, Madras, 1964

Elective Course – I
Ayurveda - आयुर्वेदोपदेशः vol. – २

Objective   :   **To introduce Basic & Practical Ayurvedic Concepts**

Unit- I   :   Introduction to Ayurveda, Ayurvedopadesah – I Dasakam

Unit – II   :   उपदेशः -1-35

Unit-III   :   उपदेशः -36-70

Unit- IV   :   उपदेशः -71-.100

Unit- V   :   उपदेशः -100-122

Prescribed book: Ayurvedopadesah vol. - 2
     Ed. Rajeshwara Sharma, Saraswati Mahal Library,
     Tanjore, 1998

Core Course – V
Etymology - निरुक्तम् - १,२अध्यायः

Objective   :   **To introduce Word Formation Techniques as per Old Grammatical Tradition**

Unit- I   :   Introduction to Sanskrit Etymology

Unit – II   :   Niruktam – I half of I chapter

Unit-III   :   Niruktam – II half of I chapter

Unit- IV   :   Niruktam – I half of II chapter

Unit- V   :   Niruktam – II half of II chapter

Prescribed book: Niruktam of Yaska
     Chowkhamba Sanskrit Series Office, Varanasi,1979

Core Course – VI

Poetics –I - प्रतापरुद्रीयम् (१&४ प्रकरणः) of विद्यानाथः

Objective : **To create an awareness of concepts relating to Literary Criticism**

Unit- I : Introduction to Sanskrit poetics, Prataparudriyam – work & author

Unit – II : Prataparudriyam – Nayaka Prakaranam –I half

Unit-III : Prataparudriyam – Nayaka Prakaranam –II half

Unit- IV : Prataparudriyam – Kavya Prakaranam –I half

Unit- V : Prataparudriyam – Kavya Prakaranam –II half

Prescribed book: Prataparudriyam of Vidyanatha
Chowkhamba Sanskrit Series Office, Varanasi,1979

Core Course – VII

Vedanta –I - विवेकचूडामणिः 60 श्लोकाः of शङ्कराचार्यः

Objective : **To give an exposure to the Basic Concepts of the Philosophy of Advaita**

Unit- I : Vivekacudamani – 1-15 verses

Unit – II : Vivekacudamani – 15-30 verses

Unit-III : Vivekacudamani – 31-40 verses

Unit- IV : Vivekacudamani – 41-50 verses

Unit- V : Vivekacudamani – 51-60 verses

Prescribed book: Vivekacudamani of Shankaracarya Sri Ramakrishna Math, Mylapore, 1998

Core Course – VIII

Scientific Literature

Objective : **To Create an awareness about the Contribution of Samskrit to Rudimentary and Advanced Concepts of Science**

Unit- I : Introduction to scientific literature in Sanskrit

Unit – II : Mathematics

Unit-III : Astronomy & Astrology

Unit- IV : Medicine

Unit- V : Architecture

Prescribed book: 1. History of Sanskrit Literature by A. B. Keith
Pub: Motilal Banarsidass,
2. A Short History of Sanskrit Literature by T.K. Ramachandra
Aiyar Pub: R.S. Vadhyar & sons, Kalpatti, Palghat, Kerala, 2006

Elective Course –II

Didactic Lyric - नीतिशतकम् of भर्तृहरिः

Objective : **To give an Exposure to Didactic Literature**

Unit- I : Introduction to Sanskrit Lyrics, Nitisatakam– verses- 1-20

Unit – II : Nitisatakam – 21-40

Unit-III : Nitisatakam – verses - 41- 60

Unit- IV : Nitisatakam – verses- 61- 80

Unit- V : Nitisatakam – verses- 81-100

Prescribed book: Nitisatakam of Bhartrhari
Chowkamba sanskrit Series, Varanasi 2003
Samskrta Bhasa Pracarini Sabha, Chitoor, 2001

Core Course – IX

Poetics – II – काव्यप्रकाशः (१,२,४ उल्लासाः) of मम्मटः

Objective : **To introduce Techniques of Literary Criticism**

Unit- I : Introduction to Sanskrit Poetics

Unit – II : Kavyaprakasa – I ullasa

Unit-III : Kavyaprakasa – II ullasa

Unit- IV : Kavyaprakasa – IV ullasa

Unit- V : Kavyaprakasa – IV ullasa

Prescribed book: Kavyaprakasa of Mammata
Chowkhamba Sanskrit Series Office, Varanasi,1979

Core Course – X

Grammar - सिद्धान्तकौमुदी of भट्टोजि दीक्षितः (पञ्चसन्धि प्रकरणम्)

Objective : **To introduce basics of Samskrit Grammar**

Unit- I : Introduction to Sanskrit Grammar

Unit – II : SiddhantaKaumudi - अच्सन्धिः

Unit-III : SiddhantaKaumudi - हल्सन्धिः

Unit- IV : SiddhantaKaumudi - विसर्गसन्धिः

Unit- V : SiddhantaKaumudi - स्वादिसन्धिः

Prescribed book: Vaiyakarana-siddhanta-kaumudi of Bhattoji Dikshita
Motilal Banarsidass, Delhi, 2004

Core Course – XI
Yoga - योगसूत्रम् of पतञ्जलिः

Objective **:** **To introduce an important and foremost manual on Yoga**

Unit- I **:** **Y**oga sutram - Chapter - I sutra -s - 1-40

Unit – II **:** **Y**oga sutram - Chapter - I sutra -s - 41-51 & Chapter -II sutra-s - 1-30

Unit-III **:** **Y**oga sutram - Chapter - II sutra -s - 31-55 & Chapter -III sutra-s – 1-15

Unit- IV **:** **Y**oga sutram - Chapter - III sutra -s – 16 - 55

Unit- V **:** **Y**oga sutram - Chapter - IV sutra -s - 1- 34

Prescribed book: **Y**ogasutram of Patanjali
Sri Ramakrishna Math, Mylapore, 2009, B.R. Publishing
Corporation, Delhi 2009

Core Course – XII
Nyaya – तर्कसंग्रह-दीपिका (full) of अन्नंभट्टः

Objective **:** **To introduce a basic Text on Indian Logic**

Unit- I **:** Introductio to Indian Logic
Unit – II **:** Tarkasangraha-dipika - Chapter - I
Unit-III **:** Tarkasangraha-dipika - Chapter - II
Unit- IV **:** Tarkasangraha-dipika - Chapter - III
Unit- V **:** Tarkasangraha-dipika - Chapter - IV

Prescribed book: Tarkasangraha-dipika
Sri Ramakrishna Math, Mylapore, 2009

Elective Course –III

Philosophical Traditions - षड्दर्शनसमुच्चयः of हरिभद्रसूरिः

Objective : **To give an exposure to the Six Systems of Indian Philosophy**

Unit- I : Introduction to darsana-s

Unit – II : बौद्धमतम्

Unit-III : नैयायिकमतम् & सांख्यमतम्

Unit- IV : जैनमतम् & वैशेषिकमतम्

Unit- V : मीमांसामतम् & चार्वाकमतम्

Prescribed book: Saddarsanasamuccha of Haribadrasuri
Krishnadas Academy, Varanasi,2002

Core Course – XIII

Samkhya - सांख्यकारिका of ईश्वरकृष्णः

Objective : **To introduce the Samkhya Philosophy**

Unit- I : Introductio to Samkhya Philosophy

Unit – II : karikas 1to10

Unit-III : karikas 11 to20

Unit- IV : karikas 21to30

Unit- V : karikas 31to42

Prescribed book: Samkhyakarika of Ishvarakrishna
Chaukhambha Sanskrit Series, Varanasi,2009
Bharatiya Kala Prakashan, Delhi 2009

Core Course – XIV

Poetics –III – ध्वन्यालोकः (1,2) of आनन्दवर्धनः

Objective : To infuse knowledge on an important Contribution to Poetics

Unit- I : Introductio to Dhvani theory

Unit – II : Dhvanyaloka chapter – I – 1st half

Unit-III : Dhvanyaloka chapter – I – 2st half

Unit- IV : Dhvanyaloka chapter – II – 1st half

Unit- V : Dhvanyaloka chapter – II – 2st half

Prescribed book: Dhvanyaloka of Anandavardhana
Chowkhamba Sanskrit Series, Delhi 1979

Elective Course –IV

Vedanta-II - यतीन्द्रमतदीपिका of श्रीनिवासः

Objective : To introduce the core Concepts of the Philosophy of Visishtadvaita

Unit- I : I & II asvasas

Unit – II : I & II asvasas

Unit-III : I & II asvasas

Unit- IV : I & II asvasas

Unit- V : I & II asvasas

Prescribed book: Yatindramatadipika of Srinivasa
1. Sri Ramakrishna Mutt, Chennai
2. Sudarsanam Publications, Puttur Agraharam, Trichy

Elective Course – V
Citra Kavyam & Prosody

Objective : **To introduce Samskrit Prosody and some unique Prosodical Compositions**

Unit- I : Padukasahasram - citra paddhati - 4 verses & srutabhoda Chandas

Unit – II : Padukasahasram - citra paddhati - 4 verses & srutabhoda Chandas

Unit-III : Padukasahasram - citra paddhati - 4 verses & srutabhoda Chandas

Unit- IV : Padukasahasram - citra paddhati - 4 verses & srutabhoda Chandas

Unit- V : Padukasahasram - citra paddhati - 4 verses & srutabhoda Chandas

Prescribed books: - 1. पादुकासहस्रम् - चित्रपद्धतिः of वेङ्कटनाथः -- २० श्लोकाः

Verses – 913, 921, 923, 924, 925, 926, 927, 928, 929, 931, 932, 940, 941,942,943,944

Pub: Sarasakala Nilayam, 8 terku mada vidi, Mylapore, Chennai, 1958

2. श्रुतबोधः of कालिदासः Pub: Chowkhamba Sanskrit Sansthan, Varanasi, 2002

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI - 620 024

M.A. Tamil - Revised Course Structure under CBCS

(For the candidate admitted from the academic year 2016-2017 onwards)

Sem ester	Course	Course Title	Ins. Hrs/ Week	Credit	Exam Hrs	Marks Int.	Marks Ext.	Total
I	Core Course - I(CC)	இக்கால இலக்கியம் I	6	4	3	25	75	100
	Core Course -II(CC)	இக்கால இலக்கியம் II	6	4	3	25	75	100
	Core Course - III(CC)	சிற்றிலக்கியம்	6	4	3	25	75	100
	Core Course - IV(CC)	தொல்காப்பியம் - எழுத்ததிகாரம் - நச்சினார்க்கினியர் உரை	6	4	3	25	75	100
	Elective Course - I(EC)	கணினித் தமிழ்	6	4	3	25	75	100
		TOTAL	30	20				500
II	Core Course - V(CC)	சமய இலக்கியம்	6	5	3	25	75	100
	Core Course -VI(CC)	காப்பிய இலக்கியம்	6	5	3	25	75	100
	Core Course - VII(CC)	அற இலக்கியம்	6	5	3	25	75	100
	Core Course - VIII(CC)	தொல்காப்பியம் - சொல்- சேனாவரையர் உரை	6	5	3	25	75	100
	Elective Course -II(EC)	ஒப்பிலக்கியம்	6	4	3	25	75	100
		TOTAL	30	24				500
III	Core Course - IX(CC)	சங்க இலக்கியம் -I எட்டுத்தொகை	6	5	3	25	75	100
	Core Course - X(CC)	சங்க இலக்கியம் -II (பத்துப்பாட்டு)	6	5	3	25	75	100
	Core Course - XI(CC)	ஒப்பீட்டு நோக்கில் உலகச் செம்மொழிகள்	6	5	3	25	75	100
	Core Course - XII(CC)	தொல்காப்பியம் - பொருள்(முன்னைந்து இயல்கள்) - நச்சினார்க்கினியர் உரை	6	5	3	25	75	100
	Elective Course -III(EC)	நாட்டுப்புறவியல்	6	4	3	25	75	100
		TOTAL	30	24				500
IV	Core Course - XIII(CC)	இலக்கியத் கொள்கைகளும் திறனாய்வும்	5	5	3	25	75	100
	Core Course - XIV(CC)	தொல்காப்பியம் - பொருள் (பின்னான்கு இயல்கள்) - பேராசிரியர் உரை	5	5	3	25	75	100
	Elective Course - IV(EC)	*சைவமும் தமிழும் வைணவமும் தமிழும் இசுலாமும் தமிழும் கிறித்துவமும் தமிழும்	5	4	3	25	75	100
	Elective Course -V(EC)	*பெண்ணியம் மொழி பெயர்ப்பியல்	5	4	3	25	75	100
	Project		10	4				100
		TOTAL	30	22				500
		GRAND TOTAL		90				2000

*ஏதேனும் ஒரு தாள் மட்டும்

Note:

Project : 100 Marks

Core Papers - 14

Elective Papers - 5

Project - 1

Theory Internal 25 marks External 75 marks

Passing minimum

A candidate shall be declared to have passed in each course if he / she secures not less than 40% of marks in the University Examination and 40% of marks in the Internal Assessment and not less than 50% in the aggregate, taking Continuous assessment and University Examination marks together.

இக்கால இலக்கியம் I கவிதையும் நாடகமும்

அலகு 1: மரபுக்கவிதை

01. பாஞ்சாலி சபதம்
	பாரதியார்
02. ஐயை (முழுவதும்)
	பெருஞ்சித்திரனார்
	தென்மொழி நூல்வெளியீடு விற்பனையகம், சென்னை

அலகு 2: புதுக்கவிதை

01. சொல்லிடில் எல்லை இல்லை
	விக்கிரமாதித்யன்
	நக்கீரன் வெளியீடு, சென்னை
02. குக்கூ
	மீரா
	அகரம், தஞ்சாவூர், 2008

அலகு 3: நாடகம் I (கவிதை நாடகம்)

01. வீரத்தாய்
	பாரதிதாசன் கவிதைகள் (தொகுதி 1)
02. நல்லமுத்துக் கதை
	பாரதிதாசன் கவிதைகள் (தொகுதி 3)
	பாவேந்தம் 7, இளங்கணி பதிப்பகம் (நூல் கிடைக்குமிடம்: தமிழ்மண்
	பதிப்பகம்), சென்னை.

அலகு 4: நாடகம் II (உரைநடை நாடகம்)

01. தற்காலத் தமிழ் நாடகங்கள்
	வெளி ரங்கராஜன் (தொகு.)
	காவ்யா, சென்னை.

அலகு 5: கவிதையியல்

01. கவிதையியல்
	க. பூரணச்சந்திரன்,
	உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை.

இக்கால இலக்கியம் II உரைநடை, புனைகதை

அலகு 1: உரைநடை

    i. நான் கண்டதும் கேட்டதும்

    ii. புதியதும் பழையதும்
        உ.வே.சாமிநாததைஐயர்
        உ.வே.சா. நூலகம், 2, அருண்டேல் சாலை, பெசண்ட் நகர், சென்னை.

அலகு 2: உரைநடை

    தமிழ் உரைநடை வரலாறு
        வி. செல்வநாயகம்
        குமரன் புத்தக இல்லம், மெய்கை விநாயகர் தெரு, குமரன் காலனி, சென்னை.

அலகு 3: புனைகதை - சிறுகதை

    01. உறவு - சிறுகதைத் தொகுப்பு
        எம். பாண்டியராஜன்
        பாவை பப்ளிகேஷன், 142, ஜானிஜான் கான்
        சாலை, இராயப்பேட்டை, சென்னை
    02. சூடிய பூ சூடற்க
        நாஞ்சில் நாடன்
        தமிழினி, ராயப்பேட்டை, சென்னை.

அலகு 4: புனைகதை - புதினம்

    01. நெடுங்குருதி
        எஸ். இராமகிருஷ்ணன்
        உயிர்மை, சென்னை
    02. எரியும் பனிக்காடு
        பி.எச். டேனியல் (தமிழில்: இரா. முருகவேள்)
        விடியல் பதிப்பகம், கோயம்புத்தூர்

அலகு 5: நவீனத் தமிழ் இலக்கிய அறிமுகம்
    நவீனத் தமிழ் இலக்கிய அறிமுகம்
        ஜெயமோகன்
        கிழக்குப் பதிப்பகம், 177/103, முதல்தளம், அம்பாள் பில்டிங், லாயிட்ஸ் ரோடு, இராயப்பேட்டை, சென்னை.

சிற்றிலக்கியம்

அலகு 1: சரசுவதி அந்தாதி - முழுவதும்

             சகலகலாவல்லி மாலை - முழுவதும்

அலகு 2: திருவரங்கக் கலம்பகம் - முழுவதும்

அலகு 3: சேக்கிழார் பிள்ளைத்தமிழ் - முழுவதும்

அலகு 4: கும்பேசர் குறவஞ்சி - முழுவதும்

அலகு 5: அழகர் கிள்ளை விடுதூது - முழுவதும்

பாடநூல்கள்:

1. சரசுவதி அந்தாதி, சாரதா பதிப்பகம், சென்னை.
2. சகலகலாவல்லி மாலை, கழக வெளியீடு, சென்னை.
3. திருவரங்கக் கலம்பகம், முல்லை நிலையம், சென்னை.
4. சேக்கிழார் பிள்ளைத்தமிழ், கழக வெளியீடு, சென்னை.
5. கும்பேசர் குறவஞ்சி, உ.வே.சா. நூல் நிலையம், சென்னை.
6. அழகர் கிள்ளை விடுதூது, கழக வெளியீடு, சென்னை.

தொல்காப்பியம் - எழுத்ததிகாரம் - நச்சினார்க்கினியர் உரை

அலகு – 1

நூன்மரபு, மொழிமரபு

அலகு – 2

பிறப்பியல், புணரியல்

அலகு – 3

தொகை மரபு, உருபியல்

அலகு – 4

உயிர்மயங்கியல், புள்ளிமயங்கியல்

அலகு – 5

குற்றியலுகரப்புணரியல்

பாட நூல்:

தொல்காப்பியம் - எழுத்ததிகாரம் - நச்சினார்க்கினியர் உரை.

(வாய்ப்புள்ள இடங்களில் தொல்காப்பிய எழுத்ததிகாரத்தை மொழியியல் நோக்கில் அறிமுகப்படுத்த வேண்டும்)

பார்வை நூல்கள்:

1. முத்துச்சண்முகம் - இக்கால மொழியியல்
2. கு. பரமசிவம், இக்கால மொழியியல் அறிமுகம், அடையாளம், புத்தாநத்தம்.
3. செ.வை. சண்முகம், எழுத்திலக்கணக் கோட்பாடு, உலகத்தமிழாராய்ச்சி நிறுவனம், சென்னை.

விருப்பப் பாடம் 1. கணினித் தமிழ்

அலகு 1 கணினியின் கட்டமைப்பும் செயல்பாடும்

கணிப்பொறியின் வரலாறும் வளர்ச்சியும் - கணினியின் வகைப்பாடு - கணினியின் கட்டமைப்பு - மையச் செயலகம் - உள்ளீடகம் - வெளியீட்டகம் - கணினி வன்பொருள் - துணைமை வன்பொருள் - கணினி செயல்படும் விதம் - மென்பொருள் - அமைப்பு மென்பொருள் பயன்பாட்டு மென்பொருள் - கையடக்க மென்பொருள்

அலகு 2 கணினித் தமிழ் அடிப்படையும் பயன்பாடும்

கணினியும் பயன்பாடும் - கணினியும் தமிழும் - குறியேற்றம் - எழுத்துருக்கள் - தமிழைத் தட்டச்சுச் செய்ய உதவும் மென்பொருள்கள் - தமிழ் தட்டச்சுப் பயிற்சி - தமிழில் விசைப் பலகை - எழுத்துருக்கள் - கணினி அச்சு சார்ந்த சில அடிப்படைகள் - கையடக்கக் கணினியும் திறன்பேசியும்

அலகு 3 தமிழ் மென்பொருள் வகைப்பாடும் வளர்ச்சியும்

தமிழ் மென்பொருள்கள் தோன்றி வளர்ந்த வரலாறு - தமிழ் மென்பொருள்கள் - தொகுப்பு மென்பொருள்கள் - மென்பொருள் ˙நீட்சிகள் - தமிழில் கணினி மொழிகள் - தன்மொழியாக்கம்/இடைமுகப்பு - திறவூற்றும் கட்டற்ற மென்பொருளும் - தமிழ் மொழி ஆய்வுக்கருவிகள் - கணினித் தமிழ் ஆய்வு - கணினித் தமிழ் ஆய்வும் தமிழ் மென்பொருளும் கணினித் தமிழ் ஆய்வுத் திட்டங்கள் - கணினித் தமிழ் ஆய்வு வளர வழி.

அலகு 4 இணையமும் தமிழ்ப் பண்பாடும்

இணையத்தின் பயன்பாடு - இணையத் தொழில்நுட்பத்தின் அடிப்படை - உலாவி - தேடுபொறி - மின்னஞ்சல் - மின் குழுக்கள் - இணையதளம் - வலைப்பூ - மின்னூலகம் - இணைய நூல்அங்காடி - மின்னூல் - ஒலிநூல் - மின்னகராதி - மின் செய்தித்தாள் - மின்னிதழ் - இணைய வானொலி, தொலைக்காட்சி - மின் அரட்டை - மின் ஆளுகை - விக்கிபீடியா - பலகைக்கணினி.

அலகு 5 இணையவழிக் கற்றலும் - கற்பித்தலும்

மின் கற்றல் - கற்றல் கற்பித்தலில் குறுவட்டு, குறுஞ்செயலி கலந்துரையாடல், இணைய நூலகம் வழி கற்றல் - தமிழ் இணையக் கல்விக்கழகம் - செம்மொழி நிறுவனப்பணி - இணையவழிக் கல்வியும் இணையதளமும் - தமிழ்வழிக் கல்வியும் இணையதளமும் - கற்பித்தலுக்கான ஒழுங்குமுறை - கணினித்தமிழ் அமைப்புகளும் செயல்பாடுகளும் - கணினித்தமிழ் விருதுகள் - கணினித்தமிழ் இதழ்கள் - கணினித்தமிழ்க் கல்வியும் பயிற்சியும்

பாடநூல்

1. இல. சுந்தரம், கணினித்தமிழ்(Tamil computing), விகடன் பிரசுரம், சென்னை, 2015.

பார்வை நூல்கள்

01. இராதா செல்லப்பன், தமிழும் கணினியும், கவிதை அமுதம் வெளியீடு, திருச்சி, 2011.
02. துரை. மணிகண்டன், தமிழ்க் கணினி இணையப் பயன்பாடுகள், கமலினி பதிப்பகம், தஞ்சாவூர், 2012.
03. பன்னிருகை வடிவேலன், தமிழ் மென்பொருள்கள், நோக்கு, சென்னை, 2014.

சமய இலக்கியம்

அலகு 1:

திருஞானசம்பந்தர்:

      முதல் திருமுறை   – திருப்பிரமபுரம் பதிகம் 'தோடுடைய செவியன்' முதல் 11
                           பாடல்கள்.

      மூன்றாம் திருமுறை – திருக்கழுமலப் பதிகம் 'மண்ணில் நல்ல வண்ணம்' முதல் 11
                           பாடல்கள்

திருநாவுக்கரசர்:

      நான்காம் திருமுறை - திருவதிகை வீரட்டானம் பதிகம், 'கூற்றாயினவாறு விலக்ககிலிர்'
                           முதல் 10 பாடல்கள்

      ஆறாம் திருமுறை   - திருப்புகலூர்ப் பதிகம் 'எண்ணுகேன் என் சொல்லி
                           எண்ணுகனோ' முதல் 10 பாடல்கள்

சுந்தரர்:

      ஏழாம் திருமுறை   - திருவெண்ணெய் நல்லூர்ப் பதிகம் 'பித்தா பிறைசூடி' முதல்
                           10 பாடல்கள்

      ஏழாம் திருமுறை   - திருப்பாண்டிக்கொடுமுடிப் பதிகம் 'மற்றுப்பற்றெனக்கின்றி'
                           முதல்   10 பாடல்கள்

அலகு 2:

மாணிக்கவாசகர்:

      எட்டாம் திருமுறை - ஆசைப்பத்து 'கருடக் கொடியோன' முதல் 10 பாடல்கள்

காரைக்காலம்மையார்:

      திரு இரட்டை மணிமாலை 'கிளர்ந்துந்து' முதல் 20 பாடல்கள்

அருணகிரி நாதர்

      'முத்தைத் தரு' முதல் 10 பாடல்கள்

அலகு 3:

திருப்பாணாழ்வார்:

      அமலனாதிபிரான் - முதல் 10 பாடல்கள்

      ஆண்டாள் - திருப்பாவை - 30 பாடல்கள் (முழுவதும்)

அலகு 4

வீரமாமுனிவர்

      திருக்காவலூர்க் கலம்பகம் - சமூக உல்லாசம் (16 பாடல்கள்)

கிருட்டிணப்பிள்ளை

      இரட்சணிய யாத்திரிகம் - இரட்சணிய மனோகரம் 1-10 பாடல்கள்
                           விசுவாசக் காட்சி 1 - 10 பாடல்கள்

      சதாவதானி செய்குத்தம்பிப் பாவலர் - நபிகள் நாயக மான்மிய மஞ்சரி 1-30 பாடல்கள்

அலகு 5

குணங்குடி மஸ்தான் சாகிபு பாடல்கள்

      அகத்தீசர் சதகம் - தவநிலை முதல் 10 பாடல்கள்

தாயுமானவர்

      எங்கு நிறைகின்ற பொருள் - அவன் அன்றி ஓரணுவும் - முதல் 11 பாடல்கள்

வள்ளலார்

      முதல் திருமுறை – வேட்கை விண்ணப்பம் - 'மன்னே என்றன்' முதல் 10 பாடல்கள்

காப்பிய இலக்கியம்

அலகு 1:

சிலப்பதிகாரம் - மதுரைக் காண்டம் (13 காதைகள்)

மணிமேகலை - 1 முதல் 10 காதைகள்

அலகு 2

சீவகசிந்தாமணி - காந்தருவதத்தையார் இலம்பகம் முழுவதும்

பெருங்கதை - இலாவாண காண்டம் - யூகி போதரவு

யூகி சாக்காடு

யூகி விலாவித்தது

அலகு 3

கம்பராமாயணம் - வாலிவதைப் படலம் முழுவதும்

பெரிய புராணம் - திருநாளைப்போவார் புராணம் முழுவதும்

அலகு 4

திருவிளையாடற் புராணம் - பிட்டுக்கு மண் சுமந்த படலம்

வில்லிபாரதம் - சூது போர்ச் சருக்கம் முழுவதும்

அலகு 5

தேம்பாவணி - வளன் சனித்த படலம்

சீறாப்புராணம் - உடும்பு பேசிய படலம்

அற இலக்கியம்

அலகு 1: திருக்குறள் - அறத்துப்பால் (1-25 அதிகாரங்கள்)

அலகு 2: பழமொழி நானூறு - 26 முதல் 50 வரை 25 பாடல்கள்

அலகு 3: நாலடியார் - நட்புப் பற்றிய பாடல்கள், சுற்றந்தழால் - கூடாநட்பு - நட்பாராய்தல் -
நட்பின் பிழை பொறுத்தல்(40 பாடல்கள்)

அலகு 4: திரிகடுகம் (1-20 பாடல்கள்)
நான்மணிக்கடிகை (1-20 பாடல்கள்)

அலகு 5: இனியவை நாற்பது (40 பாடல்கள்) முழுவதும்

பாடநூல்கள்

பாடத்திட்டத்தில் காணப்படும் பதினெண்கீழ்க்கணக்கு நூற்பகுதிகள்
(மர்ரே எஸ் ராஜம் பதிப்பு - மறுஅச்சு என்.சி.பி.எச். - அடிப்படையில்)

தொல்காப்பியம் - சொல்லதிகாரம் - சேனாவரையர் உரை

அலகு 1 :

    கிளவியாக்கம்

அலகு 2 :

    வேற்றுமையியல், வேற்றுமைமயங்கியல், விளிமரபு

அலகு 3 :

    பெயரியல், வினையியல்

அலகு 4 :

    இடையியல், உரியியல்

அலகு 5 :

    எச்சவியல்

பாடநூல் :

    தொல்காப்பியம் - சொல்லதிகாரம் - சேனாவரையர் உரை

    (வாய்ப்புள்ள இடங்களில் மொழியியல் நோக்கில் அறிமுகப்படுத்த வேண்டும்)

பார்வை நூல்கள் :

01. முத்துச்சண்முகம் - இக்கால மொழியியல்

02. கு. பரமசிவம், இக்கால மொழியியல் அறிமுகம், அடையாளம், புத்தாநத்தம்.

03. செ.வை. சண்முகம், சொல்லிலக்கணக் கோட்பாடு, உலகத்தமிழாராய்ச்சி நிறுவனம், சென்னை.

04. செ.வை. சண்முகம், தொல்காப்பியத் தொடரியல், உலகத்தமிழாராய்ச்சி நிறுவனம், சென்னை.

ஒப்பிலக்கியம்

அலகு 1:

ஒப்பிலக்கியம் - சொற்பொருள் விளக்கம் - ஒப்பிலக்கியத்தின் பண்பும் பயனும் - மூவகை இலக்கியம் - (தேசிய இலக்கியம், உலக இலக்கியம், பொது இலக்கியம்) ஒப்பியலில் அறிவியல் அணுகுமுறைகள் - ஒப்பாய்வும் மொழிபெயர்ப்பும்.

அலகு 2:

தமிழில் ஒப்பிலக்கியத் தோற்றமும் வளர்ச்சியும் - பண்டைய தமிழ்ப் புலவோர், உரையாசிரியர்கள் முதலியோரின் ஒப்பிலக்கிய நோக்கு - வ.வே.சு. ஐயர், எஸ். வையாபுரிபிள்ளை, தனிநாயக அடிகளார், க. கைலாசபதி முதலியோரின் ஒப்பிலக்கியத் தொண்டு - அண்மைக்கால ஒப்பிலக்கிய வளர்ச்சி.

அலகு 3:

இலக்கிய வகைகள் - வகைக் கொள்கைகள் - வகை நோக்கில் இலக்கிய வளர்ச்சி – அடிக்கருத்தியல் - அடிக்கருத்தும் குறிப்பொருளும் - தொன்மம் - தொன்ம வகைகள்.

அலகு 4:

தொல்காப்பிய மெய்ப்பாட்டியலும் வடமொழி இரசக் கோட்பாடும் - கம்பனும் - வால்மீகியும் - திருக்குறளும் பிறமொழி நீதி இலக்கியங்களும் (குறிப்பாக வடமொழி, இலத்தீன், சீன அற நூல்கள்).

அலகு 5:

தமிழ் வீரயுகப் பாடல்கள் - தமிழ் முல்லைத்திணைப் பாடல்களும் கிரேக்க முல்லைப் பாடல்களும் - சங்கப் பாடல்களும் கிரேக்கத் (லிரிக்) தன்னுணர்ச்சிப் பாடல்களும் - சங்க அகப்பாடல்களும் பழஞ்சீனக் காதற்பாடல்களும் - கம்பனும் மில்டனும் - பாரதியும் ஷெல்லியும் - பாரதியும் விட்மனும் - இளங்கோவும் ஷேக்ஸ்பியரும் - ஐரோப்பியப் புதுக்கவிதைகளும் தமிழ்ப் புதுக்கவிதைகளும் - தற்காலத் தமிழிலக்கியங்களில் மேலைநாட்டுத் தாக்கம்.

பார்வை நூல்கள்

1. ஒப்பிலக்கிய அறிமுகம் - டாக்டர் தமிழண்ணல்
2. ஒப்பியல் இலக்கியம் - டாக்டர் க. கைலாசபதி
3. ஒப்பிலக்கியம் - ஓர் அறிமுகம் - டாக்டர் வை. சச்சிதானந்தம்.
4. ஒப்பிலக்கியக் கொள்கைகள் - டாக்டர் ம. திருமலை
5. ஒப்பிலக்கிய மரபும் திறனும் - டாக்டர் இரா. காஞ்சனா
6. கம்பருக்குக் கதை கொடுத்தவர் வால்மீகியா? – டாக்டர் கு. திருமேனி
7. கம்பனும் மில்டனும் - எஸ். இராமதிருஷ்ணன்
8. கம்பனும் வால்மீகியும் - நாமக்கல் கவிஞர்
9. காப்பிய காலம் - எஸ் வையாபுரிப்பிள்ளை
10. சங்க இலக்கிய ஒப்பீடு (இரண்டு பாகங்கள்) – டாக்டர் தமிழண்ணல்
11. திருக்குறள் நீதி இலக்கியம் - டாக்டர் க.த. திருநாவுக்கரசு
12. பாரதியும் கீட்சும் - பாலா
13. பாரதியும் ஷெல்லியும் - ரகுநாதன்
14. புதுக்கவிதைத் திறனாய்வு – அக்கினி புத்திரன்.

சங்க இலக்கியம் I (எட்டுத்தொகை)

அலகு 1:

நற்றிணை - பாடல் 51 முதல் 75 வரை

குறுந்தொகை - பாடல் 1 முதல் 25 வரை

அலகு 2:

அகநானூறு - மணிமிடை பவளம் - பாடல் 1- 15

அலகு 3

ஐங்குநுறூறு - மருதத்திணை 1- 20 பாடல்கள்

கலித்தொகை - முல்லைக்கலி 1- 10 பாடல்கள்

அலகு 4

பரிபாடல் - செவ்வேள் முதல் 2 பாடல்கள்

வையை - முதல் 2 பாடல்கள்

திருமால் - முதல் 2 பாடல்கள்

அலகு 5

புறநானூறு - கோவூர்கிழார் - 10 பாடல்கள்

(பாடல் எண்கள்:31,32,33,41,44,45,46,47,68,70)

பதிற்றுப்பத்து - 5ஆம் பத்து

பார்வை நூல்:

01. சாமி சிதம்பரனார், எட்டுத்தொகையும் தமிழர் பண்பாடும், அறிவுப் பதிப்பகம், சென்னை.

சங்க இலக்கியம் II (பத்துப்பாட்டு)

அலகு 1

குறிஞ்சிப்பாட்டு முழுவதும்

அலகு 2

முல்லைப்பாட்டு முழுவதும்

அலகு 3

நெடுநல்வாடை முழுவதும்

அலகு 4

சிறுபாணாற்றுப்படை முழுவதும்

அலகு 5

பட்டினப்பாலை முழுவதும்

பார்வை நூல்:

01. மா. இராசமாணிக்கனார், பத்துப்பாட்டு ஆராய்ச்சி, சென்னைப் பல்கலைக்கழகம், சென்னை.

ஒப்பீட்டு நோக்கில் உலகச் செம்மொழிகள்

அலகு 1:

உலகச் செம்மொழிகள் வரலாறு (தமிழ் சமஸ்கிருதம், இலத்தீன் கிரேக்கம், சீனம். அரேபியம் மற்றும் ஈபுரு)

அலகு 2:

உலகச் செம்மொழிகளின் இலக்கியங்கள் (தமிழச் சங்க இலக்கியங்கள் முதல் காப்பியங்கள், அற இலக்கியங்கள், சமஸ்கிருதம், இலத்தீன், கிரேக்கம், சீனம், அரேபியம் மற்றும் ஈபுரு மொழிகளில் மேற்குறித்த செம்மொழி இலக்கியங்களுக்கு இணையான கால அளவிலான நூல்களின் உருவ உள்ளடக்கங்களை விரிவாக அறிமுகப்படுத்துதல்)

அலகு 3:

உலகச் செம்மொழிகளில் தொகையாக்கங்கள் - கால அடிப்படையில் உலகச் செம்மொழிகளில் தொகைப்பாடுகள் - தொகுப்பு முறைகள்.

அலகு 4:

உலகச் செம்மொழி இலக்கியப் பாடுபொருள் விழுமியங்கள் - தமிழ் - (அகம், புறம், அறநெறி, வாழ்வியல் தகைமைகள்) - சமஸ்கிருதம் - (இயற்கை, பக்தி, நீதி, வழிபாட்டு முறைகள்) - கிரேக்கம், இலத்தீன் - (வீரம், காதல், இசைப்பாடல், தன்னுணர்ச்சிப் பாடல்கள்), சீனம் - (காதல்,அரசியல், தத்துவம்) - அரேபியம் - (வாய்மொழிக் கதை மரபுகள்)

அலகு 5:

ஒப்பீட்டு நோக்கில் உலகச் செம்மொழிகள் பொதுப் பண்புகள் - வாய்மொழி மரபு, தன்னுணர்வு மரபு, பதிவுறு மரபு, ஆற்றுப்படை மரபு, வீரயுகமரபு ஆகியன - தொல்காப்பியப் பொருளதிகாரமும், அரிஸ்டாட்டிலின் கவிதையியலும் காப்பிய மரபு - (ஹோமரின் இலியட், ஒடிசி, வர்ஜிலின் காப்பியங்கள்), சிலப்பதிகாரம், மணிமேகலை (தமிழ், சமஸ்கிருதம், கிரேக்கம்) - சீன கன்பூசியசு அறநெறிகளும் திருவள்ளுவரது அறநெறிகளும்.

பாட நூல்கள்:

1. ச. அகத்தியலிங்கம், சங்க இலக்கியம் செவ்வியல் இலக்கியங்களே – மணிவாசகர் பதிப்பகம் சென்னை.
2. க. கைலாசபதி, தமிழ் வீரயுகப் பாடல்கள் (கு.வெ.பா. மொழிபெயர்ப்பு), குமரன் பதிப்பகம், சென்னை
3. செண்பகம் இராமசாமி, கிரேக்க லிரிக் கவிதைகளும் சங்க இலக்கியக் கவிதைகளும், செண்பகம் பதிப்பகம், மதுரை
4. இரா. நடராசன், செம்மொழிகள், ஸ்நேகா பதிப்பகம், சென்னை.
5. அ. அ. மணவாளன், அரிஸ்டாட்டிலின் கவிதையியல், நியூ செஞ்சுரி புத்தக நிறுவனம், சென்னை
6. கு. மோகனராசு, கன்பூசியசும் திருவள்ளுவரும், சென்னைப் பல்கலைக்கழக வெளியீடு.
7. மு. அருணாசலம், பா. ஜெயக்குமார், தமிழும் உலகச் செம்மொழிகளும், பாவை பப்ளிகேசன்ஸ், சென்னை.
8. பயணி (மொழிபெயர்ப்பாளர்), வாரிச்சூடினும் பார்ப்பவர் இல்லை, காலச்சுவடு, நாகர்கோயில்.
9. சோ.ந. கந்தசாமி, சீன இலக்கியம், தமிழ்ப்பல்கலைக்கழகம், தஞ்சாவூர்.
10. சோ.ந. கந்தசாமி, கிரேக்க இலக்கியம், தமிழ்ப்பல்கலைக்கழகம், தஞ்சாவூர்.
11. க.த. திருநாவுக்கரசு, திருக்குறள் - நீதி இலக்கியம், சென்னைப்பல்கலைக்கழகம், சென்னை.

தொல்காப்பியம் - பொருளதிகாரம் - நச்சினார்க்கினியர் உரை

(முன்னைந்து இயல்கள்)

அலகு 1:

அகத்திணையியல்

அலகு 2 :

புறத்திணையியல்

அலகு 3 :

களவியல்

அலகு 4 :

கற்பியல்

அலகு 5 :

பொருளியல்

பாடநூல் :

தொல்காப்பியம் - பொருளதிகாரம் - நச்சினார்க்கினியர் உரை

பார்வைநூல்கள்

01. தொல்காப்பியம் தமிழிலக்கிய வரலாறு – வெள்ளைவாரணம், அண்ணாமலைப் பல்கலைக்கழக வெளியிடு.

02. தமிழ்க்காதல், வ.சுப. மாணிக்கம்.

03. கு.வெ. பாலசுப்பிரமணியன், சங்க இலக்கியத்தில் புறப்பொருள், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்.

04. சோ.ந. கந்தசாமி, புறத்திணை வாழ்வியல், தமிழ்ப்பல்கலைக்கழகம், தஞ்சாவூர்.

நாட்டுப்புறவியல்

அலகு 1 :

நாட்டுப்புறவியல் சொல் விளக்கம் - பொருள் வரையறை - உலக அளவில் நாட்டுப்புறவியல் வரலாறு - இந்திய நாட்டுபுறவியல் வரலாறு - நாட்டுப்புறவியல் வளர்ச்சி முதலியன. தமிழக நாட்டுப்புறவியல் - பழந்தமிழிலக்கியங்களில் - நாட்டுப்புற வழக்காறுகளின் செல்வாக்கு - சங்க இலக்கியங்கள் - பக்தி இலக்கியங்கள் - நீதி இலக்கியங்கள் முதலியன.

அலகு 2 :

நாட்டுப்புற இலக்கியங்கள் - பாடல்கள் - கதைப்பாடல்கள் - கதைகள் - பழமொழிகள் - புதிர்கள் முதலியன. பிறப்பு முதல் இறப்பு வரையிலான வாழ்க்கை வட்டச் சடங்குகள - சடங்குகள் பற்றிய ஆய்வின் தேவை - சகுனம், கண்ணேறு கழித்தல், உள்ளிட்ட நம்பிக்கைகள் - பழக்கவழக்கங்கள் - விளையாட்டுக்கள்.

அலகு 3 :

வழிபாடுகளும் விழாக்களும் - வழிபாட்டு வகைகள் - இயற்கை வழிபாடுகள் - ஆவி வழிபாடு - வீட்டுத் தெய்வ வழிபாடு - குல தெய்வ வழிபாடு - ஊர்த்தெய்வ விழாக்கள் - முதலியன.

அலகு 4 :

நாட்டுப்புறக்கலைகள் - விளக்கம் - வகைப்பாடு, நிகழ்த்துக்கலைகள் - ஏனைய கலைகள் - வகைப்பாடு - கலைகளும் கலைஞர்களும். நிகழ்த்து கலைகள் கதை தழுவியவை, தெருக்கூத்து, நாடகம், உடுக்கடிப்பட்டு - வில்லுப்பாட்டு - பாவைக்கூத்து - வழிபாட்டுக்கூத்துக்கள்.

அலகு 5 :

நிகழ்த்துக்கலைகள் கதை தழுவாதவை, கரகாட்டம், பொய்க்கால் குதிரையாட்டம் - மயில், காளை, புலி, கரடி, முதலிய விலங்குளின் ஆட்டங்கள் - தேவராட்டம் - ஒயிலாட்டம் - தற்காப்புக் கலைகள் - சிலம்பு, களரி முதலியன.

பார்வை நூல்கள் :

1. ஆறு. இராமநாதன்,(பதி.)1991, நாட்டுப்புறவியல் ஆய்வு முறைகள், தமிழ்ப்பல்கலைக்கழகம்.

2. சு. சண்முகசுந்தரம், 1976, நாட்டுப்புற இலக்கியத்தின் செல்வாக்கு, இலக்கிய மாணவர் வெளியீடு, சென்னை

3. அ. மு. பரமசிவானந்தம், 1964, வாய்மொழி இலக்கியம்.

4. சரசுவதி வேணுகோபால்,நாட்டுப்புறவியல் கோட்பாட்டாய்வுகள்.

5. லூர்து. தே., 1976, நாட்டார் வழக்காற்றியல் - அறிமுகம், பாரிவேல் பதிப்பகம், பாளையங்கோட்டை.

6. ஆறு. அழகப்பன், 1973, நாட்டுப்புறப்பாடல்கள் - திறனாய்வு சைவ சித்தாந்த நூற்பதிப்புக்கழகம், சென்னை.

7. லூர்து. தே. ,1988, நாட்டார் வழக்காறுகள். மாணிக்கவாசகர் பதிப்பகம், சிதம்பரம்

8. பெருமாள், ஏ. என். கதைப்பாடல்கள், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை.

9. இராமநாதன், ஆறு. 1987, நாட்டுப்புறக்கதைக்களஞ்சியம் (தொகுதிகள்), மாணிக்கவாசகர் பதிப்பகம், சிதம்பரம்.

10. 9. இராமநாதன், ஆறு. 1987, நாட்டுப்புறப் பாடல் களஞ்சியம் (தொகுதிகள்), மாணிக்கவாசகர பதிப்பகம், சிதம்பரம்.

11. மருததுரை,அரு. 1995, நாட்டுப்புறவாழ்வியல், அருணா வெளியீடு, முசிறி.

12. சிவசுப்ரமணியன், ஆ. மந்திரசடங்குகள், நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை.

13. இரா. பாலசுப்ரமணியன், நாட்டுப்புறவிளையாட்டுக்கள்.

14. சண்முகசுந்தரம்,ஆ., நாட்டுப்புற விளையாட்டுகள்.

15. சு. சண்முகசுந்தரம், நாட்டுப்புறவியல் ஆய்வுகள், மணிவாசகர் பதிப்பக வெளியீடு.

16. சக்திவேல், சு. நாட்டுப்புறவியல் ஆய்வுகள், மணிவாசகர் பதிப்பக வெளியீடு.

17. பெருமாள்,ஏ.என்.1987, நாட்டுப்புறக்கலைகள், உலகத் தமிழாராய்ச்சி நிறுவனம். வெளியீடு, சென்னை.

18. அறிவுநம்பி, அ. 1986,தமிழகத்தில் தெருக்கூத்து,அமுதன் நூலகம், காரைக்குடி.

19. நவநீதகிருஷ்ணன், கே.ஏ. குணசேகரன், 1982, கரகாட்டம், அகரம், சிவகங்கை.

20. சக்திவேல், சு., நாட்டுப்புறவியல் ஆய்வு, மணிவாசகர் பதிப்பகம். சிதம்பரம்.

21. கே.ஏ. குணசேகரன், நகர்சார் நாட்டுப்புறக் கதைப் பாடல்கள்

இலக்கியக் கொள்கைகளும் திறனாய்வும்

அலகு1:

இலக்கியத் திறனாய்வு - திறனாய்வின் இருவகைப் பணிகள் - திறனாய்வு வகைகள் - திறனாய்வாளரின் தகுதிகள் - இலக்கியமும் வாழ்க்கையும் - இலக்கிய உணர்ச்சிகள் - இலக்கியத்தின் அடிப்படைக் கூறுகள் - உணர்ச்சி - வடிவம் - கருத்து - கற்பனை - சங்க அக, புற இலக்கியங்கள் - வீரயுகம் - வீரயுகம் மருவிய காலம் - செவ்வியற் பண்புகள் - அறம் சார் தொடர்நிலைச் செய்யுள்கள் - காப்பிய உருவாக்கம் போல்வன.

அலகு2:

காப்பியக் கொள்கை - கதை - நிகழ்வுகள் - மாந்தர்கள் - மூலக்கதையும் கிளைக் கதைகளும் - தமிழ் நாடகங்கள் - நாடகக் கூறுகள் - கதைக் கோப்பு - முரண் - காட்சிகள் அமைப்பு முதலியன.

அலகு 3:

பக்தி இலக்கியம் - நாயன்மார்கள் - ஆழ்வார்கள் - பக்தி இலக்கியப் பாடுபொருள்கள் - பக்தி இலக்கியக் கோட்பாடுகள் - வடிவங்கள் - திருப்பள்ளியெழுச்சி - பாவை - தாண்டகம் - திருச்சாழல் - அந்தாதி - பதிகம் போல்வன.

அலகு 4:

புனைகதைகள் (நாவலும் சிறுகதையும்) - இவற்றின் தோற்றத்திற்கான சமூகச்சூழல்கள் கதைப்பின்னல் வகைகள் - பாத்திரப்படைப்பு - பாத்திரப்பேச்சு - பின்னணியும் சூழலும் - எடுத்துரை உத்திகள் - நோக்குநிலை - புனைகதைப் படைப்பில் புதுமை உத்திகள் - நாடகத்திற்கும் நாவலுக்கும் உள்ள வேறுபாடுகள்

அலகு 5:

மரபுக்கவிதைகள் - புதுக்கவிதையின் வடிவங்கள் - படிமம், குறியீடு போன்ற உத்திகள் - தொன்ம ஆட்சி - பல்வேறு இலக்கிய இயக்கங்களின் பாதிப்புகள் - கவிதையும் உரைநடையும் - உரைநடையின் வகைகள் - உரைநடையின் அணிநலன்கள்.

பார்வை நூல்கள்:

1. தமிழில் காப்பியக் கொள்கை   - து. சீனிச்சாமி
2. இலக்கியத் திறனாய்வியல்   - தா.ஏ. ஞானமூர்த்தி.
3. நாவல் இலக்கியம்   - மா. இராமலிங்கம்
4. புதிய உரைநடை   - மா. இராமலிங்கம்
5. இலக்கியக் கொள்கைகள்   - உலகத் தமிழராய்ச்சி நிறுவன வெளியீடுகள்
6. பக்தி இலக்கியம்   - ப. அருணாசலம்
7. காப்பியத் தமிழ்   - இரா. காசிராசன்
8. உலகக் காப்பியங்கள்   - இரா. காசிராசன்
9. புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் - வல்லிக்கண்ணன்
10. இலக்கியத் திறனாய்வு   - சு. பாலச்சந்திரன்
11. கதையியல்   - க. பூரணச்சந்திரன்
12. கவிதையியல்   - க. பூரணச்சந்திரன்
13. இஸங்கள் ஆயிரம்   - எம்.ஜி. சுரேஷ்

14. இலக்கிய இஸங்கள்   - இ.எஸ்.டி.
15. தமிழ் வீரயுகப் பாடல்கள்   - க. கைலாசபதி

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தொல்காப்பியம் - பொருளதிகாரம்

(பின்னான்கு இயல்கள் - பேராசிரியர் உரை)

</div>

அலகு 1 :

மெய்ப்பாட்டியல்

அலகு 2 :

உவமவியல்

அலகு 3 :

செய்யுளியல் (சூத்திரம் 1 – 119 முடிய 'கட்டுரை வகையான்...'என்பது முடிய)

அலகு 4 :

செய்யுளியல் (சூத்திரம் 120 – 235 முடிய 'அங்கதந்தானே... என்பது முதல் 'செய்யுள் மருங்கின்... என்பது முடிய)

அலகு 5 :

மரபியல்

பாடநூல் :

தொல்காப்பியம் - பொருளதிகாரம் - பேராசிரியர் உரை

பார்வை நூல்கள் :

01. தொல்காப்பியம் தமிழிலக்கிய வரலாறு – வெள்ளைவாரணம், அண்ணாமலைப் பல்கலைக்கழக வெளியிடு.

02. சோ.ந. கந்தசாமி, தமிழ் யாப்பியலின் தோற்றமும் வளர்ச்சியும் தொகுதி 1,2 – தமிழ்ப்பல்கலைக்கழக வெளியீடு, தஞ்சாவூர்.

சைவமும் தமிழும்

அலகு1

இந்தியச் சமயங்கள் - தமிழகச் சமயங்கள் - சைவம் - தோற்றம் - உட்பிரிவுகள் - சிவ வழிபாடு - தொன்மை - காலம்தோறும் சிவழிபாட்டின் வளர்ச்சி - சங்க காலம் முதல் - இக்காலம் வரை.

அலகு 2

சிவன் சொற்பொருள் விளக்கம் - சிவ வடிவங்கள் - சிவத்தலங்கள் - சிவ தத்துவங்கள் - சிவ விரதங்கள் - சிவபுராணங்கள் - சிவனடியார்கள் - சிவசின்னங்கள் - சிவவழிபாட்டுமுறைகள்.

அலகு 3

அருளாளர்களும் படைப்புகளும் - திருஞானசம்பந்தர் திருநாவுக்கரசர் - சுந்தரர் - மணிவாசகர் - காரைக்காலம்மையார் - திருமூலர் - நக்கீரர் - சேக்கிழார் - பரஞ்சோதியார் - தாயுமானவர் - குமரகுருபரர் - சிவப்பிரகாசர் - வள்ளலார்.

அலகு 4

சாத்திரமும் ஆசாரியர்களும் - மெய்க்கண்டார் - அருணந்தி சிவாசாரியார் - மறைஞான சம்பந்தர் - உமாபதி சிவாசாரியார் - சைவ சமயக் கொள்கைகள் - பதிக் கொள்கை - பசுக் கொள்கை - பாசக் கொள்கை - சிவசக்தித் தொடர்பு - ஆன்மா.

அலகு 5

சைவ சமயப் பணிகள் - சைவத் திருமடங்கள் - சைவ சமய நூலாசிரியர்கள் - சைவ சமயமாநாடுகள் - கருத்தரங்குகள் - சைவசமய வெளியீடுகள் - சமய இதழ்கள் - திருவிழாக்கள் - பண்டிகைகள் - சைவ சமய ஆய்வுகள்.

பார்வை நூல்கள்

1. பேராசிரியர் வெள்ளை வாரணனார் - பன்னிரு திருமுறை வரலாறு I & II அண்ணாமலைப் பல்கலைக்கழகம், அண்ணாமலை நகர்.
2. சைவ சமயம் - மு. அருணாசலம், காந்தி வித்தியாலயம், திருச்சிற்றம்பலம்
3. சைவசமயத் தோற்றமும் வளர்ச்சியும் - டாக்டர் டி.பி. சித்தலிங்கையா குருகுலம், வேதாரண்யம்.
4. சைவ ஆதினங்கள் - ஊரன் அடிகள்
5. சைவ சமயம் வரலாற்றுப் பார்வை - தருமையாதின வெளியீடு, 2002.
6. சைவ சமயம் - மா. இராசமாணிக்கனார் செல்வி பதிப்பகம், காரைக்குடி.
7. தமிழர் சமயம் - ந.சி. கந்தையா, அமிழ்தம் பதிப்பகம், சென்னை.
8. சைவ சமயம் - திரு.வி.க. மணிவாசகர் பதிப்பகம், சென்னை – 108
9. சைவத்தமிழ் இலக்கிய வரலாறு - ஒளவை சு. துரைசாமிப்பிள்ளை, அண்ணாமலைப் பல்கலைக்கழகம் வெளியீடு.
10. சைவசமய வரலாறும் பன்னிரு திருமுறை வரலாறும் - வைத்தியநாதன், திருவாவடுதுறை ஆதின வெளியீடு, திருவாவடுதுறை.
11. திருத்தலங்களும் விரதங்களும் - சிவ. திருச்சிற்றம்பலம் இராஜேசுவரி புத்தக நிலையம், சென்னை.
12. சைவத்தமிழ் - மா.சா. அறிவுடை நம்பி, கருமணிப் பதிப்பகம், மதுரை.

வைணவமும் தமிழும்

அலகு 1

வரலாற்று முறையில் வைணவம் - ஆறு வழிபாட்டு மரபுகள் - வைணவ வேதங்கள் - உபநிடதங்கள் - கல்வெட்டுகள் - இதிகாசங்களில் மகாபாரதம் - பகவத்கீதை - இராமாயணம் - புராணங்கள் போன்றன.

அலகு 2

பண்டைய நூல்களில் திருமால் வழிபாடு - தொல்காப்பியம் -பத்துப்பாட்டு - கலித்தொகை - அகநானூறும் புறநானூறும் - நற்றிணை - பதிற்றுப்பத்து - பதினெண் கீழ்க்கணக்கு - திருக்குறள் - நாலடியார் - நான்மணிக்கடிகை முதலியன.

அலகு 3

வைணவ தத்துவங்கள் - தத்துவங்கள் - இதம் - புருஷ்ார்த்தம் - சித்துவிளக்கம் - ஆன்மா வகைகள் - அசித்து விளக்கம் - சுத்த தத்துவம் - மிச்சத்துவம் - அண்டங்கள் - சத்துவ சூனியம் - ஈசுவரன் விளக்கம் - இறைவனுடைய திருமேனிகள் - ஐந்து நிலைகளின் விளக்கம் - எட்டு அங்கங்கள் முதலியன்.

அலகு 4

வைணவ மந்திரங்கள் - திருமந்திரம் - திருமந்திரம் தோன்றிய வரலாறு - திருமந்திரத்தின் பெருமை - பதப்பிரிவு எழுத்துக்கள் - பிரணவத்தின் விளக்கம் - துவயம் - துவயத்தின் பொருள் - ஸ்ரீ என்பதன் பொருள் - நாராயணபதத்தின் பொருள் போன்றன.

அலகு 5

வைணவ இலக்கியங்கள் - நாலாயிரத் திவ்வியப் பிரபந்தம் - திவ்வியப் பிரபந்தங்கள் - திருவாய்மொழியின் சிறப்பு - பிரபந்தம் தொகுக்கப் பெற்ற வரலாறு - ஸ்ரீவைணவக் குரவர்கள் - ஆழ்வார்கள் 12 - ஆசாரியார்கள் - அடியார்கள் முதலியன.

பார்வை நூல்கள்:

1. முனைவர் ந.சுப்புரெட்டியார், வைணவச் செல்வம், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்.
2. முனைவர் ந.சுப்புரெட்டியார், வைணவமும் தமிழும், கழகப் பதிப்பு - 2008.
3. முனைவர் ப.அருணாசலம், வைணவ சமயம், முல்லை நிலையம் - 2002.
4. சுவீரா ஜெயஸ்வால், வைணவத்தின் தோற்றமும் வளர்ச்சியும், என்.சி.பி.எச்., சென்னை.

இசுலாமும் தமிழும்

அலகு.1 ஐம்பெரும் கடமைகள்

கலிமா - தொழுகை - நோன்பு - ஜக்காத் - ஹஜ் இஸ்லாம் தோற்றப் பின்புலம் - இசுலாமிய அடிப்படைக் கொள்கைகள் - திருக்குர்ஆன் - நபிமொழி.

அலகு.2 இசுலாமிய வாழ்க்கை நடைமுறைகள்

இசுலாமிய ஒழுக்கம் - பழக்க வழக்கங்கள் - நேர்ச்சை - நம்பிக்கைகள் - சகுனம் - சடங்குகள் - சட்டங்கள் - திருக்குர்ஆன் கூறும் ஏவல் விலக்கல்கள்.

அலகு.3 இசுலாமியக் காப்பியங்கள்

சீறாப்புராணம் - இராஜ நாயகம் - குத்பு நாயகம் - கனகாபிஷேக மாலை இன்னும் பிற.

அலகு.4 இஸ்லாமியச் சிற்றிலக்கியங்களும் மெய்ஞ்ஞான இலக்கியங்களும்

படைப்போர் - முனாஜாத்து - கிஸ்ஸா - மஸ்அலா - நாமா இன்னும் பிற., குணங்கு மஸ்தான் சாகிபு - தக்கலை பீர்முகம்மது - தென்காசி ரசூல் பீவி கீழக்கரை ஆசியா உம்மா - செய்குத்தம்பி பாவலர்.

அலகு.5 தற்கால இஸ்லாமிய இலக்கியங்கள்

புதினம் - சிறுகதை - புதுக்கவிதை - நாடகம் - உரைநடை.

பார்வை நூல்கள்

1. குர்ஆன் மஜீத் மூலமும், தமிழ் உரையும்.
2. அல்ஹாஜ் குலாம் ரசூல் - நபி மொழிகள்.
3. எஸ்.எச். எம் இஸ்மாயில் ஸலபி - இஸ்லாமிய ஒழுக்கவியல்.
4. 'அஷ்ஷெய்க் முஹம்மது ஆபூபக்கா சித்திக் - நோன்பு ஓர் அரிய வாய்ப்பு
5. எச் ∴பரீதுல் ∴பர்ஸானா - நேர்ச்சை.
6. முனைவர் மு. சாயுபு மரைக்காயர் - இஸ்லாம் வளர்த்த தமிழ்.
7. முகம்மது உவைஸ் - இஸலாமும் இன்பத்தமிழும்.
8. முகம்மது உவைஸ் -இஸ்லாமியத் தமிழ் இலக்கிய வரலாற்றுத் தொகுதிகள் 1,2,3
9. ஜெ.ஆர். லெட்சுமி - இஸ்லாமியச் சிற்றிலக்கியங்கள்
10. ஜமால் முகமது கல்லூரி வெளியீடு – தமிழ் இஸ்லாமியப் புனைகதைகள்.
11. பேரா. மு. ஹம்ஸா - இஸ்லாமியத் தமிழ்ச் சிறுகதைகள்.
12. Rev. Ed Ward Sell - The Faith of ISLAM.

கிறித்தவமும் தமிழும்

அலகு 1:

தமிழகத்தில் மேலைநாட்டார் வருகையும் கிறித்துவ சமயத் தோற்றமும் - மேலை நாட்டுக் கிறித்துவர்களின் தமிழ்த்தொண்டு - தமிழக கிறித்தவர்களின் தமிழ்ப்பணி - கிறித்தவரல்லாதோரின் கிறித்துவப் பணி - கல்விப் பணியும் பிற பணிகளும்.

அலகு 2:

கிறித்தவக் காப்பியங்கள் - தனித்தன்மைகள் - இலக்கியச் சிறப்புகள் சமயச் சிந்தனைகள் -தேம்பாவணி - இரட்சணிய யாத்திரீகம்

அலகு 3:

கிறித்தவச் சிற்றிலக்கியங்கள் - சிற்றிலக்கிய வடிவங்களும் உள்ளடக்கமும் சிறப்புக் கூறுகள் - சமயச் செய்திகள் - கித்தேரி அம்மான் அம்மானை - திருக்காவவலூர்க் கலம்பகம் - ஜெபமாலை - பெத்லேகேம் குறவஞ்சி - சாஸ்திரக்கும்மி - அன்னை வேளாங்கண்ணி பிள்ளைத்தமிழ் - கல்வாரி காவலன் உலா - தேவமாதா அந்தாதி - இவற்றில் காணும் தனித்தன்மைகளும் சிறப்புகளும்

அலகு 4:

கிறித்தவ சமயம் சார்ந்த புதினங்கள், சிறுகதைகள், நாடகங்கள் - அவற்றில் இடம்பெற்றுள்ள கிறித்தவ சமயச் சிந்தனைகள், சமூகச் சிந்தனைகள், இலக்கியத் தன்மைகள்

அலகு 5:

கிறித்தவ கவிதைகள் - புதுக்கவிதைகள் - கீர்த்தனைகள் - புத்தெழுச்சிப் பாடல்கள் - நாட்டுப்புறப்பாடல்கள் - இலக்கியக் கட்டுரைகள் - ஆகியவற்றில் அமைந்துள்ள சமயக் கருத்துக்கூறும் இலக்கியக் கூறும்

பாடநூல்:

01. கிறித்தவ இலக்கிய வரலாறு- இர. ஆரோக்கியசாமி, பூரண ரீத்தா பதிப்பகம், தஞ்சாவூர்.

பார்வை நூல்கள்:

1. ப.ச. ஏசுதாசன், கிறித்தவ இலக்கியக் கட்டுரைகள் - முதல் தொகுதி, சுதா பதிப்பகம், திருச்சி.
2. சூ. இன்னாசி, கிறித்தவத் தமிழ்க்கொடை, தொகுதி 1,2, மணிவாசகர் பதிப்பகம், சென்னை.
3. டேவிட் சித்தையா, நாவல் வளர்ச்சி, கிறிஸ்துவ இலக்கியம், மணிவாசகர் பதிப்பகம், சென்னை.
4. மயிலை சீனி. வேங்கடசாமி, கிறித்தவமும் தமிழும், சாரதா பதிப்பகம், சென்னை.
5. பால் சந்திரமோகன்(பதி.), ஏதேனிலிருந்து கல்வாரி வரை
6. பால் சந்திரமோகன்(பதி.), மந்தையில் சேர்ந்த ஆடுகள்

பெண்ணியம்

அலகு1:

பெண்ணிய விளக்கம் - மேலை நாடுகளில் பெண்ணியம் - பெண்களுக்கு வாக்குரிமை - பெண் விடுதலை இயக்கம்

அலகு 2:

பெண்ணியக் கோட்பாடுகள் - பெண்ணடிமையின் காரணங்கள், பெண்கள் முன்னேற்ற வழிகள் - மிதவாதப் பெண்ணியம் - மார்க்சியப் பெண்ணியம் - சோஷலிசப் பெண்ணியம் - தீவிரவாதப் பெண்ணியம் - ஆன்மீகப் பெண்ணியம் - கலாச்சாரப் பெண்ணியம் - கிறித்துவப் பெண்ணியம் - இந்தியப் பெண்ணியம் - பெரியார் பெண்ணியம்.

அலகு 3:

பெண்ணியம் - இந்தியாவில் தோற்றமும் வளர்ச்சியும் - காலந்தோறும் பெண்மை - பெண்களும் சட்டங்களும் - பெண்களும் அரசுத் திட்டங்களும் - மகளிர் அமைப்புகள்.

அலகு 4:

தமிழிலக்கிய நோக்கில் பெண்கள் - மரபு இலக்கியத்தில் பெண்கள் - பாரதி படைப்புகளில் பெண்ணியம் - பெண் சிறுகதை ஆசிரியர்கள் - பெண் நாவலாசிரியர் - பெண் புதுக் கவிஞர்கள் - மகளிர் இதழ்கள்.

அலகு 5:

இலக்கியமும் மகளிர் மேம்பாடும் - பெண்ணியப் படைப்புகளில் விமர்சனப் பார்வை - பின் நவீனத்துவப் பார்வையில் பெண்ணியம்.

பார்வை நூல்கள்:
1. முத்துச்சிதம்பரம், பெண்ணியம் தோற்றமும் வளர்ச்சியும், தமிழ்ப் புத்தகாலயம், சென்னை, 1997.
2. பிரேமா, பெண் மரபிலும் இலக்கியத்திலும், தமிழ்ப் புத்தகாலயம், சென்னை, 2001.
3. பிரேமா, பெண்ணியம், தமிழ்ப் புத்தகாலயம், சென்னை, 2000
4. ராஜம் கிருஷ்ணன், காலந்தோறும் பெண், தாகம், சென்னை, 2002.
5. குமாரசாமி, பெண்ணிய நோக்கில் பாரதி, தமிழ்ப் புத்தகாலயம், சென்னை, 2001.
6. மங்கையர்க்கரசி, இலக்கிய இயக்கங்கள், நியூ செஞ்சுரி புக் ஹவுஸ், 2004.
7. சா. வளவன், பெண் படைப்பாளர் தம் படைப்புகள், திருமலை தெய்வம் ஆர்ட் பிரிண்டர்ஸ், சென்னை-29.
8. செ. கணேசலிங்கன், பெண்ணியப் பார்வையில் திருக்குறள், குமரன் பப்ளிஷாஸ், சென்னை -26
9. வீ. அரசு, பெண்ணியமும் பாரதியும், அலைகள் வெளியீட்டகம், சென்னை-24
10. சு. சிவகாமசுந்தரி, தமிழகப் பெண்கள் வாழ்வும் வளர்ச்சியும், அன்பு வடிவு, வெளியீட்டகம், தஞ்சாவூர்.
11. ஹரி. விஜயலட்சுமி, ராஜம் கிருஷ்ணன் புதினங்களில் பெண் மாந்தர், என்னெஸ் பப்ளிகேஷன்ஸ், உடுமலைப்பேட்டை.
12. தாயம்மாள் அறவாணன், பெண் இன்று நேற்று அன்று, பச்சைப்பசேல் பதிப்பகம், புதுச்சேரி.
13. ர. விஜயலட்சுமி, தமிழக மகளிர் (தொடக்ககால முதல் ஆறாம் நூற்றாண்டு வரை), சந்தியா பதிப்பகம், சென்னை.

மொழி பெயர்ப்பியல்

அலகு 1

மொழிபெயர்ப்பினைப் பற்றிய பல்வகை விளக்கங்கள் - மூலமொழி, இலக்குமொழி பற்றிய கண்ணோட்டம், மொழிபெயர்ப்பின் தன்மை - தகவல்கள் வெளியிடும் தன்மை - மொழிபெயர்ப்பின் நோக்கம் - பயன் - இன்றியமையாமை - உலக அரங்கில் மொழிபெயர்ப்பின் இன்றைய முக்கியத்துவம் - மொழிபெயர்ப்பின் தோற்றமும் வளர்ச்சியும் - மேலைநாட்டு மொழிகளில் மொழிபெயர்ப்பு முயற்சிகள் - தமிழ்நாட்டில் மொழிபெயர்ப்பு - விவிலிய நூல் மொழிபெயர்ப்பு - குறிப்பிடத்தகுந்த மொழி பெயர்ப்பாளர்கள்.

அலகு 2

மொழிபெயர்ப்பு வகைகள் - சொல் நேர் மொழிபெயர்ப்பு - விரிவான மொழிபெயர்ப்பு, முழுமையான அல்லது சரிநிலை மொழிபெயர்ப்பு - பகுதிநிலை மொழிபெயர்ப்பு - நம்பகநிலை மொழிபெயர்ப்பு - சுருக்கம் - தழுவல் - மொழியாக்கம்.

அலகு 3

மொழிபெயர்ப்பாளர் தகுதிகள் - இருமொழி, பன்மொழி அறிவின் இன்றியமையாமை - இலக்கு மொழி அறிவின் கூறுகளும் மரபுகளும், பண்பாட்டுத் தாக்கம், மொழிகளைப் பற்றிய அறிவு - பிறதுறைகளில் ஆழ்ந்த பயிற்சியும் புலமையும் - மூல நூலாசிரியருக்கு ஒத்த திறன் - மூல நூலின் தோய்வு - படைப்பு மனம் - அறிவியல் பார்வை.

அலகு 4

மொழிபெயர்ப்பின் அடிப்படைகள் - மொழிபெயர்ப்புக் கொள்கைகள் - நிகரன் கொள்கை (Theory of Equivalence) இயங்குநிலை நிகரன்கள் (Dynamic Equivalence) சூழல்கள் ஒத்தமைவு (Contextual consistency) இவற்றின் விளக்கங்கள் மொழி பெயர்ப்பின் பொதுவான சிக்கல்கள். சிக்கல்களுக்கான காரணிகள் - தமிழ் மொழிக்கே உரிய சிக்கல்கள் - சொல்லும் பொருளும் - மரபுச் சொற்கள் - வழக்குச் சொற்கள் - உறவுமுறைச் சொற்கள் - பொருள்கோள் குறிப்புப் பொருள் - பழமொழிகள்.

அலகு 5

படைப்பிலக்கியங்களை மொழிபெயர்க்கும் முறை - கவிமொழிபெயர்ப்பு - சில தமிழ் ஆங்கில மொழிபெயர்ப்புகளை ஒப்புநோக்கல் - புனைகதை மொழிபெயர்ப்பு - அறிவியல் தொழில்நுட்ப இலக்கியங்களை மொழி பெயர்க்கும் முறை, ஆட்சி ஆவணங்களை மொழிபெயர்த்தல்.

பார்வை நூல்கள்:

01. சு. சண்முகவேலாயுதம், மொழிபெயர்ப்பியல், உலகத்தமிழாராய்ச்சி நிறுவனம், சென்னை.

02. சி. சிவசண்முகம், வே. தயாளன், மொழிபெயர்ப்பியல், அன்னம், சிவகங்கை.

03. சேதுமணி பணியன், மொழிபெயர்ப்பியல் கோட்பாடுகளும் உத்திகளும், செண்பகம் வெளியீடு, மதுரை.

04. செ. இராஜேஸ்வரி, மொழிபெயர்ப்பியல் ஆய்வு, , நெல்லையா பதிப்பகம், மதுரை.

05. வை. சச்சிதானந்தன், 'ஒப்பிலக்கியம் ஓர் அறிமுகம்' மொழிபெயர்ப்புப் பற்றி இடம் பெற்றுள்ள கட்டுரைகள் மட்டும் - ஆக்ஸ்போர்டு யுனிவர்சிட்டி பிரஸ்.

06. கா. சிவத்தம்பி, இலக்கியமும் கருத்துநிலையும், மொழிபெயர்ப்புப் பற்றிய கட்டுரை மட்டும், தமிழ்ப்புத்தகாலயம், சென்னை.

07. முனைவர் வளர்மதி, 'மொழிபெயர்ப்புக்கலை' (உலகத் தமிழ் ஆராய்ச்சி சிறுவனம்), திருமகள் புத்தக நிலையம், சென்னை.

08. A. Nida, The Theory and Practice of Translstion.

09. A. Nida, Towards A Science of Translation.

10. Theodore Savory, The Art of Translation.

11. Peter New Mark 'Approaches to Translation.'

BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024

MASTER OF BUSINESS ADMINISTRATION (MBA) Syllabus under CBCS

(Applicable to the candidates admitted from the academic year 2016-2017 onwards)

Semester	Course	Subject Title	Hours	Credit	Int. Marks	Ext. Marks	Total
I	Core - I	Management concepts	5	5	25	75	100
	Core - II	Managerial Communication	5	5	25	75	100
	Core - III	Mathematics & Statistics	5	5	25	75	100
	Core - IV	Managerial Economics	5	5	25	75	100
	Core - V	Organisational Behaviour	5	5	25	75	100
	Core - VI	Management Accounting	5	5	25	75	100
Total			**30**	**30**	**150**	**450**	**600**
II	Core - VII	Operation Research	5	5	25	75	100
	Core - VIII	Production Management	5	5	25	75	100
	Core - IX	Marketing Management	5	5	25	75	100
	Core - X	Financial Management	5	5	25	75	100
	Core - XI	Human Resource Management	5	5	25	75	100
	Core - XII	Research Methods in Management	5	5	25	75	100
Total			**30**	**30**	**150**	**450**	**600**

III	Core - XIII	Strategic Management	5	5	25	75	100
	Core - XIV	Legal aspects of Business	4	4	25	75	100
	Core - XV	Knowledge Management	4	4	25	75	100
	Elective - I	Course A-I / B-I / C-I / D-I / E-I	5	4	25	75	100
	Elective - II	Course A-II / B-II / C-II / D-II / E-II	5	4	25	75	100
	Elective – III	Course A-III / B-III / C-III / D-III / E-III	5	4	25	75	100
		Managerial Skills	2	2	25	75	100
Total			**30**	**27**	**150**	**450**	**700**
IV	Core - XVI	International Business Environment	5	5	25	75	100
	Core - XVII	Entrepreneurial Development	5	5	25	75	100
	Core – XVIII	Total Quality Management	5	5	25	75	100
	Elective – IV	Course A-IV / B-IV / C-IV / D-IV / E-IV	5	4	25	75	100
	Elective - V	Course A-V / B-V / C-V / D-V / E-V	5	4	25	75	100
	Elective – VI	Course A-VI / B-VI / C-VI / D-VI / E-VI	5	4	25	75	100
Total			**30**	**27**	**150**	**450**	**600**
	Project Work.	(Dissertation 80 + Viva Voce 20). Actual Project during the vacation of III semester and Viva Exam before the IV semester Exam.	-	6	-	-	100
Total			**-**	**6**	**25**	**75**	**100**
Grand Total			**120**	**120**	**650**	**1950**	**2600**

Semester	Course	Subject Title	Hours	Credit	Int. Marks	Ext. Marks	Total
**Electives : Choose any one Group**							
III	**A : Marketing**						
	E-Course-I	Consumer Behaviour	5	4	25	75	100
	E-Course-II	Business to Business Marketing	5	4	25	75	100
	E-Course-III	Sales and Distribution Management	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**
IV	E-Course-IV	Advertising and Sales Promotion	5	4	25	75	100
	E-Course-V	Marketing of Services	5	4	25	75	100
	E-Course-VI	Retail Management	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**
III	**B : Finance**						
	E-Course-I	Strategic Financial Management	5	4	25	75	100
	E-Course-II	Financial services	5	4	25	75	100
	E-Course-III	Security Analysis & Portfolio Management	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**
IV	E-Course-IV	Project Management	5	4	25	75	100
	E-Course-V	Global Financial Management	5	4	25	75	100
	E-Course-VI	Merchant Banking	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**
III	**C : Human Resource**						
	E-Course-I	Organisation Development	5	4	25	75	100
	E-Course-II	Compensation Management	5	4	25	75	100
	E-Course-III	Change Management	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**
IV	E-Course-IV	Public Relations Management	5	4	25	75	100
	E-Course-V	Managing Interpersonal Effectiveness	5	4	25	75	100
	E-Course-VI	Group Dynamics	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**

III		**D : Systems**					
	E-Course-I	E- Business	5	4	25	75	100
	E-Course-II	Internet Technologies	5	4	25	75	100
	E-Course-III	Management Information Systems	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**
IV	E-Course-IV	Software Project Management	5	4	25	75	100
	E-Course-V	Relational Database Management System	5	4	25	75	100
	E-Course-VI	Object Oriented Programming & C++	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**
III		**E : Operations**					
	E-Course-I	Supply Chain Management	5	4	25	75	100
	E-Course-II	Advanced Operation Research	5	4	25	75	100
	E-Course-III	Management Control Systems.	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**
IV	E-Course-IV	Material Management	5	4	25	75	100
	E-Course-V	Lean Manufacturing	5	4	25	75	100
	E-Course-VI	World Class Manufacturing	5	4	25	75	100
		Total	**15**	**12**	**75**	**225**	**300**

CORE COURSE I

MANAGEMENT CONCEPTS

Objectives:

This course is designed to expose the students to fundamental concepts of management. To acquaint students with the management process, which includes understanding the theory behind the practical application of management.

Unit I

Management : Definition – Nature – Scope and functions – Evolution of management thought – Relevance of management to different type of organisation like, Insurance, Hospitals, Universities, Hotels, Social Service Organisation.

Unit II

Planning : Nature, importance and strategic considerations in planning – Planning Premises – Components of planning as objectives, policies, strategies, procedures, methods, rules, projects and budgets – Making plans effective – Decision making.

Unit III

Organising : Nature, purpose and kinds of organisation – Structure – Principles and theories of organization – Departmentation – Span of control – Line and staff functions – Authority and responsibility – Centralisation and decentralisation – Committees – Informal organization.

Unit IV

Staffing and Directing : General principles, importance and techniques. Delegation of Authority – Process or Elements of delegation – Advantages – Types – Principles how to make delegation effective.

Unit V

Controlling : Objectives and process of control – Devices of control - Integrated control – Business process reengineering – Total quality management – Bench marking.

Recommended Text Books

1. Principles of Management – P.C. Tripathi and PN Reddy – Tata Mcgraw Hill – www. tata mcgrawhill.com
2. Management Principles and Applications, India edition, Ricky W. Griffin. Cengage Learning – www. cengage.in
3. Management – Principles Processes and Practices – Anil Bhat – Aryakumar – Oxford University Press – www.Oup.com
4. Management concept, Theory and Practice S.N Chand – Atlantic publishers – www.atlantic books.com
5. Management text and cases – A. Satyaraju and A. Parthsarathy PHI learning private ltd., - www. phindia.com

Suggested Readings

1. Introduction to Management science with spread sheets – william J. Stevenson India Edition – Tata mcgraw hill.
2. Management concepts and strategies J.S. Chandan, Vikas publishing Houst Pvt ltd., www. vikaspublishing.com
3. Modern management concepts and skills – samuel C. CERTO &
   S. Treviscerio, PHI learning private ltd., - India edition.
4. Principles of Management, India Edition – Charles WL Hill and Steven
    Mc Shane by Tata mcgraw Hill.

CORE COURSE   II

MANAGERIAL COMMUNICATION

Objectives:

The course aims to develop all forms of communication skills of the students to enable them to conduct well in any business process without any communication barrier. To train students to enhance their skills in written as well as oral Communication through practical conduct of this course. This course will help students in understanding the principles & techniques of business communication.

Unit I

Communication – Meaning and Significance for Management – Types of Communication – Media – Barriers to Communication – Principles of Effective Communication.

Unit II

Correspondence – Norms for Business Letters – Letter for different kinds of situations – Personalized stand letters, enquiries, customers' complaints, collection letters – Sales promotion letters, Application letters.

Unit III

Non-verbal communication – Personal Appearance Posture – Body Language – Use of Charts, Diagrams & Tables – Visual & Audio Visual Aids for communication – Dyadic communication : Face to Face Communication – Telephonic Conversation.

Listening: Meaning, Importance, Types of listening, Tips for effective listening, Barriers for listening

Unit IV

Report Writing – Structure of Reports – Long & Short Reports – Formal & Informal Reports – Writing Research Reports, Technical Reports – Norms for including Exhibits & Appendices.

Unit V

Conducting Meetings : Procedure – Preparing agenda, Minutes and Resolutions Conducting Seminars & Conferences : Procedure of Regulating Speech Evaluating Oral Presentation – Group Discussion : Drafting Speech – Negotiation Skills.

Recommended Text books :

1. Business communication – PC Bhatia – Ane books Pvt ltd., - www.anebooks.com.
2. Business communication, principles and methods and Techniques – Nirmal singh, Deep and Deep publications Pvt Ltd., - www.ddpbooks.com
3. Business communication – Sathya swaroop Debaish Bhagabandas – PHI learning private ltd.,
4. Business communication – Meenakshi Raman, Prakash singh, Oxford university press
5. Foundations of Business communication, India Edition – Dona. J. Young Tata mcgraw – Hill.

Suggested Readings :

1. Business communication, Building critical skills – Indian Edition – Kitty O Locker & Stephen KYO KACZMAREK, Tata mcgraw Hill.
2. Business communication – making connections in a Digital world – Indian Edition – Raymond V Lesikar and others – Tata Mcgraw Hill
3. Business communication – Asha kaul – PHI learning private ltd.,
4. Professional communication, Aruna Koneru, Tata mcgraw Hill.

CORE COURSE III

MATHEMATICS & STATISTICS

Objectives :

This course mainly deals with the use of Mathematical and Statistical concepts in the resolution of managerial decision problems. As such the course will deal not only with some of the theoretical concepts in Mathematics and Statistics but will also be concerned with their application.

Unit I

Mathematical basis of managerial decisions : Functions – Appliaion of functions – maxima & Minima – Matrix Algebra – Arithmatical Operations – Properties, Solutions of equations by inverse method, Gauss – Jordan method and Cramer's rule:

Unit II

Linear Programming – Formulation – Graphical methods – Introduction to Probability – Addition & Multiplication theorems – Bayes theorems and its applications. Theory of expectation – EMV.

Unit III

Descriptive Statistics – measures of central tendency – measures of dispersion; Skewness & Kurtosis – Frequency distribution – Histograms – Polygons.
Definition of random variable – Binomial distribution, Poisson distribution, Normal distribution – Applications to Business situations.

Unit IV

Preliminary concept of sampling - Types of samples - Deliberate, Judgement sampling – Quota sampling - Cluster sampling - Probability sampling - Random sampling- Stratified sampling- Systematic sampling- Multistage sampling.
Testing of Hypothesis and Theory of inference – Type I and II errors. Concept of sampling distribution – test of significance for means, proportions and S.Ds. Large samples : Analysis of Variance one way classification.

Unit V

Theory of Correlation and Regression : Meaning of Correlation and regression – Principles of Least squares – Simple Linear Regression – Simple correlation – Co-efficient – Rank Correlation.

Recommended text books :

1. Business statistics – K. Alagar – Tata Mcgraw Hill.
2. Mathematics for Management – M. Ragavachari Tata Mcgraw Hill.
3. Statistics for Management, TN Srivastava and Shailaja Rego – Tata mcgraw Hill.
4. Business mathematics and statistics BM. Aggarwal, Ane books Pvt Ltd.,
5. Statistics for Managers, Indian Edition – Levine, Stephen, Krehbiel and Berenson – PHI learning private ltd.,

Suggested Readings

1. Complete Business statistics, Indian Edition – Aczel and Soundar Pandian, Tata Mcgraw Hill.
2. Applied Statistics in Business and Economics – David P. Doane and Lori E. Seward – Indian Edition. Tata Mcgraw Hill.
3. Business statistics, Bharat Jhunjhunwala – S.Chand.co.
4. Mathematics for Economics and finance – Martin Anthony and Normanbiggs – Low price Edition – Cambridge University press.

CORE COURSE IV

MANAGERIAL ECONOMICS

Objectives:

The course is aimed at building a perspective necessary for the application of modern economic concepts, precepts, tools and techniques in evaluating business decisions taken by a firm. The course will also look at recent developments in business in the context of economic theory.

Unit I

Consumer Preferences – Consumer preference and utility function, utility maximization, indirect utility, compensated (Hicksian) and ordinary (Marshallian) demand functions . Consumer Demand – Normal versus inferior goods, consumers surplus Behaviour under Uncertainty – Expected utility.

Unit II

The theory of Firm Behaviour – Production function, isoquants, elasticity of substitution, returns to scale, profit maximization, factor demand and output supply functions, profit function. Cost Minimization – Conditional factor demands, average and marginal costs, short-run versus long – run costs.

Unit III

Market Equilibrium – short-run equilibrium, entry and exit, long-run equilibrium. Monopoly – Basic model, welfare and output, price discrimination (first degree, second degree, third degree), monopoly regulation. Oligopoly – Basic elements of game theory, quantity, or price leadership model; collusion.

Unit IV

Macroeconomics; micro foundations, aggregation problem, macro economic problems. Micro foundations of Keynesian Models – Microeconomic foundations of consumption function, investment function and liquidity preferences. Macroeconomic Models for India .

Unit V

Indian Economic Development – Understanding the Indian Economy – Growth of GDP and Per Capita Income – Planning for the economy; Monetary Policy –Inflation-Financial Sector Reforms – Role of Central Bank – Credit Policy – Industrial Policy – Industrial Controls and Licensing – Productivity and Growth – Industrial Credit – Industrial Sickness – Foreign Investment – Industrial Reforms -Impact of WTO.

Recommended Text books

1. Managerial Economics By Joel dean Indian Edition, PHI learning India PVT Ltd.,
2. Managerial Economics, MA. Beg and Manoj kumar Dash – Ane books PVT Ltd.,
3. Managerial Economics, An Integrative Approach, Mark Hirschey – India Edition – Cengage Learning.
4. Managerial Economics – Geetika, Piyali Ghosh and Purba Roy Choudhury – Tata Mcgraw hill co.,
5. Managerial Economics, DN Dwivedi Vikas publishing house PVT Ltd.,

Suggested Readings:

1. Managerial Economics, E Narayana Nadar and S. Vijayan, PHI learning Private Ltd.,
2. Managerial Economics – Indian Edition, Christopher R. Thomas and S. Charles Maurice – Tata mcgraw hill.
3. Managerial Economics, A problem solving approach – India Edition – Luke M. Froeb and Brain T. Mccann, Cengage learning.
4. Managerial Economics – Yogesh Maheswari – PHI learning PVT Ltd.,

CORE COURSE   V

ORGANISATIONAL BEHAVIOUR

Objectives:

The objectives of the course is to familiarize the participants with the behavioural patterns of human beings at individual and group levels in the context of an Organization.

Unit I

Orgnanizational Behavior – Definition, Need for studying Organizational Behavior, Disciplines involved in the study of Organizational Behavior, -Contributing disciplines and area like psychology, social psychology, economics, anthropology etc. Application of Organizational Behavior in Business.

Unit II

Individual behaviour – personality, perception, learning, attitudes inter-personal behaviour – Group and inter-group behaviour.

Unit III

Group Dynamics – Formal and Informal Group, Group Norms, Group Cohesiveness, Group Behaviour and Group Decision – making.

Unit IV

Motivation and morale, leadership-nature, styles and approaches, development of leadership including laboratory training . Power and Authority – Definition of Power – Types of Power.

Unit V

Management of change-conflict Management- Organisation Health, Development and Effectiveness. Management of culture, Cross Cultural Management.

Recommended Text books

1. Organizational Behaviour, India Edition, Nelson & Quick, Cengage learning.
2. Organisational Behaviour, S. Fayyaz Ahamed and others, Atlantic publisher.
3. Organisation Behaviour, A modern approach – Arun Kumar & N. Meenakshi Vikas publishing House PVT Ltd.,
4. Behaviour in organizations, Indian Edition, Jerald Green Berg and Robert A. Baron – PHI Learning PVT Ltd.,
5. Organisational Behaviour, UMA Sekaran, Tata Mcgraw Hill.

Suggested Readings :

1. Fundamentals Organisational Behaviour, India Edition – Slocum and Hell Riegel by Cengage learning.
2. Culture and organisational Behaviour Jai B.P. Sinha www. sagepublications. com
3. Organizational Behaviour, Special Indian Edition – by Steven L Mcshane, Mary Ann Von Glinow and Radha R. Sharma, Tata Mcgraw hill co.
4. Management of Organizational Behaviour Indian Edition, By Paul Hersey Kenneth. H. Blanchard and Dewey – PHI learning PVT Ltd.,

CORE COURSE VI

MANAGEMENT ACCOUNTING

Objectives :

The purpose of this course is to impart basic knowledge of both financial and cost accounting so that students are able to understand financial statements and reports to make decisions.

Unit I

Purpose and Scope; changing role of Accountant in profession, industry and as a consultant; Basic accounting concepts and postulates and their implications.

Accounts Records and Systems; The journal and other subsidiary books. The Ledger and account, debit and credit, adjusting and closing entries, ruling and balancing accounts. The trial balance.

Construction of Profit and Loss Account and Balance Sheet of joint stock companies as per companies act requirement.

Unit II

Cost concepts, determination of costs, elements of Cost-cost classification- Preparation of cost sheet, tender.

Unit III

Overheads, Allocation, Apportionment, Absorption, Control over Factory, administration, selling and distribution Overheads, valuation of Inventories.

Unit IV

Marginal costing – Distinction between absorption costing and marginal costing- Cost volume profit (CVP) Analysis- Break Even Analysis- Margin of safety.

Unit V

Budget and budgetary control - Objectives- Advantages and limitations- Production budget - Sales budget- Cash budget and Flexible budget.

Recommended Text books

1.   Management Accounting – My Khan & P K Jain. Tata Mcgraw hill.
2.   Management Accounting – Paresh shaw – Oxford University Press.
3.   Management Accounting – A. Murthy and S. Gurusamy – By Tata Mcgraw Hill.
4.   Management Accounting – NM Singhvi and Ruzbeh J. Bodhanwala PHI learning PVT Ltd.,
5.   Management Accounting, Principles and Applications – HUGH Coombs, David Hobbs and Ellis Jenkuis – By Sage www.sagepublications.com

Suggested Readings

1.   Advanced Management Accounting Jawaharlal, S. Chand & Co
2.   Managerial Accounting – Indian Edition Ronald W.Hicton, G. Ramesh and M. Jayadev by Tata Mcgraw Hill.

CORE COURSE VII

OPERATION RESEARCH

Objectives:

The objectives of the course is to acquaint the student with the applications of Operations Research to business and industry and help them to grasp the significance of analytical techniques in decision making. Students will be tested on the application of Operations Research to business related problems.

Unit – I

Introduction to Operations Research, scope, phases- merits and limitations – concept of optimization, Theory of simplex methods to solve canonical and general LPP, Primal – dual problem and its properties, dual simplex method, Sensitivity analysis. Concept of Goal Programming.

Unit – II

Transportation problem by Vogel's approximation method ; assignment problem , linear Programming complete enumeration method .

Unit – III

Network analysis – drawing of Arrow diagram – critical path method – calculation of critical path duration, total, free and independent floats, PERT problems; Inventory Theory, Deterministic models – purchase problem without and with shortages, with price breaks, production problem without shortages.

Unit – IV

Decision under risk – expected money value criterion – decision trees – decision under uncertainty – minimax criterion; Theory of Games – pure and mixed Strategies, Principles of dominance, graphical methods, simplex methods.

Unit – V

Queuing theory – M/M/1/FIFO/oc model; Markovian chain, Simulation :- Monte Carlo Method.

Recommended Text books

1 For Unit I, IV and V
 Operations Research concepts and cases – Fredrick S. Hiller and Gerald J. Lie Berman –
 TATA Mcgraw Hill company. Email : mark_pani@mcgrawhill.com

2 For Unit II and III
 Operations Research – R. Panneer selvam – PHI learning.
 Email : phi@phindia.com

3 Operations Research principles and Applications – G. Srinivasan –PHI learning.

4 Introduction to operations Research – Billy E. Gilett – TATA Mcgraw hill.

Suggested Readings :

1 Operation Research – India Edition – Cengage learning fourth edition by Wayne.L.
 Winston.
 Email : narasimhan.r@cengage.com. www. cengage.co.in

2 Operation Research with C programs by S. Kalavathy Vikas publishing.
 Email :p.thanigaimalai@vikaspublishing.com

3 Operation Research – by Rathindra P. Sen, PHI learning India.

CORE COURSE VIII

PRODUCTION MANAGEMENT

Objectives:

To acquaint the students with decision making in Planning, Scheduling and control of Production functions in both manufacturing and services.

Unit - I

Production function – an Introduction – Definitions and types of production systems. Strategic Management – corporate strategies, production strategies, World class manufacturing, demand forecasting for Operations.

Unit – II

Product Design – New product development, process planning and design, value analysis, capacity planning .

Unit – III

Plant location – factors influencing plant location, Plant layout- classification of layout with advantages, layout design procedures, Production planning and control – aggregate planning-nature, Strategies, methods, Master production Plan.

Unit – IV

Quality control-Definition, need, Quality control techniques, control charts, acceptance sampling , six sigma , quality circles. TQM-scope, benefits.JIT.

Unit – V

Flexible Manufacturing Systems. Poka yoke-Characteristics, levels, classification, principles, device. Kaizen-Elements, classification, steps in implementing kaizen.

Recommended Text Books

1.   Production and Operations Management By R. Panneerselvam – PHI learning. www. phindia.com
2.   Production and Operations management with solution manual by Kanishka bedi, Oxford University press, Chennai. www.oup.com
        Email : v.anand@oup.com
        Production and operations Management by Martin K. Staff – Cengage learning. www.cengage.co.in
        Production & operation & Management By V.K. Khurana – ANE books – Email : anebooks_tnairtelmail.com
        Production and operations management by R.B. Khanna, PHI learning private ltd., www. phindia.com

Suggested Readings :

1.   World – class manufacturing – A strategic perspective – B.S. Sahay and others – Macmillan publishers India ltd., www.macmillan publishers india.com.
2.   Production and operations management – SN. chary – Tata mcgrawhill.com
3.   Production and operations management Everett.E. Adam, Indian Edition – PHI learning.
4.   Production and operations management by N.G. Nair, Tata mcgraw hill Co.

CORE COURSE IX

MARKETING MANAGEMENT

Objectives:

The course aims at making students understand concepts, philosophies, processes and techniques of managing the marketing operations of a firm.

Unit - I

Marketing – Concept – Functions – Marketing Planning & Implementing Marketing Programmes – Marketing Environment -Market Segmentation and Consumer Behaviour – Marketing Research and Market Information System.

Unit – II

Product : Meaning – Product Planning – Policies – Positioning – New Product Development – Product Life Cycle – Branding, Packaging, Labeling.

Price : Pricing Objectives – Factors, Methods and Procedure.

Unit – III

Promotion : Promotion Mix – Advertisement –kinds of advertisement- Message – Copy – Advertisement Budgeting – Measuring Advertisement Effectiveness – Media Strategy – Sales Promotion – Personal Selling and Publicity.

Unit – IV

Physical Distribution : Distribution Mix – Managing Channel – Intermediaries – Transport and Warehousing – Distribution Strategies – Distribution Cost Analysis.

Unit – V

Marketing Strategies – Tools for Competitive Differentiation of Product – Strategies for Competitors – Leaders, challenges, follower & niches – Marketing of Services – Consumerism and Consumer Protections, Evaluating & Controlling Marketing Performance. Direct Selling, Direct Marketing.

Recommended Text book

1. Marketing Management by Czinkota Kotabe, India Edition cengage learning, Chennai. E-mail : sriram.b@cengage.com
2. Strategic marketing Management Text and cases by S.L. Gupta – Atlantic publishers (P) Ltd., Chennai. Email : chennai@atlanticbooks.com
3. Marketing Management – VS Ramasamy and S. Namakumari, Macmillan publisher India ltd., Chennai. www.macmillanindia.com
4. Market based Management by Roger J. Best, Indian Edition, PHI learning India PVT Ltd., New Delhi.
5. Principles of Marketing by Kurtz / Boone cengage learning – Chennai.
6. Introduction to marketing – Adrian Palmer, Oxford University Press, Chennai.
7. Marketing Management by Joel.R Evans & Barry Berman – India Edition Cengage Learning, Chennai.
8. Strategic marketing management text and cases, by UCP mathur – Macmillan India Ltd., Chennai.
9. Strategic marketing, India Edition Ferrell & Hartline, by cengage learning chennai.
10. Marketing management, M. Govindarajan, PHI learning India PVT Ltd.,

CORE COURSE - X : FINANCIAL MANAGEMENT

Objectives

The purpose of this course is to acquaint the students with the broad framework of financial decision making in a business unit.

Unit I

Financial Management- meaning, scope, objectives and functions. Financial Analysis and Control; Overview of Indian Financial System- Legal, Regulatory and tax framework.

Unit II

Time value of Money; Instruments of Long Term Finance, Cost of Different Sources of Raising Capital. Cost of Capital - Computation for each source of finance and weighted average cost of capital - EBIT -EPS Analysis - Operating Leverage - Financial Leverage - problems

Unit III

Investment and Capital Structure Decisions - Net Income Approach - Net Operating Income Approach - MM Approach; Valuation and Rates of Return; Method of Capital Budgeting.

Unit IV

Working Capital Management - Definition and Objectives - Working Capital Policies - Factors affecting Working Capital requirements - Forecasting Working Capital requirements (problems) - Cash Management - Receivables Management and - Inventory Management - Working Capital Financing - Sources of Working Capital and Implications of various Committee Reports.

Unit V

Internal Financing and Dividend Policy - Types of Divided Policy - Dividend Policy and share valuation - CAPM. Financial Modeling.

Recommended Text Book :

1. Financial Management by I.M. Pandey Vikas Publishing House PVT Ltd.,. Email : p.thanigaimalai@vikaspublishing.com

2. Financial Management Theory and practice by Prasanna chandra Tata Mcgraw Hill co. Chennai. Email : mark_pani@mcgrawhill.com

3. Financial Management By Rajiv Srivstava & Anil Misra, Oxford University Press, Chennai. Email : v.anand@oup.com

4. Financial management – Preeti singh Ane books – PVT Ltd., Chennai.   E-mail : anebooks_tnairtelmail.com.

5. Financial Management By D. Chandra Bose, PHI learning India PVT Ltd., www.phindia.com

6. Financial Management Text and cases – cengage learning – By Brigham & Ehrhardt India edition.

7. Financial Management Text, problem and cases – My.Khan and PK. Jain Tata Mcgraw Hill Co.

8. Financial Management – Bhabatosh Banerjee – PHI Learning PVT Ltd.,

9. Financial Management India Edition, James C.VAN Horne & Joh. M.Wachowfcz, PHI learning Private Ltd.,

10. Financial Management – By P. Periasamy Tata Mcgraw Hill Co.

CORE COURSE   XI

HUMAN RESOURCE MANAGEMENT

Objectives:

The course aims at introducing the students to various aspects of human resources management. The important functions of a human resources manager such as recruitment and selection processes interview methods. Performance appraisal, training and development, disciplinary procedures, collective bargaining and employee welfare.

Unit I   Perspectives in Human Resource Management

Evolution of Human Resource Management – The Importance of the Human Factor – Objectives of Human Resource Management – Role of Human Resource Manager – Human Resource Policies – Understanding business process in the context of Human Resource Management – Computer Applications in Human Resource Management.

Unit II   The concept of Best-fit Employee

Importance of Human Resource Planning – Forecasting Human Resource requirements – Internal and External sources. Selection Process – Screening – Tests – Validation – Interview – Medical Examination – Recruitment. Induction – Importance – Practices Socialization benefits.

Unit III   Training and executive Development

Types of training methods – Purpose – Benefits – Resistance. Executive development programmes – Common practices – Benefits – Self Development .

Unit IV   Sustaining Employee Interest

Compensation Plans – Rewards – Motivation – Theories of motivation – career Management – Developing Mentor – Portage Relationships.

Unit V   Performance Evaluation and Control Process

Methods of Performance Evaluation – Feedback – Industry practices, Promotion, Demotion, Transfer and Separation – Implications of job change. The control process – Importance – Methods – Requirements of Effective Control System. Grievances – causes – Implications – Redressed Methods – Gender Sensitivity.

Recommended Text book :

1. Human Resource Management By MIRZA – S – Saiyadain Tata Mcgraw Hill Co. Email : mark_pani@mcgrawhill.com
2. Human Resource Management by Chitra Atmavam Naik, ANE books PVT Ltd., Chennai.
3. Human Resource Management By P. Jothi and D.N. Venkatesh, Oxford University Press, Chennai.
4. Human Resource Management By K. Aswathappa – Tata Mcgraw Hill Co.
5. Human Resource Management By Biswajeet Pattanayak, PHI learning India PVT Ltd.,
6. Human Resource Management By SK. Sharma Global India Publications PVT Ltd., New Delhi. Email : info@globalindiapublications.com
7. Introduction to Human Resource management by Paul Banfield and Rebecca kay – Oxford University press, Chennai.
8. Managing Human Resource by Fisher, Schoenfeldt and shaw, cengage learning.
9. Managing Human Resources By Wayne.F Cascio, Tata Mcgraw Hill Co.
10. For Unit V: Advanced Human Resource management by SC Gupta, ANE Books, Chennai.
11. Human Resource management in practice, Srinivas R. Kandula PHI learning India PVT Ltd.,
12. Strategic Human Resource Management, By Nayantara – Atlantic publishers (P) Ltd., Chennai. Email : chennai@atlanticbooks.com

CORE COURSE XII

RESEARCH METHODS IN MANAGEMENT

Objectives:

The course aims at equipping students with an understanding of the research process, tools and techniques in order to facilitate managerial decision-making.

Unit I: INTRODUCTION

Research – Importance and its types – research approaches – process – problem formulation – development of hypothesis – Research design – determining the sample design – collecting data – analysis of data – identifying research problem.

Unit II: Measurement and its techniques

Measurement in research and its problems – meaning of scaling – tests of sound measurement – types of scaling- Techniques of measurement – Attitude scales – summated rating scale – Equal appearing Interview scale – cumulative scale – Rating scale – Scale constructing Techniques.

Unit III: DATA COLLECTION AND HYPOTHESIS

Classification of data – sources of data – collection of primary and secondary data – Questionnaire method – Guidelines for Questionnaire design – Interview technique – Observation techniques – Processing of data – Editing – Coding – Tabulation – Interpretation of data – Formulation of hypothesis – Test of hypothesis.

Unit IV: Statistical Techniques

Statistical Techniques – Measures of Central Tendency – Arithmetic mean, Median and Mode – Karl Pearson's coefficient of correlation – Regression – Chi-square test – conditions for applying chi-square test – ANOVA – Spearman's Rank Correlation.

Unit V : INTERPRETATION AND REPORT WRITING

Interpretation – Techniques of Interpretation – Significance of Report Writing- Different steps in writing report – layout of research report – types – oral presentation – mechanics of writing a research report – precautions for writing research reports – Role of computers in Research

Recommended Text book :

1. Business Research methods By Dr. T.N. Srivastava and Mrs. Shailaja Rego – Tata Mcgraw Hill. Co Chennai – Email : mark_pani@mcgraw.hill. com
2. Business Research methods, Alan Bryman and Emmabell – Oxford University press. chennai. Email : v.anand@oup
3. Research methodology, By R. Panneer Selvam, phi learning India PVT Ltd., New Delhi. Email : phi@phindia.com
4. Academic writing, A guide for management students and Researchers, By Mathukutty M. Monippally and Badrinarayanan Shankar Pawar – www.sagepublications.com
5. Research methods Indian Edition By Donald H. Mcburney and Theresa – Cengage learning. Email : sriram.b@cengage.com

MANAGERIAL SKILLS

Learning Objective

The learning objective of this course is to enable the students to learn the art of getting things done in the modern business world by learning topics like lateral thinking, decision making, balancing work and life, corporate social responsibility, and work ethics.

UNIT -I

THINKING STRATEGIES
Strategic thinking – meaning – questions- things included in Strategic thinking – Process consideration in Strategic thinking – Strategic thinking competencies – importance of Strategic thinking – characteristics of Strategic Thinkers – Points to be kept in mind in Strategic thinking.
Lateral Thinking – meaning – why Lateral Thinking – when to use Lateral Thinking – Benefits of Lateral Thinking – Techniques used in Lateral Thinking – Who needs Lateral Thinking – How to use Lateral Thinking? – Conventional Vs Lateral Leaders – Questions asked by Lateral Leaders – becoming a Lateral leader

UNIT – II

INTERPERSONAL STRATEGIES
Conflict Resolution – meaning – points to be understood before studying conflict resolution – sources of conflict – common reactions to conflict – role of perception in conflict – steps for Conflict Resolution – Conflict handling matrix – Functional and Dysfunctional outcome of conflict.
Negotiation skills – process – styles – outcome – principles involved – negotiation model – being a negotiator – qualities of a negotiator.

UNIT – III

IMPLEMENTATION STRATEGIES
Facing changes – meaning – characteristics –why changes –pace of changes – impact of resistance –Reasons for resistance – types of people in facing changes – introducing change. Facing challenges – meaning – importance – path to facing challenges – benefits of facing challenges.

UNIT – IV

ACTION BASED STRATEGIES
Risk taking - meaning – factors determining Risk Taking – Risk management – users of Risk Management – Steps in Risk Management.
Effective decision making – meaning – approaches – methods – steps – Decision making at the work place.

UNIT – V

BEHAVIOURAL STRATEGIES

Motivation and Staying motivated – meaning – finding reason for being motivated – staying motivated at work place – staying motivated in negative work environment – staying motivated during crisis.

Balancing work and life – meaning – work satisfaction – gender differences – responsibility of the employers and employees – ways of balancing work and life – handling professional and personal demands – organizing your desk.

TEXT BOOK:

Alex K. (2012) Soft Skills – Know Yourself & Know the World, S.Chand & Company LTD, Ram Nagar, New Delhi- 110 055.
Mobile No :94425 14814 (Dr. K. Alex)

REFERENCE BOOKS:

(i)   Meena.K and V.Ayothi (2013) A Book on Development of Soft Skills
        (Soft Skills : A Road Map to Success), P.R. Publishers & Distributors, No,
        B-20 & 21, V.M.M. Complex, Chatiram Bus Stand, Tiruchirappalli- 620 002.
        (Phone :0431-2702824: Mobile : 94433 70597, 98430 74472)
(ii)   Emotional Quotient – Daniel Goleman
(iii)   Power of the Plus factor – Norman Vincent Peale.
(iv)   The Seven Habits of Highly Effective people – Stephen covey.

CORE COURSE   XIII

STRATEGIC MANAGEMENT

Objectives:

To create an awareness of the importance of strategic approach to managerial situations and issues in the context of globalization and liberalization trends.

Unit I

Corporate Strategic planning – Mission – Vision of the firm – Development, maintenance & the role of leader – Hierarchal levels of planning – Strategic planning process. Merits and limitations of Corporate Strategic Planning. Strategic Management in Practice.

Unit II

Environment Analysis & Internal Analysis of Firm :
General environment scanning, competitive environment analysis – to indentify opportunities & threat – Assessing internal environment through functional approach and value chain – indentifying critical success factors – to identify the strength & weakness – SWOT audit – swot matrix – implications core competencies – Port-folio analysis – Stake – holder's expectations, Scenario – Planning

Unit III

Strategy Formulation:
Generic strategies – Grand strategies – Strategies of leading Indian Companies – The role of diversification – limits – means and forms. Strategic management at Corporate level, at Business level and at Functional level with special reference to companies operating in India.

Unit IV

Concepts and tools of Strategy evaluation :

Competitive cost dynamics – experience curve – BCG approach – cash flow implication – IA – BS matrix – A.D. Littles Life – Cycle approach to strategic planning – Assessment of economic contribution of strategy – Cost of equity capital – M/8 model with stationary growth – Assessing market value of a Business – Profitability matrix – divestiture decision – cash flows and selection of proper discount rates.

Unit V

Strategy Implementation & Control :

Various approaches to implementation of strategy – Commander approach – Org – change approach, collaborative approach, Cultural approach, creative approach – Matching organization structure with strategy – 76 model – Strategic control process – Du pant's control model and other Quantitative and quantitative tools – steps – M. Porter's approach for Globalisation – Future of Strategic Management.

Recommended Text books

1. Strategic Management and Business policy by Azar Kazmi, Tata Mcgraw Hill – www. tata mcgraw hill. com
2. An integrated approach to strategic Management, Charles Wl Hill. Gareth R. Jones, Indian Edition, Cengage learning – www.cengage.co.in
3. Strategic management, Theory and Application by Adriar Haberberg & Alison Rieple – Oxford University Press – www.oup.com
4. Strategic Management concepts and cases Indian Edition. By Fred R. David, PHI learning PVT Ltd., www.phindia.com

Suggested Readings:

1. Strategic business management Dr. KNS. Kang, Deep and Deep publishers. www.ddpbooks.com
2. Strategic management, India edition by Ireland, Hoskisson and Hitt, Cengage learning.
3. Strategic management text and cases by Degs, lump kin and Eisner, Indian Edition Tata Mcgraw Hill.
4. Understanding Strategic management by Anthony Henry, Oxford University Press.

CORE COURSE XIV

LEGAL ASPECTS OF BUSINESS

Objectives:

To provide a basic understanding of various statutory provisions that confronts business managers while taking decisions.

Unit I

The Indian Contract Act, 1872

Introduction – Definition of contract – agreement – offer – acceptance – consideration capacity to contract – contingent contract – Quasi contract – performance – Discharge – Remedies to breach of contract.

Unit II

Partnership- essentials of partnership, Rights and duties of partner, types of partners. Dissolution of partnership.

Sale of Goods Act: Sale and Agreement to sell, Conditions and Warrantees, Transfer of property, Finder of goods, Performance of contract of sale, Rights of an unpaid seller.

Unit III

Contract of Agency- Essentials of Contract of Agency – Creation of Agency – Kinds of Agents – Comparison Between an Agent and Servant – Comparison Between an Agent and Independent Contractor – Relationship of Principal and Agent – Duties of an Agent – Rights of an Agent – Duties and Rights of the Principal – Delegation of authority by an Agent – Sub Agent – Position of Principal and Agent in relation to third Parties – Termination of Agency.

Unit IV

Company – Formation – Memorandum – Articles – Prospective Shares – debentures – Directors – appointment – Powers and duties. Meetings – Proceedings – Management – Accounts – audit – oppression & mismanagement – winding up.

Unit V

The Consumer Protection Act, 1986; Object – Rights of Consumers –Important Terms-Consumer Complaint - Consumer Protection Councils – Redressal Machinery – District Forum – State Commission - National Commission. Cyber Law -Need for Cyber laws – Cyber law In India – Information Technology Act – 2000 – Defining Cyber Crime – Types of Cyber Crimes – Preventing of Computer Crime.

Recommended Text books

1.   Business legislation for management M.C. Kuchal and Deepa Prakash, Vikas Publish House PVT Ltd.,
2.   Legal aspects of Business, Ravinder kumar, Cengage learning.
3.   Business law, Sathish B, Matur Tata Mcgraw Hill.
4.   Business law, D. Chandra Bose, PHI learning PVT Ltd.,
5.   Legal aspects of Business by Akhileshwar Pathak. Tata Mcgraw Hill.
6.   Legal aspects of Business by kubendran.

Suggested Readings

1.   Law of Business contracts in India by Sairam Bhat, Sage, www. sagepublications.com
2.   Company law, Ashok K Bagrial Vikas publishing House.
3.   Business Law, chandra Bose, PHI learning India PVT Ltd.

CORE COURSE XV

KNOWLEDGE MANAGEMENT

Objectives:

To make the students realize the importance of capturing knowledge elements and its structures application as a competitive advantage to business.

Unit I

Introduction to KM, History of KM, Importance of KM, Information Management to Knowledge Management, KM Cycle, Industrial Economy to Knowledge Economy

Unit II

Mechanics of Knowledge Management – Tools and Technologies, Communities of Practice and Knowledge conversion, The knowledge Management Matrix.

Unit III

Social Nature of Knowledge, Social Network Analysis, Obstacles to knowledge sharing, Organizational learning & social capital. Knowledge Application – Individual level, Group level & Organization level.

Unit IV

KM Strategy, Knowledge audit, GAP Analysis, Road Map, KM Metrics, Balance Score Card.
KM Tools-Knowledge Capture & creation tools, Knowledge sharing & Dissemination Tools, Knowledge Acquisition & Application tools.

Unit V

KM Team-Roles & Responsibility, Political issues in KM, Ethics in KM
Strategic issues in Knowledge Management, Future of Knowledge Management.

Text Book :Kimiz Dalkir, Knowledge Management in Theory and practice. Elsevier Publication.

Recommended Text books :

1.   Knowledge Management By WAMAN JAWADEKAR, Tata Mcgraw Hill Co Chennai. Email : mark_pani@mcgrawhill.com.
2.   Knowledge management – An Evolutionary view – BECERRA – Fernandez & Leidner, By PHI learning PVT Ltd.,
3.   Knowledge Management – Sudhir Warier by Vikas Publishing House PVT Ltd,
4.   Information & Knowledgement by D. Kamala Vijayan – Macmillan India Ltd., Chennai.
5.   Knowledge Management Systems Edited by Stuart Barnes, India Edition,Cengage learning www.cengage.co.in
6.   Ten steps to maturity in knowledge management, J.K. Suresh and Kavi Mahes Chandos publishing distributed by Ane books – e-mail – anebooks@vsnl.com
7.   Knowledge Management – an inter disciplinary Perspective by Sajjad   M. JASIMUDDIN, Cambridge University Press, International Edition, ISBN : 978-981-4271-22-6. E-mail :cupdel@cambridge.org.
8.   Knowledge Management - Complexity, Learning and Sustainable Innovation By Dr.J.K.MISHRA, year 2009- GLOBAL INDIA BUSINESS Publications,   New Delhi. E-mail: info@globalindiapublications.com
9.   Information and Knowledge Management Extra Series – By
         Ane Books Private Ltd, Chennai. E-mail: anebooks_tn@airtelmail.in

CORE COURSE XVI

INTERNATIONAL BUSINESS ENVIRONMENT

Objectives

The primary objectives of this course is to acquaint the students to emerging global trends in business environment.

Unit I

International Business : An overview – Modes of International Business; The External Environment- Economic , Political Environment, technological and Cultural Environment; Its Influence on Trade Investment Patterns; Recent World Trade and Foreign Investment Trends.

Unit II

Foreign Direct Investment-FDI-Types of FDI, Rationale for FDI, Benefits of FDI to Home countries, Benefits of FDI to MNC,s, Threats and Restrictions on MNCs , Adverse effect of FDI on Host countries. Reasons for India seeking FDI, Hurdles for FDI in India.

Unit III

World Financial Environment; Cross-national Co operation and Agreements; Tariff and Non-Tariff Barriers, WTO, Regional Blocks.

Cross Border Mergers& Acquisition-Reasons for mergers & Acquisition, Why do M & A fail?-Stages involved in M & A-Regulations of M & As.

Unit IV

Foreign Exchange Market Mechanism: Determinants of Exchange Rates; Euro-currency Market; Offshore Financial Centers: International Banks; Non-Banking Financial Service Firms; Stock Markets.

Unit V

Global Competitiveness; Export Management; Licensing; Joint Ventures Technology and Global Competition; Globalisation and Human Resource Development; Globalisation with Social Responsibility; Negotiating an International Business, Issues in Asset Protection; Multilateral Settlements.

Recommended Text book

1) International Business Text and cases by Francis Cherunilam / PHI lerning India PVT Ltd., New Delhi. Email : phi@phindia.com

2) <u>For Unit I</u>

   International Business – By Rakesh Mohan Joshi, Oxford University Press, Chennai. Email : <u>v.anand@oup.com</u>

   International Business management- S.C.Gupta (Ane Books Pvt ltd 2010) – II & III Unit.

3) For Unit IV

   International Business, Justin Paul, PHI learning India PVT, Ltd., New Delhi.

4) International Business – S. Shajahan By macmillan India Ltd., Chennai.

5) International Business – Sumati Varma, ANE books PVT Ltd., Chennai.

6) International Business, India Edition, Mike W-Peng, Cengage learning.

7) International Business – Charles WL Hill and Arun K. Jain, Tata Mcgraw Hill Co.,

8) International Business Strategy By Allain Verbeke, Cambridge University Press, Chennai.

9) International Business, Michael R. Czinkota and others cengage learning.

10) <u>For Unit V :</u>

   The International Business Environment – Janet Morrison By Palgrave macmillan – London – ANE Books chennai.

   Email : anebooks_tn@airtelmail.in

11) International Business – By Donald A Ball and others, India Edition By TATA Mcgraw Hill Co.

CORE COURSE XVII

ENTREPRENEURIAL DEVELOPMENT

Objectives:

1. To provide a basic frame-work to start a small / medium scale business / Industrial Unit.
2. Preparation of Project profile / Report on a line of manufacture / business / service unit of actual interest to the participant – bankable project report taking into account technical feasibility, financial viability, requirements of financial institutions / commercial banks etc.,

UNIT I

Entrepreneur - meaning - importance - Qualities, nature, types, traits, culture. Similarities and differences between entrepreneur and intrapreneur. Entrepreneurship and economic development - its importance - Role of entrepreneurship - entrepreneurial environment.

UNIT II

Evolution of entrepreneurs - entrepreneurial promotion: Training and development. mobility of entrepreneurs - entrepreneurial change - occupational mobility - factors in mobility - Role of consultancy organisations in promoting entrepreneurs - Forms of business for entrepreneurs.

UNIT III

Project management: Sources of business idea - Project classifications - identifications - formulation and design - feasibility analysis . Financial analysis - project cost estimate - operating revenue estimate -Ratio analysis - investment Process - B E analysis - Profit analysis - Social cost benefit analysis - Project Appraisal methods . Preparation of Project Report and presentation.

UNIT IV

Project finance: Sources of finance - Institutional finance - Role of IFC, IDBI, ICICI, LIC,SFC, SIPCOT, Commercial Bank - Appraisal of bank for loans. Institutional aids for entrepreneurship development - Role of DICS, SIDCO, NSICS, IRCI, NIDC,
SIDBI, SISI, SIPCOT, Entrepreneurial guidance bureau - Approaching Institutions for Assistance .

UNIT V

Steps in setting SSI unit - Problems of entrepreneurs - Sickness in small industries - reasons and remedies - Incentives and subsidies - Evaluating entrepreneurial performance - Rural entrepreneurship - Women entrepreneurship.

Recommended Text book

1) <u>For Unit I and III</u>

    Entrepreneurship By Rajee Roy Oxford University press – Chennai.

    Email : v.anand@oup.com

2) <u>For Unit II, IV, V</u>

    Entrepreneurship Text and cases By P. Narayana Reddy – cengage learning. Email : sriram.b@cengage.com

3) For preparation of Project Report and Filling in Unit V

    Management and Entrepreneurship By Kanishka Bedi Oxford University press.

4) <u>For Better Projects Through SWOT Analysis in Unit V</u>

    Entrepreneurial Management Edited volume by Shivaganesh Bhargava – contributed by N. Mani Mekalai and A. Mohamed Abdullah, Bharathidasan University Trichy. Book published by Sage publications Chennai. Email : chennai@sagepub.insagepublications.com

5) Entrepreneurial Development By Jayshree Suresh, Margam publications, Chennai.

Suggested Readings

1) Entrepreneurship in The New Millenium By Kuralko and Hodgetts – Cengage learning.

2) Entrepreneurship – Robert D Hisrich and others, Tata Mcgraw Hill Co.

TOTAL QUALITY MANAGEMENT

Objectives: This course aims to familiarize the TQM concepts and to develop an insight into the uses of Total Quality Management tools.

Unit I :

Total quality Management – Definition – Scope of TQM. Dimensions and ingredients of quality, Dimensions of product quality, Dimensions of service quality. TQM Framework - Contributions of Deming, Juran and Crosby.

Unit II

Steps in implementing TQM. Advantages , Limitations and barriers to TQM Implementation. TQC-Meaning, factors affecting TQC.

Unit III

Strategic tools for TQM – Bench Marking, Business Process Reengineering, Six sigma, JIT, QFD, Tagichi's quality engineering, Failure mode and Effect analysis. Poka yoke.

Unit IV

Quality Education, process, quality system – quality objectives and quality policy – quality planning – quality information feedback. TQM Culture. Quality circles. Quality audits.

Unit V

The ISO 9000 SERIES, Need for ISO 9000- ISO 9000-2000 , Process of obtaining ISO Certification, Advantages of ISO certification, New version of ISO standards. Documentation, ISO 14000 – Concepts, Requirements and Benefits.

Recommended Text books :

1. Total Quality Management, PN. Mukherjee. PHI learning PVT Ltd.,

2. Total Quality Management, Text and cases by B. Janakiraman and RK. Gopal, PHI learning PVT Ltd.,

3. Total Quality Management, SK. Mandal Vikas Publish House PVT Ltd.,

4. Total Quality Management, James. R. Evans, India Edition, Cengage learning.

5. Principle of Total Quality, Vincent .K Omachonu Joel E. Ross, CRC Press distributed by Ane books PVT Ltd., www.anebooks.com

6. Production and operations Management – PANEERSELVEM R.

Suggested Readings

1. Total Quality Management, L. Suganthi and Anand, A.Samvel, PHI learning

2. Juran's Quality Planning and Analysis for Enterprise Quality, India Edition by Tata Mcgraw Hill Co.

3. Quality Control and Management By Evans and Lindsay India Edition, Cengage learning.

A : MARKETING

ELECTIVE COURSE I : CONSUMER BEHAVIOUR

Objectives: This course aims at enabling students to understand the process of consumer behavior, the various external and internal factors that influence consumer behaviour and to apply this understanding to the development of marketing strategy.

Unit – I   CONSUMER BEHAVIOUR – AN INTRODUCTION

Consumer Behaviour – meaning, definition, Significance . Application of consumer behavior principles to strategic marketing. Role of Marketing in Consumer behavior.   Market Segmentation and Consumer behavior.

Unit – II   CONSUMER AS AN INDIVIDUAL

Consumer needs and motivation, Personality and Consumer Behaviour, Psychographics Consumer Perception, attitudes, attitude formation and change, Learning.

Unit – III   CONSUMER IN A SOCIAL & CULTURAL SETTING

Group dynamics and consumer reference groups, Family, Social class and Consumer behaviour, The influence of Culture on Consumer behaviour. Sub – Cultural and Cross Cultural Consumer Analysis.

Unit – IV   CONSUMER DECISION MAKING PROCESS:

Personal influence and the opinion leadership. Diffusion of innovation process, Consumer Decision making process, Comprehensive models of consumer decision making. New Product purchase and repeat purchase.

Unit – V   CONSUMER BEHAVIOUR APPLICATIONS

Consumer Behaviour applicable to Profit and Non Profit Organizations, Societal Marketing Concept, Marketing Ethics, Consumer movement, Consumer protection in India.

Recommended Text books :

1. Consumer Behaviour – Ramanuj Majumdar PHI learning PVT Ltd.,
2. Consumer Behaviour, CL Tyagi and Arun kumar, Atlantic publishers.
3. Consumer behaviour, India Edition, Jay D. Lindqnist and M. Joseph Sirgy, Cengage learning.
4. Consumer behaviour, concepts, Applications and cases – MS Raju, Dominic Xardel, Vikas publishing House PVT Ltd.,
5. Consumer Behaviour, By David L. LOUDON Albert J. Della Bitta – India Edition Tata Mcgraw Hill. Co

Suggested Readings

1. Consumer Behaviour, Blackwell and others, India Edition, Cengage learning.
2. Consumer Behaviour, Indian Edition – Michael R. Solomon, PHI learning PVT Ltd.,
3. Consumer behaviour, Special Indian Edition, Deli Hawkins Roger J Best and others Tata Mcgraw Hill.
4. Consumer Behaviour and Marketing Strategy By J. Paul Peter and Jerry C. Olson, Special Indian Edition – Tata Mcgraw Hill.

A : MARKETING

ELECTIVE COURSE – II : BUSINESS TO BUSINESS MARKETING

Objectives :

The Course attempts to expose the various concepts of Industrial marketing to students who have had a foundation course in marketing.

Unit I

Basics of Business-to-Business Marketing. – Nature of Industrial Marketing: Industrial Marketing Vs. Consumer Marketing . Industrial Demand & Industrial Customer . Industrial Marketing Operations.

Unit II

Segmentation in Industrial Marketing, Demand concepts for Industrial products, Industrial Marketing Research, Industrial Buyer Behaviour.

Unit III

Product Management – Product line planning – New Product development strategy.

Unit IV

Pricing, Distribution- B2B Channel Strategies, Advertising and Sales Promotion of Industrial Products.

Unit V

Marketing strategy for Industrial Firms – Product Market Management – Developing & Evaluating Strategies – Effective implementation of Strategies.

Recommended Text books :

1. Industrial Marketing Management M. Govindarajan, Vikas publishing House PVT Ltd.,

2. Industrial Marketing by MILIND T. Phadtare - PHI learning PVT Ltd.,

A : MARKETING

ELECTIVE COURSE III

SALES AND DISTRIBUTION MANAGEMENT

Objectives :

The purpose of this paper is to acquaint the student with the concepts which are helpful in developing a sound sales and distribution policy and in organising and managing sales force and marketing channels.

Unit I

Nature and scope of Sales Management; Setting and Formulating Personnel; Developing and Conducting Sales Training Programmes; Designing and Administering Compensation Plans.

Unit II

Supervision of Salesmen; Motivating Sales Personnel; Sales Meetings and Sales Contests; Designing Territories and Allocating Sales Efforts; Objectives and Quotes for Sales Personnel.

Unit III

Developing and Managing Sales Evaluation Programme; Sales Cost and Cost Analysis. An overview of Marketing Channels, their structure, Functions and Relationships.

Unit IV

Channel Intermediaries – Wholesaling and Retailing; Logistics of Distribution; Channel Planning Organisational Patterns in Marketing Channels; Managing Marketing Channels; Marketing Channel Policies and Legal Issues.

Unit V

Information System and Channel Management, Assessing Performance of Marketing Channels including sales force; International Marketing Channels.

Recommended Text books :

1. Sales and Distribution Management - Krishna K. Havaldar and Vasant M Cavale, Tata mcgraw Hill.
2. A practical Approach to Sales Management by Kujnish Vashisht – Atlantic publishers.
3. Sales Management, India Edition, By Joseph F Hair and others, Cengage learning.
4. Sales Management, Analysis and Decision making India Edition by Ingram and others, Cengage learning
5. Sales Management By CL Tyagi and Arunkumar, Atlantic publishers.

Suggested Readings

1. Sales Management, principles, process and practice, Bill DONALDSON by Palgrave macmillan distributed by Ane book PVT Ltd., www. anebooks.com
2. Sales and Distribution management, An Indian perspective Pingalivenugopal sage, www.sagepublication.com
3. Basics of Distribution Management A logistical approach. By Satish. K Kapoor and Purvakansal, PHI learning PVT Ltd.,

B : FINANCE

ELECTIVE COURSE I :

STRATEGIC FINANCIAL MANAGEMENT

Objectives

1.To acquaint the students with concepts of Financial management from strategic perspective

2.To familiarize various Techniques and Models of Strategic Financial Management.

UNIT – I

Financial Policy and Strategic Planning –Strategic Planning Process – Objectives and Goals – Major Kinds of Strategies and Policies – Corporate Planning – Process of Financial Planning – Types of Financial Plan – Financial Models – Tools or Techniques of Financial Modelling – Uses and Limitations of Financial Modelling – Applications of Financial Models – Types of Financial Models - Process of Financial Model Development.

UNIT – II

Investments Decisions under Risk and Uncertainty – Techniques of Investment Decision – Risk Adjusted Discount Rate, Certainty Equivalent Factor, Statistical Method, Sensitivity Analysis and Simulation Method – Corporate Strategy and High Technology Investments.

UNIT – III

Expansion and Financial Restructuring – Corporate Restructuring - Mergers and Amalgamations – reasons for Merger, Benefits and Cost of Merger – Takeovers – Business Alliances – Managing an Acquisition – Divestitures – Ownership Restructuring – Privatisation – Dynamics of Restructuring – Buy Back of Shares – Leveraged Buy-outs (LBOs) – Divestiture – Demergers.

UNIT – IV

Stock Exchanges: Constitution, control, functions, Prudential Norms, SEBI Regulations, Sensitive Indices, Investor Services, Grievance Redressal Measures.

UNIT – V

Financing Strategy - Innovative Sources of Finance – Asset Backed Securities - Hybrid Securities namely Convertible and Non-Convertible Debentures, Deep Discount Bonds, Secured Premium Notes, Convertible Preference Shares – Option Financing, Warrants, Convertibles and Exchangeable Commercial Paper.

Recommended Text books

1.Rajni Sofat & Preeti Hiro, Strategic Financial Management, Phi, Delhi, 2011

2 .Weaver & Weston, Strategic Corporate Finance, Cengage Learning, Delhi,   2001

3.Chandra, Prasanna, Financial Management, Tata McGraw Hill, Delhi. 2007

 4.Financial Markets and Institutions, S Gurusamy, Thomson

B : FINANCE

ELECTIVE COURSE – II : FINANCIAL SERVICES

Course Objectives:

This course provides an understanding of the following fund-based and fee-based financial services offered by financial intermediaries such as non-banking finance companies, banks and financial institutions and also gives some insights into the operations of the Indian Stock Market.

UNIT 1

Evolution of Financial Services –Indian Financial System – Formal Financial System and Informal Financial System – Financial Institutions –Banking Companies and Non Banking Companies – Classification of Non Banking Companies – Classification of Activities of Non Banking Finance Companies- Fund Based Activities – Fee Based Activities – concepts, growth and trends of fee Based and Fund Based activities

Unit II

Equipment Leasing: Overview, Legal & Tax Aspects, Lease Evaluation, Lease Accounting, Recent Development, International Leasing.

Unit III

Hire Purchase & Consumer : Overview, Legal & Tax Aspects, Financial Evaluation of Hire Purchase, Accounting for Hire Purchase, Consumer Credit.

Unit IV

Accessing Capital Market: Issue Management: Regulatory & Tax Framework, Issue Pricing Models – Equity and Debt Convertible Instruments, Financial Engineering, Raising funds from the International Capital Markets, Assessing Money Markets.

Unit V

Organisation and functions of stock exchanges - regulation and control of stock exchanges - NSE, BSE, OTCEI, regional exchanges.

Recommended Text books

1.Bhalla V.K. Management of Financial Services, Anmol. New Delhi.
2. Financial Services By Dr. S. Gurusamy Tata Mcgraw Hill Co
3. Financial Services, By Nalini Prava Tripathy, PHI learning PVT ltd.,
4. Financial markets, Institutions & Services by NK Gupta and Monika Chopra –
   Ane books Pvt Ltd., www.anebooks.com
5. Financial services M.Y Khan, Tata mcgraw Hill co.,
6. Financial markets and Institutions by Jeff Madura, India Edition, Cengage
   learning.

B : FINANCE

ELECTIVE COURSE – III : SECURITY ANALYSIS & PORTFOLIO MANAGEMENT

Objective :

This course provides (a) an understanding of the conceptual framework underlying Security Analysis & Portfolio Management and (b) an appreciation of the regulatory and tax framework circumscribing investment in securities; and (c) some insights into the operations of the Indian Stock Market.

Unit I

Calculation of Bond returns. Valuation of Bonds : Measures of Yield, Duration & Convexity, Measures of Risk, Determinants of Interest Rates and Theories on Term Structure, Bond Swaps.

Unit II

Derivative Securities : Equity Options : Concept, Applications & Valuation, Economic Analysis, Industry Analysis.

Unit III

Valuation of Equity Stocks : Approaches of Equity Stock Valuation, Index features, concept, applications and valuation.

Unit IV

Valuation of Equity Stocks: Company Analysis, Technical Analysis, Efficient Markets Hypothesis.

Unit V

Portfolio Management – The Conceptual Framework: Modern Portfolio Theory, Portfolio Management, Performance Evaluation of Portfolio, Applications of Options & Futures in Portfolio Management.

Recommended Text books :

1. For Unit I and II

    Security Analysis and Portfolio management By Punithavathy Pandian, Vikas publishing House PVT Ltd.,

2. For Unit III, IV and V

    Security Analysis and Portfolio Management with CAPM – By Dr. Sankara Narayanan – ANE Books Chennai – Email : anebooks_tn@airtelmail.com

3. Security Analysis and Portfolio Management by RITTU Ahuja, Atlantic publishing Co.,

4. Portfolio Management By Samir K. BARUA and others, Tata Mcgraw Hill.

5. Security Analysis and Portfolio Management, By S. Kevin, PHI learning PVT Ltd.,

6. Investment Analysis and Portfolio Management By Prasanna Chandra, Tata Mcgraw Hill Co.,

Suggested Readings :

1. Investments, Special Indian Edition by ZVI Bodie and others Tata Mcgraw Hill.

2. Fundamentals of Investment Management Indian Edition, By HIRT and Block Tata Mcgraw Hill Co.,

3. Investment Management, By Vk. Bhalla S.Chand & Co., www.schandgroup.com.

C : HUMAN RESOURCE

ELECTIVE COURSE – I : ORGANISATION DEVELOPMENT

Objectives: To enable the students to understand the philosophical, historical, theoretical, political and practical underpinnings of OD as a core area of practice within HRD and to increase awareness of different tools that are used to diagnose organizations as well as interventions used through hands-on experience, enhance skills in facilitation, OD skills, group process, communication, and collaboration.

Unit I

Introduction to Organization Development :Concept, Nature and Scope of O.D. Historical Perspective of O.D. Underlying Assumptions & Values. Theory and Practice on change and changing. The Nature of Planned Change. The Nature of Client Systems : Group Dynamics, Intergroup Dynamics and Organizations as Systems.

Unit II

Operational Components of O.D. Diagnostic, Action and Process – Maintenance Components Action Research and O.D.

Unit III

O.D. Interventions : Team Interventions, Inter – group Interventions, Personal, Interpersonal and group process interventions, Comprehensive Interventions, Structural Interventions.

Unit IV

Implementation and Assessment of O.D, Implementation – conditions for failure and success in O.D. efforts. Assessment of O.D. and change in Organizational performance, The impact of O.D.

Unit V

Key considerations & Issues in Organizational Development- Issues in consultant – Client relationships, Mechanistic & Organic systems and the contingency approach, The future of O.D, Some Indian experiences in O.D.

Recommended Text books :

1. Organization Development and Change – By Cummings and Worely Cengage learning . www.cengage.co.in

2. Management of Change and Organisation Development, SK Bhatia, Deep and Deep publishers.

3. Organization Development and Transformation, Special Indian Edition by Wendell .L French and others. Tata Mcgraw Hill. Co.

4. Organisation Development Principles, Process and Performance By Amitab Mehta , year 2009 - Global India Business Publications, New Delhi.

   E-mail: info@globalindiapublications.com

C : HUMAN RESOURCE

ELECTIVE COURSE – II : COMPENSATION MANAGEMENT

Objectives: This course gives an introduction to compensation principles and practices. The goal of the course is to give students an opportunity to comprehend the variety of theories and methods used to recruit, retain and reward employees.

Unit I

INTRODUCTION TO COMPENSATION CONCEPTS

Introduction to Compensation, Goals of Compensation System, Compensation Strategy, Monetary & Non-Monetary Rewards, Intrinsic Rewards ,Cafeteria Style Compensation, Employees satisfaction and Motivation issue in compensation design. Establishing Internal, External and individual equally.

Unit II

ESTABLISHING PAY VARIABLES AND WAGE BOARDS

Strategic importance of variable in a day-Determination of Inter and Intra industry compensation differentials. Individual and Group Incentives.

Unit III

ISSUE RELATED TO COMPENSATION

Dearness Allowance Concept-Emergence & Growth in India. Fringe Benefits and Supplementary Compensation- The role of fringe benefits in reward systems, retirement Plans including VRS / Golden Handshake Schemes.

Unit IV

EXECUTIVE COMPENSATION

Executive Compensation Systems in Multinational Companies and IT companies including ESOP.

Unit V

COLLECTIVE BARGAINING AND EMERGING TRENDS

Collective Bargaining Strategies – Long term settlements – Cases of Productivity Settlements – Exercise on drawing up 12(3) and 8(1) settlement. Cases of Productivity Settlement. Emerging Trends in IR due to LPG.

Recommended Text books

1. Compensation – By George T. Milovich and C.S. Venkatraman special Indian Edition, Tata Mcgraw Hill.

2. Human Resource Management by C.B. Gupta sultan chand & sons.

3. Compensation Management Rewarding Performance By D.S.Upadhyay Global India Business Publications, New Delhi.

   E-mail: info@globalindiapublications.com

4. Compensation: Theory, Evidence and Strategic Implications, Barry Gerhart and other ISBN : 8178 2992 08 Sage Publications , New Delhi.

   E-mail: chennai@sagepub.in

5. Reward Management – A Critical Text Vol:2, By White Geoff ISBN : 0415431891 (PB) Taylor and Francis, 2008

   Marketing By Atlantic Publishers, Chennai.

   E.mail: chennai@atlanticbooks.com

C : HUMAN RESOURCE
ELECTIVE COURSE – III : CHANGE MANAGEMENT

Objectives: To study how environmental events affect organizations and drive the need for continuous change · Analyze change at the individual, group, and systemic levels · Contrast planned and unplanned change · Evaluate and apply integrative models for assessing, diagnosing, and implementing the need for change · Identify the role of leaders and managers, change agents and change recipients in various stages of organizational change.

Unit I

Nature and Types of Organizational Change, Causes of and rationales for change, environmental and internal organizational determinants of change. Planned and emergent change. Proactive and reactive emergent change and response to these changes. Incremental and radical change, and rates / levels of change as a function of organizational life cycle positions. The links between nature / type of change and nature / type of leadership required e.g. transactional Vs transformational. The roles of corporate vision and strategy in charge.

Unit II

Theoretical frameworks, multi-source feedback for organizational change, Models of diagnosing organizational groups and jobs The organizational change web Resistance to change, Barriers to organizational change, rethinking resistance to organitional change, strategies to deal with resistance.

Unit III

Culture and the change process. The personnel manager as a cultural change agent handling power and political issues arising from change. The theoretical and practical contexts of cultural maintenance and cultural change strategies, corporate reorganization and sub culture management, Strategies and methods for achieving cultural change.

Unit IV

Behavioral Implications of change, The manifest, intent and paradoxical consequences of change, the concept of resigned behavioral compliance. The positive and negative functions of resistance. Intended and unintended behavioural reaction to downsizing and delayering. Understanding and managing uncertainty and ambiguity in the change process.

Unit V

Intervention Strategy, Structural, technological and process factors in intervention strategies. Advantages / limitations of change technologies and associated leadership models. Role of leadership in change process. Leadership and emotional knowledge strategies to achieve congruence of personnel, structure and culture. Challenges of leading change.

Recommended Text books

1. Change Management By V. Nilakani and S. Ramnaryan By Sage, www.sagepublications.com

2. Organizational change, Tupper cawsly and Gene Deszca by Sage

3. Management of Organizational change K. Harigopal by Sage.

4. Managing Organizational change Indian Edition By Palmer /dunfordlakin, Tata Mcgraw Hill Co.,

5. Change Management, Radha R. Sharma Tata Mcgraw Hill. Co.,

6. The Theory and practice of change Management, By John Hayes, Palgrave Macmillan Co., distributed by Ane books PVT Ltd., www.anebooks.com

ELECTIVE COURSE – I : E-BUSINESS

Objectives: This course encompasses the study of current management issues associated with electronic commerce strategies. It gives an insight into Intra Business applications and electronic payment system. The course imparts understanding of the concepts and various application issues of e-business like Internet infrastructure, security over internet, payment systems and various online strategies for e-business.

Unit I **Introduction**

Definitions of Electronic Business, Categories of E-business (b2b, b2c, b2a etc)Introduction to Whiteley's Model (Electronic Markets, EDI, Internet Commerce).Emerging cyber economy – Opportunities and challenges offered by internet – generic business models on the net-types and technology and economic changes.

Unit II **Intra Business Applications**

Intra business applications : Online sales force automation, online customer service & support, virtual organization, logistics management, distribution & payment channel, corporate digital library network centric computing, EDI implementation & standards, software, network carrier & mode of information transmission, business applications.

Unit III **Marketing through the Internet**

Marketing through the internet : Advertising & Marketing on the internet – Analysis of markets – Building of electronic market place of buyers & sellers, E-intermediaries, mercantile models – consumers & merchants perspective. E-Commerce & retailing – Case studies of products and services marketed on the internet.

Unit IV **Electronic Payment Systems**

Electronic payment systems & electronic cash E-Commerce & banking. Internet monetary payment & security requirements – confidentiality of payment information, payment information integrity, account holder & merchant authentication payment & purchase order process, account holder registration, merchant registration, account holder ordering, payment authorization, online e-cash anonymity, double spending, interoperability, electronic payment schemes – digital cash, credit cards, internet cheque, debit card, smart cards, financial EDI, E -wallers, micro transactions, payment clearing service providers.

Unit V **Emerging Trends**

Emerging trends : Cyber communities – new communication paradigm, building infrastructure, gaining access, multi-sensory communications, mass markets / verticals / affinity groups, e governance. Legal & regulatory issues, global learning infrastructure, computer based education & training, digital copyrights.

Recommended Text books :

1. E-commerce, By Dr. M. MAMOUDI Maymand, Deep and Deep publications PVT Ltd., www.ddpbooks.com
2. E-commerce, India Edition, Gary P. Schneider – Cengage Learning.
3. Information Systems today Leonard Jessup / Joseph VALLACICH. PHI learning PVT Ltd.,
4. E-business in the 21st century – Realities and outlook by Junu XV and

   Mohamed Quaddus, Cambridge University Press India Ltd., ISBN : 978-981-

   283-674-8 www.cambridgeindia.org

Suggested Readings :

1. Essentials of E-commerce Technology By V. Rajaraman – PHI learning PVT Ltd.,
2. Introduction to Information Systems by Alexis Leon and Mathens Leon Tata Mcgraw hill Co.,
3. E-Commerce and Web Marketing by Hanson and Kalyanam, India Edition Cengage learning.
4. Internet Marketing, By Mary Lou Roberts, India Edition, Cengage learning.

ELECTIVE COURSE – II : INTERNET TECHNOLOGIES

Objectives: The objective of this course is to enable the students to develop an online platform
for various business transaction using internet and java programming tools.

Unit I   **Introduction & Web Design**

Internet Communication Technologies - Networking Architecture – Protocols – Value
Added Networks – Virtual Private Networks. Introduction to Web Technologies –
Evolving Trends – Content Design – Graphics and Animation using Adobe Photoshop,
Dream Weaver, Flash player, Shockwave – HTML Fundamentals.

Unit II   **Client Application Development**

Java Script : Variables – Literal Arrays – Expressions and Operators – Control
Statements – Functions – Event Handling – Working with Layers – Controlling Page
Appearance using Style Sheets – Providing Security with object Assigning. VB Script :
Variables – Data types – Operators – Control Flow – Error Handling – Event
Programming, Procedures – Forms – Controls – Active X objects.

Unit III   **Web Architecture and Web Servers**

Overview of components – Tuning and Load balancing – Network Architecture –
Architecture Security, E-commerce architecture models – MS Internet Information Server
– Distributed Internet Architecture – Microsoft Transaction Server – Visual Age of Java
– Net Objects fusion – Web sphere Web logic – Net Commerce - Netscape Application
Server – Cold Fusion – Silver Stream – Vignette Story Server – Broad Vision one – to –
one Enterprise.

Unit IV   **Security**

Need for Computer Security – Protecting resources – Types of risks – Security Strategies,
Mechanisms for Internet Security – Security Tools, Enterprise Level Security,
Encryption, PKI (Public Key Infrastructure), Fire Walls, Digital Certificate (X.509),
Digital Certificate servers (entrust, netscape, verisign, oracle), Secure Socket Layer,
LDAP (Light Weight Directory Access Protocol).

Unit V   **Advanced Concepts**

Dynamic HTML – Extended Markup Language – Wireless Markup Language – Virtual
Reality Modeling Language – Wireless Application Protocol – Voice Over Internet
Protocol – Component Object Model – Common Object Request Broker Architecture –
Java Beans – Enterprise Java Beans.

Recommended Text books :

1. The Internet Book by Douglas E Comer, India Edition, PHI Learning   PVT Ltd.,

2. Introduction to Information Systems, Alexis Leon and Mathews Leon by Tata Mcgraw Hill.Co.,

3. Internet for Everyone, By Alexis Leon and Mathews Leon,Vikas Publishing House PVT Ltd.,

4. Information Systems Today, By Leonard Jessup and Joseph Vallacich. PHI learning PVT Ltd.,

D : SYSTEM

ELECTIVE COURSE – III : MANAGEMENT INFORMATION SYSTEMS

Objectives: The objective of this course is to expose the students to the managerial issues relating to information systems and help them identify and evaluate various options in this regard.

Unit I INTRODUCTION TO BUSINESS SYSTEMS IN BUSINESS

Foundations of Information Systems: A framework for business users - Roles of Information systems - System concepts - Organisation as a system - Need for IS in Business – fundamentals of IS – System concepts – Components of IS – IS resources Activities – Overview of IS – Operation Support Systems, Management Support Systems, Other Classification – System approach to Problem solving – Global business scenario – trends in technology and applications.

Unit II INFORMATION SYSTEMS FOR BUSINESS OPERATIONS :

Business Information Systems – Marketing Information Systems – Manufacturing – Information Systems – Human Resource Information Systems – Accounting Information Systems, Financial Information Systems – Transaction Processing System.

Unit III INFORMATION SYSTEMS FOR MANAGERIAL DECISION SUPPORT

Management Information & Decision Support Systems – Management Information Systems – Expert Systems – Examples, Executive Information Systems – Artificial Intelligence Technologies.

Unit IV INFORMATION SYSTEMS FOR STRATEGIC ADVANTAGE :

Strategic roles of IS-Breaking Business Barriers – Reengineering Business Processes Improving Business Quality – Creating Virtual Company – Building knowledge Creating Company – Using Internet Strategically – Challenges of Strategic IS – Enterprise – wide systems and E-Business applications.

Unit V   **MANAGING INFORMATION SYSTEMS :**

Enterprise Management – Information Resource Management – Strategic Management, Operational Management – Resource Management Technology Management – Distributed Management. Organizing Planning – IS planning methodologies – Critical Success Factors – Business Systems Planning – Computer Aided Planning Tools. Security & Ethical Challenges; IS controls – Facility Controls – Procedural Controls – Computer Crime – Privacy Issues.

Recommended Text books

1. Information Systems Today, By Leonard Jessup and Joseph VALACICH INDIAN Edition, PHI learning PVT Ltd.,

2. Management Information system, By EFF OZ, Indian Edition, Cengage learning.

3. Management of Information systems by S.A. Kelkar, PHI learning PVT Ltd.,

4. Management Information systems Indian Edition, Gordon B. Davis and Margrethe H. Olson, Tata Mcgraw Hill.

5. Introduction to Information Systems by Alexis Leon and Mathews Leon Tata Mcgrawhill Co.

Suggested Readings

1. Management Information Systems S. Sadagopan, PHI learning PVT Ltd.,

2. Management of Information Systems By Waman S. Jawadekar Tata Mcgraw Hill.

3. Management Information System – The Managers view Indian Edition By ROBERT Schultheis and Mary Summer Tata Mcgraw Hill.

4. Principles of Information Systems By RALPH Stair and George Reynolds, Cengage Learning.

E : OPERATIONS

ELECTIVE COURSE – I : SUPPLY CHAIN MANAGEMENT

Objectives :

To explain basic theory and techniques of supply chain to examine the issue and problems associated with supply chain in a changing business environment.

Unit I

Supply Chain Management: Introduction and Development- Nature and Concept - Importance of Supply Chain - Value Chain - Components of Supply Chain - The Need for Supply Chain - Understanding the Supply Chain Management - Participants in Supply Chain – Global Applications.

Unit II

Flow Management and its importance-Management of material flow in the supply chain, Management of information flow, Management of cash flow and value flows, Customer Service strategy, Bench marking best practices.

Unit III

Customer relationship Management, Out-bound logistics resources planning and management, Quick response systems in Manufacturing .

Unit IV

Management of in-bound logistics, E-supply chain cases, Role of a Manager in Supply Chain - Supply Chain Performance Drivers - Key Enablers in Supply Chain Improvement - Values of Supply Chain.

Unit V

Bull Whip Effect and Supply Chain – Supply Chain Relationships – Conflict Resolution Strategies .Supply chain cost analysis. Supply chain performance measures. Issues in Global supply chain

Recommended Text books:

1. Supply chain management – John T. Ment Z FR By Response Books, a division of Sage Publications. wwwsagepublications.com
2. Supply chain management – Rahul V. Altekar, By PHI learning PVT Ltd.,
3. Supply chain management, India Edition John J. Coyle and others. Cengage learning.
4. Supply chain management By Narayan Rangaraj and others, Tata mcgraw Hill. Co., www. tatamcgrahill.com

Suggested Readings

1. World class supply chain management India Edition, By Burt – Dobler – Starling Tata Mcgraw Hill Co.
2. Introduction to supply chain management Robert B. and others India Edition, PHI learning PVT Ltd.,
3. Designing and Managing The Supply chain, concepts, strategies and case studies by David Simchilevi, Ravi shankar and others Special Indian Edition, Tata Mcgraw Hill Co.
4. Supply Chain Management : Concepts Techniques and practices – by Lingli Cambridge university press International Edition. www.cambridgeindia.org.

E : OPERATIONS

ELECTIVE COURSE – II : ADVANCED OPERATION RESEARCH

Objectives: To develop an understanding of Advance concept of Operation Research techniques and their role managerial decision making.

Unit I

- ❖ Non Linear Programming – Non linear programming problems of general nature – one variable unconstrained optimization Multi variable unconstrained optimization – Karush Kuhn Tuker (KKT) conditions for constrained optimization – its Applications in Management.
- ❖ Seperable programming and its Applications in Management.
- ❖ Quadratic Programming – convex programming – geometric programming – Fractional programming and its Application in Management.

Unit II

- ❖ Markov chains – Formulation – Kolmogorov Equation – steady state conditions – Markov chain modelling through Graphs – communication networks – weighted diagraphs – classification of states of Markov chain – Long Run properties of Markov chains.
- ❖ Empherical Queuing models – (M/M/1) : (GD / ∞/∞) Model - (M/M/C) : (GD/∞/∞) Model – (M / M / 1) : (GD / N / ∞) Model –
  (M / M/ C) : (GD / N / ∞) Model (for C $\leq$ N) –
  (M / M / C) : (GD / N / N) Model (for C < N) –
  (M / M / 1) : (GD / N / N) Model (for N > 1)

Unit III

- ❖ Integer Programming – Formulation – Branch and Bound Technique and its applications to Binary Integer Programming and Mixed Integer Programming – Branch and Cut Approach to solve Binary Integer Programming (BIP).
- ❖ Applications of BIP in the Areas of Investment Analysis, site selection, Designing a production and Distribution network, Dispatching shipments, scheduling and its interrelated activities and Airlines Industry.

Unit IV

- ❖ Dynamic Programming (DP) – Applications of DP in capital budgeting, Reliability Improvements, stage-coach, cargo loading, single machine scheduling, optimal sub – dividing – solving LPP using Dynamic programming Technique.

Unit V

- ❖ Network Models – Terminologies – shortest path model – minimum spanning tree problem - Maximal flow problem – Minimum cost flow problem.
- ❖ Replacement and maintenance Analysis – Types of Maintenance – Types of Replacement problem and decisions – Determination and problems of Economic life of an Asset.

Recommended Text books

For Unit – I, Unit – II, Unit – III

1. Introduction to Operations Research (Concepts and cases)
    By Frederick S. Hillier and Gerald J. Lieberman (Eighth Edition)
    Tata Mc-Graw Hill Education Private Limited (Special Indian Edition)
    E-mail : mark_pani@mcgrawhill.com

For Unit II, Unit IV, Unit V

2. Operation Research (Second edition)
    By R. Paneerselvam
    PHI Learning Private Ltd., New Delhi.
    E-mail : prakash@phindia.com

For Unit II

3. Operations Research (Algorithms and Applications)
    By Rathindra P. Sen
    PHI Learning Private Ltd., New Delhi.

NOTE :   TO COVER ALL THE UNITS IN THE SYLLABUS STUDENTS

SHOULD GET THE ABOVE 3 BOOKS.

E : OPERATIONS

ELECTIVE COURSE – III : MANAGEMENT CONTROL SYSTEMS

Objectives: To enrich the students with the knowledge of Management Control concepts and its implication in organizations. To give an insight into key variables in Management control designs.

Unit I

Nature of Management control – Control in organisations – phases of management control system – Management control Vs Task control.

Unit II

Control and organisational Behaviour – Types of organisations and their implications – Types of organisations and their implications – Types of control and variations in controls based on organisational structure and design.

Unit III

Goals and strategies – Key variables in Management control Design and their types – key Result Areas.

Unit IV

Management control structure – Expense control – profit centers – Transfer pricing – Investment centers – Management control process – Programming and budgeting – Analysing reporting – Performance evaluation.

Unit V

M.I.S. for management control – Systems theory and management control – Installation of Management Information & Control System – Structured and unstructured decision – Implication for control.

Special management control situations – Multinational companies – Service organisation – Non-profit organisations – Multi – Project organisation.

Recommended Text book :

1) Management control systems By N. Ghosh – PHI learning private Ltd.,
2) For Unit – V
   Management control systems by Joseph A. Maciariello and other, India Edition PHI learning PVT Ltd.,

Suggested Readings

1) Management control system by Robert N. Anthony and Vijay Govindarajan, Tata Mcgraw Hill – special Indian Edition.

A : MARKETING

ELECTIVE COURSE - IV : ADVERTISING AND SALES PROMOTION

Objectives

The aim of the paper is to acquaint the students with concepts, techniques and give experience in the application of concepts for developing an effective advertising and Sales Promotion programme.

Unit I

Advertising's Role in the Marketing Process : Legal Ethical and Social Aspects of Advertising; Process of Communication – Wilbur Schramm's Model, Two step Flow of Communication, Theory of Cognitive Dissonance and Clues for Advertising Strategists.

Unit II

Simulation of Primary and Selective Demand – Objective Setting and Market Positioning; Dagmar Approach – Determination of Target Audience; Building of Advertising Programme – Message, Headlines, Copy, Logo, Illustration, Appeal, Layout.

Unit III

Campaign Planning; Media Planning; Budgeting; Evaluation – Rationale of Testing Opinion and Aptitude Tests, Recognition, Recall, Experimental Designs; Advertising Organisation.

Unit IV

Selection, Compensation and Appraisal of an Agency; Electronic Media Buying. Advertising campaign, Advertising V/s Consumer Behaviour.

Unit V

Sales promotion – Role of Creative Strategies – Different methods of sales promotion – Evaluating effectiveness of different promotional strategies.

Recommended Text book :

1) Advertising and Promotion By George E. Belch and others. Tata Mcgraw Hill Co.
   Email : mark_pani@mcgrawhill.com

2) Advertising Management with solution manual by Jaishri Jethwaney and Shruti Jaui Oxford University Press, Chennai.

3) Advertising and promotion by Shimp Cengage learning, Chennai.
   Email : sriram.b@cengage.com

4) Strategic advertising management by Lorry percy and Richard Elliott oxford University press, chennai.

5) Advertising planning and implementation by Sangeeta Sharma and Raguvirsingh PHI learning India PVT Ltd.,

6) Advertising & promotions are (IMC) Integrated Marketing Communication approach by Kruti Shah and Alan D'souza, Tata Mcgraw Hill Co.

7) Advertising Management by O' Guinn and others, cengage learning Chennai – Special India Edition.

8) Contemporary Advertising William .F Arens, Tata Mcgraw Hill Co.

9) Principles of Advertising and IMC by Tom Duncaw, Indian Edition Tata Mcgraw Hill Co.

10) Advertising Management Media approach for Market Research Global India Publications PVT Ltd., New Delhi.
    Email : info@globalindiapublications.com

11) Branding and Advertising by Seema Gupta – Global India Publications, New Delhi.

A : MARKETING

ELECTIVE COURSE - V : MARKETING OF SERVICES

Objectives: This course aims at providing a perspective on the concepts ,framework and analytical procedures available to service marketers to resolve the varies challenges faced in different situations.

Unit I

Developing a Framework for understanding Services Marketing – Classification of Services on similar characteristics.

Unit II

Nature of service – Relationship with customers – customerisation and judgement in Service delivery – Nature of demand relative to supply method of service – Delivery – Significance of people based attribute and / or facility based attributed of the service product.

Unit III

Managing Customer Mix – Deciding on what segment of Customers to serve – Positioning the service – Developing of service positioning strategy – Positioning map.

Unit IV

Managing Demand – Demand supply interaction – Strategies relating to demand – Inventory Demand – Flexible capacities – Modifying marketing mix elements to manage demand.

Unit V

Service business as a system – service operations sub – systems – Service delivery subsystem – Service marketing subsystem – Planning, organization – and implementation of Marketing effort – inter functional Conflict between marketing and operation – Evaluation of marketing effort.

Recommended Text book

1) <u>For Unit I, II, III</u>

   Services Marketing – operations and Management, By Vinnie Jauhari & Kirtidutta, Oxford University Press, Chennai. Email : v.anand@oup.com

2) <u>For unit IV & V</u>

   Marketing of services, India Edition, K. Douglas Hofiman, John.E.G. Bateson, Cengage learning. Chennai. Email : sriram.b@cengage.com

3) Services marketing by Kapoor, Paul & Halder – TATA Mcgraw Hill Co – Chennai.

4) Services marketing Govind Apte, Oxford University Press, Chennai.

5) Services marketing, The Indian Context, R. Srinivasan, PHI learning.

Suggested Reading

1) Services marketing and management by Audrey Gilmore, Response Book – sage publication. www.indiasage.com

2) Services marketing text and cases Steve Baron and others, published by Palgrave Macmilan London, Distributed by ANE book PVT Ltd., Chennai. Email : anebooks_tn@airtelmail.in

3) Text book of marketing of services by Nimit chowdhary – Macmillan India Ltd.,

A : MARKETING

ELECTIVE COURSE - VI : RETAIL MANAGEMENT

Objectives : The course will focus on (i) Manufacturers perspective on retailers.

(ii) Retailers understanding of the retail business.

Unit I

Retailing – meaning, definitions, functions performed by retailers, Importance of retailing. Requisites for successful retailer. Forces affecting retail sector in India. The retail life cycle. The strategic Retail Planning process, Retailing mix. Issues in Retailing.

Unit II

Traditional and modern formats of retail business – Marketing Concepts in Retailing – Consumer purchase behaviour – Cultural and Social group influence on Consumer Purchase Behaviour.

Unit III

Retail Location strategies: Issue to be considered in site selection. Decisions on geographic locations of a retail store. Location site and types of Retail development. Types of planned shopping area. Factors involved in the location decision. Catchment area analysis.

Unit IV

Merchandise Planning – Stock turns, Credit Management, Retail Pricing, Return on per. sq.feet of space – Retail Promotions . Traffic flow and analysis – Population and its mobility – Exteriors and layout – Customer traffic flows and pattern – Creative display.

Supply Chain Management – Warehousing – Role of IT in supply chain management.

Unit V

Consumerism and ethics in Retailing, Retail Audits, e-Retailing, Application of IT to Retailing, Retail Equity, Technology in Retailing – Retailing through the Internet.

Recommended Text book

1. Retailing Management – Text and cases by Swapna Pradhan – Tata Mcgraw Hill Co – Chennai. Email : mark_pani@mcgrawhill.com
2. Principles of retail management by Rosemary Varley and Mohamed Raffiq – Palgrave macmillan – London – distributed by ANE books PVT Ltd.,

Email : anebooks_tn@airtelmail.com

3. Retail management – Dunne Lusch, cengage learning, Chennai.

Email : sriram.b@cengage.com

4. Retail supply chain management by James B. Ayers and Mary Odegaard special Indian Edition – ANE books PVT Ltd., Chennai.

Email: anebooks_tn@airtelmail.com

Suggested Readings

1) Retailing management, Michael Barton and others – Tata Mcgraw Hill co.
2) Managing Retailing – Piyush Kumar Suiha and others. Oxford University press. Chennai.
3) Retailing environment & operations Andrew J. Newman and other, cengage learning Chennai.
4) International Retailing, Nicholas Alexander – Oxford University press Chennai.
5) Fundamentals of Retailing – KVS madaan, Tata Mcgraw Hill Co.
6) Retail Management – Chetan Bajaj and others. Oxford University Press.
7) Retail Management By Neelesh Jani Global India Publichations, New Delhi.
8) Retail Management by Sajai Gupta and GVR Preet Randhawa – Atlantic publishers – Chennai.

B : FINANCE

ELECTIVE COURSE - IV : PROJECT MANAGEMENT

Objectives: This course enables the students to get enrich in the concepts of project management and to help the students in project planning and scheduling.

Unit I

Concepts of Project Management; Project – Meaning – Nature – Types of project and project life cycle – Project management – Nature and scope of project management – Project management as a profession – Role of project manager.

Unit II

Project Identification and Formation: Project environment – Identification of investment opportunities – Projects screening – Preferability study – Project selection – Project formulation – Stages in project formulation – Project report preparation – Planning Commission's guidelines for project formulation.

Unit III

Project Appraisal: Objectives, essentials of a project methodology – Market appraisal – Technical appraisal – Financial appraisal – Socio – economic appraisal – Management appraisal.

Unit IV

Project Planning and Scheduling : Objectives – Process or Planning Components or good planning – Project designing and project scheduling and time estimation – Scheduling to match availability of man power and release of funds – Cost and time trade cost.

Unit V

Project Execution and Administration – Project contracting: Contract pricing, types – Project organisation: Forms of organisation – Project direction – Project communication – Project co ordination – Factors influencing effective project management – project time monitoring and cost monitoring – Project over runs. Project Control : Control techniques – PERT, CPM - Proper review – Project audit.

Recommended Text book

1) For Unit II and IV
Total project T Management The Indian context by PK. Joy – Mac millan
India Ltd.,
2) For Unit I and V
Project Management – by R. Panneerselvam and P. Senthil kumar PHI learning
India PVT Ltd.,
3) Project Management By Bhavesh .M Patel, Vikas Publishing Hous PVT Ltd.,
4) Project Management By S. Choudhury Tata Mcgraw Hill Co.
5) Project Management India Edition By CIDO I Clements, Cengage learning.
Suggested Readings
1) Project Management by CCI Pfor D.F. Gray and Erik .w Carson – Tata Mcgraw Hill Co.
3) Text book of project management by P. Gopalakrishnan & VE. Ramamoorthy Macmillan
India Ltd.,
4) Projects, Planning, analysis, selection financing, Implementation and Review
by Prasanna Chandra – Tata Mcgraw Hill Co.

Suggested Readings

1) Project Management by CCI Pfor D.F. Gray and Erik .w Carson – Tata Mcgraw Hill Co.

2) Project Management – Management extra series – ANE books
   E-mail : anebooks_tn@airtelmail.in

3) Text book of project management by P. Gopalakrishnan & VE. Ramamoorthy Macmillan India Ltd.,

4) Projects, Planning, analysis, selection financing, Implementation and Review by Prasanna Chandra – Tata Mcgraw Hill Co.

B : FINANCE

ELECTIVE COURSE - V : GLOBAL FINANCIAL MANAGEMENT

Objectives: This course enrich the students with the concepts of International Financial markets. It also gives an insight into merits and effects of Foreign Direct Investments.

UNIT-I

Globalisation - Implications of Globalisation – Goals of International Financial Management - scope of International Finance – International Monetary System – Bimetallism – Gold Standard – Bretton Woods System – Floating Exchange Rate Regime – European Monetary System – IMF – WTO – GATT .

UNIT-II

Balance of Payments – The Current Account – The Capital Account – significance - Balance of Payments in the World – Balance of Payments Account of India

UNIT-III

International Financial Markets – Sources of International Funds – Multilateral Development Banks – Governments/ Governmental Agencies – International Banks – Security Markets Instruments of International Financial Markets– International Equities – GDRs – ADRs - International Money Market and Bond Market Instruments – Euro Bonds – Repos – Euro Commercial Paper – Medium Term Notes – Floating Rate Notes – Loan Syndicates – Euro Deposits – Euro Issues in India.

UNIT-IV

Currency Risk and Exposure – Types of Currency Risk – Management of Currency Risk – Concept and Measurement of Transaction Exposure - Techniques of Transaction Exposure Management – Translation Exposure – methods – Transaction Exposure Vs. Translation Exposure – Exchange Risk Management – Operating Exposure – measuring and managing Operating Exposure.

UNIT-V

Foreign Direct Investment (FDI) – Forms of FDIs – FDI in World – purpose of overseas investment – Benefits to the Host Countries – Effects of FDI – Political Risk.

Recommended Text books

1.Joseph Anbarasu, Global Financial Management, Ane, Delhi, 2010
2.Kevin s, Fundamentals Of International Financial Management, PHI, Delhi, 2010
3.Jeff Madura, International Financial Management, Cengage learning, Delhi, 2008

Suggested Readings
1) International Finance – By Thomas J. Obrien, Oxford University Press, Chennai.
2) International Financial Management By PG. APTE, Tata Mcgraw Hill Co
3) Global Financial Reporting and Analysis, Cengage learning – By Alexander Britton and Jorissen.
4) International Financial Management by Ephraim Clark – cengage learning.

B : FINANCE

ELECTIVE COURSE - VI : MERCHANT BANKING

Objectives: To help students to learn the various concepts in merchant banking and its role in appraisal of projects.

To help the students to know about insurance industry.

Unit I

Introduction – An Over view of Indian Financial System – Merchant Banking in India – Recent Developments and Challenges ahead – Institutional Structure – Functions of Merchant Banking - Legal and Regulatory Frameworks – Relevant Provisions of Companies Act- SERA- SEBI guidelines- FEMA, etc. - Relation with Stock Exchanges, OTCEI and NSE.

Unit II

Role of Merchant Banker in Appraisal of Projects, Designing Capital Structure and Instruments – Issue Pricing – Pricing – Preparation of Prospectus Selection of Bankers, Advertising Consultants, etc. - Role of Registrars – Underwriting Arrangements - Dealing with Bankers to the Issue, Underwriters, Registrars, and Brokers – Offer for Sale – Book – Building – Green Shoe Option – E-IPO Private Placement – Bought out Deals – Placement with FIs, MFs, FIIs, etc.

Unit III

Mergers and Acquisitions – Portfolio Management Services – Credit Syndication – Credit Rating – Mutual Funds - Business Valuation.

UNIT-IV

Mutual Funds - Origin, Types of Mutual Funds, Importance, Mutual Funds Industry in India – SEBI's directives for Mutual Funds, Private Mutual Funds, Asst Management company – Unit Trust of India – Evaluation of Performance of Mutual Funds – Money Market Mutual Funds – RBI Guidelines – Venture Capital: Meaning, Origin, Importance, Methods, India Scenario.

UNIT-V

Insurance – Meaning, Types, Insurance Industry in India and related reforms – Other Financial Services – Credit Cards – Credit Rating: Regulatory framework – Credit Rating Agencies – Rating Process and Methodology – Rating symbols/Grades – Pension Plan.

Recommended Text books

1. J.C.Verma, 'A Manual of Merchant Banking', Bharath Publishing House, New Delhi.
2. K.Sriram, 'Hand Book of Leasing, Hire Purchase & Factoring', ICFAI, Hyderabad.
3. Economic Dailies, Relevant Publication of AMFS.
4. Bhalla. V.K. – 'Management of Financial Services' – Anmol, New Delhi.
5. Khan, M.Y., FINANCIAL SERVICES, Tata McGraw Hill, New Delhi, 2001. Gurusamy, MERCHANT BANKING AND FINANCIAL SERVIES, Tata McGraw Hill, Delhi, 2009.

C : HUMAN RESOURCE

ELECTIVE COURSE - IV : PUBLIC RELATIONS MANAGEMENT

Objectives

1. To understand the role of public relations in building and maintaining a healthy corporate image.
2. To gained working knowledge of the various tools used in public relations.

Unit I

Introduction to P.R. – Definition, Nature, History and Development, Role of PR, PR associations. Objectives Of Public Relations, Emergence Of Public Relation.

Unit II

Public Relations Process, PR Problems, Elements Of Public Relations, The Psychological factors that affect the perception of the public,decision making process.

Unit III

Public Opinion Research, Functions Of Public Relations Department, PR Professional Code. Relations with the Government, Community Relations, Shareholders Relations, Promotion Programmes, Donations, Employee Publications, Guest Relations, Establishment Of Relations With The Public.

Unit IV

Media & Tools : Press, Radio, Television, Documentaries, Films.

Company Literature : Annual reports, manuals Brochures Information bulletins, House Journals, News Letters, Direct mailing.

Unit V

Advertising and Promotional Techniques : Promoting and positioning your organization through Advertising, Exhibitions, open house, Tournaments etc.,

Lobbying, Managing Rumors & Leaks.

Recommended Text books

1) Effective public relations and media strategy by C.,V. Narasimha Reddy – PHI learning India PVT Ltd.,

   Email : phi@phindia.com

2) <u>For Unit V</u>

   Public Relations principles and practices with solution manual by Iqbal S. Sach deva Oxford University Press, Chennai. Email : v.anand@oup.com

3) Public relations practices by Allen H. Center and patrick Jackson – cage studies and problems – Indian Edition - PHI learning India PVT Ltd.,

4) Public management – maximize efficiency and effectiveness by Sukumar chatterjee – Global India Publications, New Delhi.

   Email :   1) info@globalindiapublications.com

                    2) pragati@mdppi.com

C : HUMAN RESOURCE

ELECTIVE COURSE - V : MANAGING INTERPERSONAL EFFECTIVENESS

Objectives: To help the students to understand their self. To give an insight into changing attitude and environment influence. It also helps the students to understand the concepts of stress.

Unit I : SELF PERCEPTION AND SELF-PRESENTATION

Defining & perceiving self, gaining self-knowledge, self-effectiveness, self-presentation, self-presentation motives and strategies, impression management, self-monitoring.

Unit II : COMMUNICATION

Communication & language, Non-verbal communication, proxemics (interpersonal space) paralanguage, kinesics, deception, detection deception, non-verbal leakage.

Unit III : ATTITUDE AND ATTITUDE CHANGE

The nature of attitude, changing attitudes – theoretical perspectives, changing attitudes through persuasion, Avoiding measurement pitfalls, conditions promoting and reducing consistency.

Unit IV : ENVIRONMENTAL INFLUENCE

Territoriality, crowding, environmental quality and social behavioour, the impact of our surroundings.

Unit V : QUALITY OF WORK LIFE (QWL)

Quality of Work Life : Working and well being, The working woman and the stress on working women, Advertising and consumer Behaviour, public health, aging and life quality, using social psychology to improve quality of work life.

Recommended Text Books

1) For Unit I and II

   Behaviour in Organisations By Jerald Greenberg and Robert. A. Baron – PHI learning India PVT Chennai. E-mail : phi@phindia.com

2) Culture and Organisational Behavior by Jai B.P> Sinha – Sage, Chennai. E.mail : chennai@sagepub.insagepublications.com

3) Organisational behaviour by S. Fayyaz Ahamed and others – Atlantic publishers – chennai.

4) For unit II

   Fundamentals of Organizational behaviour by Slocum and Hellriegel, India Edition by cengage learning chennail. Email : sriram.b@cengage.com

5) For Unit III

   Organisational Behaviour by Steven L MC Shane and others, Tata MCgrawhill Co. Chennai. Email : mark_pani@mcgrawhill.com

6) For Unit Iv

   Essential social Psychology – By (RISO . R.J) and Turner R.N. – Thousand Oaks, CA; International Edition – Sage publication, chennai. E.mail : chennai@sagepubuisagepublications.com

7) For Unit V Quality of work life

   Organisational Behaviour By John. W. Newstrom – Tata Mcgraw Hill, Special Indian Edition. Email : mark_pani@mcgrawhill.com.

8) For Unit V

   Working Woman and the stress organisational behaviour by Steeven L. MC Shane, Tata Mcgraw hill. Chennai.

C : HUMAN RESOURCE

ELECTIVE COURSE - VI : GROUP DYNAMICS

Objectives: To help the students understand the concepts in group dynamics and to learn the process of decisions making in groups. To know the factors affecting the integration in groups and how to overcome it.

Unit I

Groups and its formation – Formal and informal groups – Functions fulfilled by groups – Variables affecting the integration in groups of organization in groups of organizational groups and personal needs.

Unit II

Training for effective group membership – T Group training or sensitivity training – Lab exercises and feedback to individuals for improving interpersonal competence goals, approaches and utilization of sensitivity – training in Organizations.

Unit III

Process of decisions making in groups – Problems and approaches for 'consensus' formation – effective meetings.

Theory and model of interpersonal behaviour of C William Shutz – FIRO – B Test – its application – Achieving group compatibility – Problems in Reaching compatibility.

Unit IV

Use of groups in Organizations Vs Individual performance – Inter group Problems in Organizations – Inter group competition – Reducing competition through training – Conflict – Management of conflict – Preventing interpersonal conflict and inter group conflict Achieving integration in groups.

Unit V

Organization Development through better management of group dynamic – Team work development.

Recommended Text book
1) Group processes – India Edition by Donel son. R. Forsyth – cengage learning.
   Email : sriram.b@cengage.com
   Mobile : 99401 11491
   www.cengage.co.in
2) Organisational Behaviour By S. Fayyaz Ahamed and others, Atlantic publishers & Distributors (p) Ltd., Chennai.
   Email : chennai@atlanticbooks.com

D : SYSTEM

ELECTIVE COURSE - IV : SOFTWARE PROJECT MANAGEMENT

Objective: To introduce the students to various key stages in the development of software. The focus is on system implementation. To introduce database technologies and software project management.

Unit I : SYSTEM ANALYSIS & DESIGN

Overview of system analysis & Design : Introduction to different methodologies & Structured system analysis – Details of SDLC approach – mini cases – E.R. diagrams – DFD concepts – Data dictionary concepts. Structure charts – modular programming – I/O & file design consideration – Entity Life histories (ELH).

Unit II   SYSTEM IMPLEMENTATION

System implementation & maintenance : Implementation Strategies – SW / HW selection & procurement – Control & security – issues of designing & implementing on-line systems – data communication requirements – system conservation approaches & selection issues.

Unit III   PROJECT DEVELOPMENT & DATABASE DESIGN

Introduction to Database technologies & CASE tools with specific packages – overview of relational model – Database creation – SQL command – Normalization – designing forms & reports – using CASE tools for system analysis & design-case studies – Cost / benefit analysis – project & resource planning – design & development testing & documentation.

Unit IV   SOFTWARE PROJECT MANAGEMENT

Software project management: challenges & opportunities – changing technologies & approaches – choice development of methodologies & technical platforms, project management techniques – monitoring 7 measurement of progress.

Unit V   SOFTWARE PROJECT MANAGEMENT

Software project management – elements, cost estimation, manpower planning, Software & Product Metrics – Quality assurance & control – standards' & documentation – testing – implementation – training – technology management – quality standards – certificate – handling multiple projects, issues of share development.

Recommended Text books :

1) Software Engineering Principles and practice by Waman S.Jawadekar Tata Mcgraw Hill Co. – Chennai. Email : mark_pani@mcgrawhill.com

2) <u>For Unit I</u>

   Database Management systems Alexis Leon & Mathews Leon, Vikas Publishing House PVT Ltd.,

3) Software Project Management by S.A. Kelkar, PHI learning India PVT Ltd., Email : phi@phindia.com

4) Software project management (2 volumes set) by Prof. SN. Singh and SL. Gupta – Global India publications PVT Ltd., New Delhi.

   Email : info@globalindiapublications.com

D : SYSTEM

ELECTIVE COURSE - V : RELATIONAL DATABASE MANAGEMENT SYSTEM

Objective: The course is aimed at providing skills on developing and implementing applications in RDBMS.

Unit I   INTRODUCTION TO RDBMS AND ORACLE

Basic concepts of Relational Data Model – Introduction to SQL – Normalization. Creating tables – data types – data functions – conservation and transformation functions – queries and sub queries.

Unit II   ADVANCED CONCEPTS OF ORACLE

Changing data – advanced use of functions and variables – creating, dropping, altering tables and views – SQL (Structured Query Language) plus – accessing remote data – building reports – authority allocation – triggers and procedures. Data dictionary – design and performance issues.

Unit III   INTRODUCTION TO VISUAL BASIC

Introduction to basics – variable and values – drawing on the screen – building programs – adding menu bar – using array variable – building clock programs.

Unit IV   BUILDING LARGER PROGRAMS

Designing and building larger programs – address – book interfacing – working with multiple records – searching, printing, sorting and deleting – data management and control tool box for controls, forms, drawing fonts, and miscellaneous.

Unit V   PROJECT DEVELOPMENT

Selection of a Client / Server based application – design the project and tools – development using Oracle and Visual Basic – demo and review.

Recommended Text books :

1) <u>For Unit I and II</u>

   Oracle Database 11g By Satish Asnani – PHI learning India PVT Ltd.,

   Email : phi@phindia.com

2) <u>For Unit III and IV</u>

   Programming with visual basic 6.0 by Mohamed Azam – Vikas publishing house
   PVT Ltd., Chennai – www.vikaspublishing.com

3) <u>For Unit V</u>

   Database Management System Oracle SQL and PL / SQL by Pranabkumar Dasguptal
   PHI learning India PVT Ltd.,

4) Database system concepts by Peter Rob & Carlos Coronel India Edition, Cengage
   learning Chennai. Email : sriram.b@cengage.com

Suggested Readings :

1) Oracle PL / SQL programming by Laksman Bulusu, cengage learning, Chennai.

2) Database Management Systems By Gerald V.Post – Tata Mcgraw Hill Co.

3) Database Management Systems By Alexis Leon and Mathews Leon – Vikas
   Publishing House PVT Ltd.

D : SY STEM

ELECTIVE COURSE - VI :

OBJECT ORIENTED PROGRAMMING & C++

Objective: The objective is to provide the students with basic understanding of programming. It also gives an insight into object oriented Programming and data modeling.

Unit I : INTRODUCTION

Traditional Programming approaches – Straight – Run Programming & structured Programming techniques – Limitations of Traditional Approaches – Object Oriented Approach – Objects – Classes – Data encapsulation – Data abstraction – Inheritance – Code Reusability – Polymorphism – Object Oriented Languages.

Unit II   OBJECT ORIENTED ANALYSIS AND DATA MODELING

Object Oriented Analysis & Data Modeling – Object Oriented Concepts, Object Oriented Analysis Modeling – Object Oriented design concepts, object oriented design methods, class & object definition, refining operations, program components & interfaces.

Unit III   DESIGNING OF OOD SYSTEMS

Notation for OOD, Implementation detailed design, An Alternative Object Oriented Design strategy, integrating OOD with SA/SD.

Unit IV   C++ BASICS

C++ Programming basics – classes & objects, constructor & destruction, Overloaded constructors, Access specifies, static class data, Inheritance, Base Class & Derived class constructors, overriding member functions, class hierarchies, abstract base class, public & private inheritance, levels of inheritance, multiple inheritance.

Unit V   ADVANCED CONCEPTS

Polymorphism, operator overloading, Virtual functions, Dynamic or Late binding, abstract classes, virtual base classes, friend functions static functions, Templates classes, Case Studies & Programming development in C++ demonstration & presentation.

Recommended Text book

1) For Unit I

   C++ and object oriented programming paradigm by ebasish Jawa, PHI learning India PVT Ltd.,

2) For Unit II, III and IV

   Object Oriented Programming with C++ by Balagurusamy – Tata Mcgraw Hill Co.,

3) For Unit V and case studies

   Programming with ANSI C++ by Bhusha Trivedi with solution manual Oxford University press, Chennai. www.oup.com

4) For unit II, III & IV

   Object Oriented Programming using C++ by Joyce Farrell, Cengage learning, India edition.

Suggested Readings :

1) Programming with C++ by D. Ravichandran – Tata Mcgraw Hill Co.

2) C++ programming Today by Barbara Johnson, India Edition PHI learning India Edition.

3) Introduction to Object Oriented Programming and C++ By ISRD Group, Tata Mcgrawhill Co.

4) Object Oriented Programming with C++ by Rohit Khurana Vikas publishing house PVT Ltd.,

E : OPERATIONS

ELECTIVE COURSE - IV : MATERIAL MANAGEMENT

Objectives :

The key objective of this course is to acquaint the students with Decision – making for effective and efficient purchase, storage and flow of materials in manufacturing and service organizations.

Unit I   PURCHASING

Material management-meaning, advantages. Codification. Purchase management-Objectives, ,Functions, responsibilities and duties of purchase department .8R's of Purchasing. Kardex system. Methods of purchasing. Buying procedure.

Unit II   VENDOR DEVELOPMENT

Scope of vendor development, stages in source selection, vendor rating- criteria, methods of rating .

Unit III   RELATED MATERIALS FUNCTION

Spare parts management- definition, classification of spares, problems and issues in spares management.
Store keeping – types of stores, benefits, store location, store layout, principles in stores management.

Unit IV   MATERIAL HANDLING

Definition, objectives of material handling, Importance, symptoms of poor material handling, principles of material handling. Material handling equipments, symbols, costs.

Unit V

Out sourcing, Make or buy decisions. Value engineering. Stores material accounting-Bin card, stores related ledgers.Recent development in material handling.

Recommended Text books

1) Materials Management procedures Text and cases, By A.K. Datta, PHI Learning India, www.phindia.com

2) Materials Management Text and cases, PHI learning India, New Delhi.

3) Materials Management case study and solutions by H. Kaushal Macmillan India Ltd.,

4) Purchasing and materials management – NK Nair Vikas Publishing House PVT Ltd.,

5) Material Management

An Integrated approach by Dr. Pawan Arora Global India Publications PVT Ltd., New Delhi. Email : info@globalindiapublications.com

6) Purchasing – By Monczka, Trent and Hand field – By cengage learning, India Edition.

E : OPERATIONS
ELECTIVE COURSE - V : LEAN MANUFACTURING

Objectives :

This course gives the integrated perspective of Lean thinking apart from covering all the basic tools needed. This course will be relevant for those joining both manufacturing and service organizations.

Unit I

Evolution of lean thinking – Craftsman era, Mass Production era and Lean thinking.

Unit II

Lean Principles :

- The value
- Value stream mapping
- Flow
- Pull
- Perfection

Unit III

From thinking to action : Lean Leap Tool – Kit

1. TQM Concepts and Tools – QFD, FMEA Robust Design concepts; SPC, QC circles and KAIZEN approaches Six – Sigma philosophy and Methodologies.
2. 5S and TPM
3. JIT system and KANBAN concepts
4. Cellular Layouts

Unit IV

Creating Lean Enterprise – Organization and Implementation steps.

- Cases from Manufacturing Industries.
- Cases from service Industries, Including Software Industry.

Unit V

The Future – Lean Network.

Recommended Text book

1) Lean materials planning and execution India Edition – Cengage learning by Donald H. Sheldon.
2) Lean manufacturing implementation by Dennis P. Hobba. Cengage learning.
3) For Unit III
   Total Quality Management by SK. Mandal Vikas publishing.
4) Simplified Lean manufacture – By N. Gopala krishnan – PHI learning Private Ltd.

E : OPERATIONS

ELECTIVE COURSE - VI : WORLD CLASS MANUFACTURING

Objective: To help the students understand the concepts in Manufacturing management.

Unit I : Strategic decisions in Manufacturing Management

- Choice of Technology, Capacity
- Layout / Automation in Material handling systems
- Emerging trends

Unit II :   Aggregate planning and Master Production Scheduling

- Materials Requirement Planning (MRP)
- Manufacturing Resources Planning (MRP – II)
- Implementation Problems / Indian experience

Unit III :   Review of Operations Scheduling Process

- Job Shop Scheduling
- Batch Production Scheduling
- Flow Production Line Balancing

Unit IV   Just-in-Time System

- Pull System – Use of Kanban
- JIT Purchase – Source Development, Buyer – seller relations
- Indian Experience

Unit V   Total Productive Maintenance

- Objective of TPM – Total System effectiveness
- Break-down maintenance
- Preventive Maintenance   Productive Maintenance
- Predictive Maintenance
- Condition Monitoring System
- Maintenance Prevention
- Mainfability Improvement
- Reliability Improvement
- Total Employee Involvement and Small Group Activities.

Recommended Text book

1) Production and operations managements by R. Panneerselvam, PHI learning India Ltd., www.phiindia.com

2) For Unit II and V

   Operations Management with DVD in the Book by William J. Stevenson, Special Indian Edition, Tata Mcgraw Hill Co. Chennai.

   Email : mark_pani@mcgrawhill.com

3) World Class Manufacturing by B.S. Sahay and others Macmillan publishers India Ltd., Chennai. Phone : 044 – 22384231.

Suggested Readings

1) Industrial Engineering and Management by OP. Khanna, Dhanpatrai publications PVT Ltd., New Delhi.

2) Operations Management – By James R. Evans. David A. Collier, India Edition Cengage learning, Chennai.

   Email : narasimhan.r@cengage.com

3) Operations Management by Norman Gaither Greg Frzier, India Edition, cengage learning, Chennai.

4) Essentials of operations management by Scott.T. Young, sage South Asia Edition. www.sagepublications.com

5) Progressive manufacturing, India Edition, By Soli.J Engineer, Cengage learning.

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Curriculum of M.Sc. Statistics
2018-2019

DEPARTMENT OF STATISTICS
BHARATHIDASAN UNIVERSITY
KHAJAMALAI CAMPUS
TIRUCHIRAPPALLI-620 023

Department of Statistics

Curriculum Structure
M.Sc. Statistics-2018-2019
<u>New Syllabus</u>
List of Subjects with codes
Total Credits-90

Internal marks-25   External marks-75

Semester		Total
I	**5 Core Courses**	**24**
II	**4Core courses** **1 Department Elective Course**	**23**
III	**3Core Courses** **1 Department Elective Course** **1 University Elective Course**	**21**
IV	**2Core Course** **2 Department Elective Course** **1 Project**	**22**

Department of Statistics
M.Sc. Statistics
Syllabus 2018-2019
List of Core / Department Elective / University Elective Courses to be offered
CORE COURSES (CC)

Code	Title of the Course	Lecture Hours	Tutorial Hours	Practical Hours	Credits
11SCA01CC	Probability and Measure Theory	4	2	0	5
11SCA02CC	Distribution Theory	4	2	0	5
11SCA03CC	Sampling Theory	4	2	0	5
11SCA04CC	Advanced Operations Research	4	2	0	5
11SCA05CCP	Statistical computing in CProgramming &MySQL	4	0	2	4
11SCA06CC	Statistical Inference-I	4	2	0	5
11SCA07CC	Statistical Inference-II	4	2	0	5
11SCA08CC	Statistical Quality Control	4	2	0	5
11SCA09CCP	Statistical Computing in SPSS	4	0	2	5
11SCA10CC	Multivariate Analysis	4	2	0	5
11SCA11CC	Stochastic Processes and Time Series Analysis	4	2	0	5
11SCA12CCP	Data Science using R Programming	4	0	2	4
11SCA13CC	Applied Regression Analysis	4	2	0	5
11SCA14CCP	Data Analysisusing Python Programming	4	0	2	4
11SCA15PROJ	Project/Dissertation	4	2	0	5
11SCA16CC	Mathematical Methods for Statistics	4	2	0	5
11SCA17CC	Data Mining	4	2	0	5

DEPARTMENT ELECTIVE COURSES (DEC) for internal students

Code	Title of the Course	Lecture Hours	Tutorial Hours	Practical Hours	Credits
11SCA01DEC	Linear Models and Design of Experiments	4	2	0	4
11SCA02DEC	Demography and Econometrics	4	2	0	4
11SCA03DEC	Survival Analysis and Reliability Theory	4	2	0	4
11SCA04DEC	Actuarial Statistics	4	2	0	4
11SCA05DEC	Statistical Genetics	4	2	0	4

UNIVERSITY ELECTIVE COURSES (UEC) for external students

Code	Title of the Course	Lecture Hours	Tutorial Hours	Practical Hours	Credits
11SCA01UEC	Econometrics	2	1	0	3
11SCA02UEC	Bio-Statistics	2	1	0	3
11SCA03UEC	Industrial Statistics	2	1	0	3
17ST01UEC	Basic Statistical Tools in Data Analysis	2	1	0	3

VALUE ADDED COURSES (VAC)

Code	Title of the Course	Lecture Hours	Tutorial Hours	Practical Hours	Credits
17ST01VAC	Decision Theory and Machine Learning	2	1	0	2
17ST02VAC	Minor project in Data Science	2	1	0	2

Examination

- Each candidate admitted to the course will be examined in each paper under Continuous Internal Assessment by the course teacher and by end semester University Examination. The weightage of marks of continuous Internal Assessment system and end semester University Examination shall be 25:75.

- Each admitted candidate shall have to carry out a project work during the fourth semester under the supervision of the faculty members of the University Department of Statistics. Each candidate shall have to prepare and submit a report of the project work at the end of the fourth semester. The project report will be evaluated for a maximum of 100 marks (internal guide-40, external guide-40) and in which each candidate shall appear for a Viva-Voce examination for a maximum of 20 marks.

Teaching and Learning practices

- The content of the syllabus is delivered to the students through lectures and **demonstrating the concepts through practical implementation and examples along with software** where required.

- The students are stimulated to actively collaborating them with some specific contents **by providing the materials before hand and after classroom discussion, presentations and assignment works** are arranged for group learning.

- The concepts are delivered in easily conceivable scenarios by briefing the contents which help the students **to accomplish the link from concepts to advanced concepts in same or different subjects**.

- Some specific contents are communicated to the students through **blended learning in flipped classroom environment especially software packages, projects, Application of Statistical Test ,**methods and models (basic and Advanced), Projects in data Science, machine learning for deep understanding of the contents and enrichment of the technical skills.

- **Debriefing is practiced through conversational sessions like seminars** that revolve around the sharing and examining of information of some specific contents to facilitate reflection and feedback and better understanding.

QUESTION PAPER PATTERN FOR UNIVERSITY EXAMINATION

M.Sc., Degree Examination
Branch II – Statistics

Time: 3 Hours   Max. Marks: 75

Section - A   (10 × 2 =20)
Answer all the questions
Each question carries 2 marks

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Section - B (5 × 5 = 25 Marks)
5 Questions (One question from each Unit) with internal choice
Each question carries 5 marks

11. (a)

(OR)

(b)

12. (a)

(OR)

(b)

13. (a)

(OR)

(b)

14. (a)

(OR)

(b)

15. (a)

(OR)

(b)

Section – C (3 × 10 = 30 marks)
Answer any 3 questions.
Each question carries 10 marks

16.
17.
18.
19.
20.

7. Award of Degree

A candidate who has secured minimum of 40% marks in end semester University Examination as well as 40% marks in continuous Internal Assessment and end semester University Examination in each paper shall be declared to have passed the M.Sc., degree course in Statistics.

A candidate who has secured minimum of 50% marks comprising both continuous Internal Assessment and end semester University Examination in aggregate shall be declared to have passed M.Sc., degree course in Statistics.

Programme Outcomes

Programme Specific Outcomes

- Students will be enriched with technical skills used in data science, data analytics through projects including big data.

- Students are enhanced with the skills of creating taxonomy of cognitive domain in Statistics (Knowledge, Comprehension, Application, Analysis, Synthesis, evaluation)

- Students are stimulated with self learning skills that helps them in research work in future and also to perform in NET, SLET, GATE.

- Students are groomed up with the present and advanced analytical skills that help them to be an entrepreneur or advisor in Data analytics and Predictive Modeler domain.

- Students can utilize their statistical skills, computation and comprehensive knowledge in other disciplinary courses and projects.

- Students can increase their competency and perform well in government and Central government jobs for statistics like ISS, UPSC .

- Students can synthesize their statistical expertise in Medical research, Finance and can work as a prominent part in the medical survey, research analytics.

- Students will be incorporated with the knowledge of data impurity and handling them with statistical techniques and well known with the automation of building a new statistical model with the criteria, assumptions and appropriateness

CORE COURSES

CCI-Probability and Measure Theory

Course Code: 11SCA01CC   **Credits : 5**

Objectives:

- To incorporate the concepts of probability theory in the perspective of measure theory which serve as the core material in building theoretical ideas along with practical notion.
- To deliver the fundamental framework of the ideas that are required for NET/ SLET exam

Unit – I

Random experiment – Sample space and events – Algebra of sets – Classes of sets, Sigma-fields (σ -fields), Minimal fields, Minimal σ –field –Partition – Borel fields, Monotone field - Point function and set function, Function of a function- Inverse function

Measurable function, Borel function, induced σ -field, Real and vector-valued random variable - Limits of Random variable. Definition of Probability – Simple Properties –Probability Space – Induced Probability Space – Independence- Total probability Theorem- Conditional probability- Bayes' Theorem-Problems

Unit – II

Measure-Probability Measure, Properties of measure, Probability Space, Continuity of Probability measure, Extension of Probability Measure, General Probability Measure, Counting measure, Lebesgue measure.
Distribution Function of a Random Variable – Decomposition of Distribution functions – Jordan Decomposition Theorem – Distribution Functions of Vector Random Variables, Mixture Distribution – Empirical Distribution Function.

Unit – III

Expectation – Properties of Expectation – Moments – MGF - Chebyshev's Inequality -Holder's Inequality – Minkowski Inequality – Basic Inequality – Markov Inequality – Jensen's Inequality – Kolmogorov Inequality
Convergence of Random Variables: Convergence in Probability, Convergence Almost Surely, Convergence in Distribution, Convergence in rth Mean, Dominated Convergence theorem – Monotone Convergence Theorem-FubiniTheorem(Statement only)

Unit – IV

Characteristic Functions – Inversion Theorem– Problems– Bochner's Theorem (Statement only).Convergence of sequence of distribution functions-Helly convergence theorem& Applications-Helly Bray theorem-Levy Cramer theorem-De-Moivre-Laplace theorem-Slutsky Theorem
Sequence of independent events, independent classes of events, independence of r.v-Equivalent

Unit – V

Law of large numbers-WLLN-Khintchin theorem- Bernoulli's WLLN-SLLN-Kolmogorov theorem-BorelCantelli theorem - Glivenko-Cantelli theorem (statement only).
Central Limit Theorem – CLT for iidr.vs-Linderberg- Levy CLT theorem for iid-Applications-CLT for variable distributions- Liapounoff"s CLT- Linderberg - Feller CLT

Unit – VI (Advanced topics only for discussion)
Current Contours:
Decomposition theorem- conditional - Hahn Decomposition theorem-Lebesgue decomposition

Books for Study:

1. Bhat, B. R. (2005) :**Modern Probability Theory – An Introductory Text Book**, Third Edition, New Age International.
2. A.K. Basu (2010): **Measure Theory and Probability**, Fourth Edition, PHI Learning Pvt Limited
3. Billingsley, P.(2012): **Probability and Measure(Third Edition)**. Jon Wiley & sons, New York
4. SuddhenduBiswas& G.L Sriwastav(2011): **Mathematical Statistics, First Edition ,** Narosa Publishing House
5. Rohatgi, V.K. (1992) :**An Introduction to Probability Theory and Mathematical Statistics**, Wiley Eastern Ltd., New Delhi.
6. V. Sundarapandian(2009):**Probability, Statistics and Queueing Theory,First Edition,** PHI Learning Private Limited

Books for References:

1. Hogg, R.V, Craig, A and Mckean W.J (2005): **Introduction to Mathematics Statistics,** Sixth Edition, Pearson.
2. G. de Barra, **Measure Theory And Integration**, New Age International Pvt. Ltd.
3. S.R. Athreya& V.S. Sunder(2008): **Measure Probability** - 1st edition, University Press
4. Feller, W. (1972) :**Introduction to Probability Theory and its Applications**, Vol. II, Second Edition, Wiley Eastern

Course outcomes

- The students will be accustomed with the fundamental concepts of measure theory

- The content will give them an idea which is required for NET/SLET examination.

- The students will be motivated to do research work.

- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examinations

- The content serves as the core material which helps the students in all aspects

- The students will be equipped with the advanced concepts which is required for internship in research institutes

CCII-Distribution Theory

Course Code: 11SCA02CC   **Credits : 5**

Objectives:

- To integrate the intrinsic ideas of preliminary and advanced distributions in the viewpoint of NET/SLET, ISS, UPSC examination
- To convey the applications of different distribution associated with real time problem

Unit – I

Joint distributions-pdf, cdf- conditional distributions, independence, conditional expectation and problems, covariance, correlation – problems.Distribution of functions of random variables including sum, means, products, and ratios. Transformations of random variables, use of Jacobians-problems, Marginal distribution.

Unit- II

Derivations-moment generating function, Expectations-Concepts on probability distribution- Bernoulli trials,binomial,Poisson,geometric, negative binomial,hypergeometric – derivations and problems,Power Series distribution - Logarithmic Series distribution

Unit-III

Probability Distributions : Normal distribution- derivations and problems-Log Normal distribution-Exponential – Gamma distribution- Laplace distribution- Weibull distribution- Gumbel distribution-Cauchy distribution – Pareto distribution.

Unit – IV

Truncated distribution – Compound distribution–-Bivariate distribution-multinomial distribution - Derivations and applications- chi-square distributions and their properties and derivations and problems and CentralF- distribution -derivations, properties, expectations- central t-distribution- derivations, properties.

Unit – V

Non Central F- distribution - Non Central t-distribution-derivations,Order Statistics – Distribution of order statistics – Joint distribution of order statistics –r^{th} order statistics –problems on order statistics, distribution of Range & Mid range.

Unit – VI (Advanced topics only for discussion)
Current Contours:
Bivariate Normal distribution, Multivariate normal distribution, Distribution in Quadratic form- Applications in other disciplinary projects

Books for Study:

1. Murray R Spiegel, Schiller &Srinivasan(2016): **Probability and Statistics**, Indian Edition 2010, McGraw Hill Education(India) Private Limited.
2. Johnson, N, Kotz, S and Balakrishnan, N (1995): **Continuous Univariate Distributions,** Vol.1 & 2, Second Edition, Wiley.
3. SuddhenduBiswas& G.L Sriwastav (2011): **Mathematical Statistics**, First Edition, Narosa Publishing House.
4. Rao, C.R. (2009).:Linear Statistical Inference and its Applications(Second Edition). John Wiley & Sons.
5. V. Sundarapandian(2009):**Probability, Statistics and Queueing Theory, First Edition,** PHI Learning Private Limited.

Books for References :

1. Rohatgi, V.K. (1992) :**An Introduction to Probability Theory and Mathematical Statistics**, Wiley Eastern Ltd., New Delhi.
2. Feller, W. (1972) :**Introduction to Probability Theory and its Applications**, Vol. II, Second Edition, Wiley Eastern.

3. Hogg, R.V, Craig, A and Mckean W.J (2005): **Introduction to Mathematics Statistics,** Sixth Edition, Pearson.

4. Johnson and Kotz (1972): **Distributions in Statistics**, Princeton University Press.

Course outcomes

- The content will give them the problem solving intuition which is required for NET/SLET, ISS examination.

- The students will accomplish the knowledge about the different distribution required for applications in real time problem.

- The content also makes the eligible for formulation of new distribution by gathering the intrinsic knowledge about distribution.

- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examinations.

- The students will be motivated to do research work.

- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examinations

CCIII-Sampling Theory

Course Code: 11SCA03CC   **Credits : 5**

Objectives:

- To amalgamate the intellectual facts of the sampling techniques to implement in projects and to motivate the students in carrying out the field projects in scientific manner and statistical skills
- To convey some extended concepts in sampling to encourage the students in industrial and research aspects

Unit – I

Concept of Sampling Design, types of Sampling Scheme and Sampling Strategy, Estimator of Population mean in SRS with replacement. Stratified Sampling Systematic sampling – Variance of Estimated mean, Populations in Random order, population with Linear and Period Trend, Auto-Correlated Populations

Unit – II

Des Raj method of Estimation, Murthy's Unordering Principle, Sampling Strategy due to Rao-Hartley and Cochran, Hartley-Ross Estimator, Midzuno Scheme of Sampling, PPS Sampling Procedures.

Cluster Sampling – Single Cluster Sampling – Cluster of Equal and Unequal sizes, Two Stage Cluster Sampling; Mean, Variance, Variance of the Estimated Mean.

Unit – III

Ratio Estimates – Methods of Estimation, Approximate Variance of Ratio Estimates, Bias of the Ratio Estimates, Conditions under which the Ratio Estimate is Optimum, Unbiased Ratio – Type Estimates.

Regression Estimates – Linear Regression Estimates, Regression estimated when computed from sample, Accuracy of the Variance of Regression Estimates.

Unit – IV

Double sampling Procedures and repeated surveys, Double Sampling for Stratification and Optimum Allocation, Regression Estimates – Estimated Variance for Stratification and Regression Ratio Estimates – Repeated Samplings – Sampling on two occasions, Sampling on more than two occasions.

Unit – V

Errors in Surveys – Non-Response, types of Non-Response, Call-Backs, a mathematical model of the effects of Call-Backs adjustment for basis without Call-backs, Mathematical Model for Errors of Measurement, Interpenetrating sub sample – NSSO.

Unit – VI (Advanced topics only for discussion)
Current Contours:
Sampling for Time series-framing questionnaires and designing sampling frame in real time projects-Re sampling Methods

Books for Study:

1. Daroga Singh& F. S. Chaudhary (2015): **Theory and Analysis of Sample Survey Designs**, New Age International Publishers
2. Cochran, W.G.(1972): **Sampling Techniques**, Wiley Eastern Private Limited.
3. Sukhatme, P.V. and Sukhatme, B.V.(1977): **Sampling Theory of Survey with Applications**, Asia publishing House.
4. Thompson (2012). **Sampling,** Wiley Eastern Private Limited.

Books for Reference:

1. Des Raj (1976): **Sampling Theory**, Tata-Mcgraw Hill.
2. Sampath.S (2000) :**Sampling Theory and Methods**, Narosa publishing company, New Delhi.
3. Murthy, M.N. (1967) :**Sampling Theory and Methods,** Statistical Publishing Society, Calcutta.

Course outcomes:

- The students will accomplish research oriented concepts given for sampling techniques.

- The students will have ideas of usage of sampling techniques in projects

- The students will be motivated to use sampling techniques in industrial use

- The content of syllabus also avails them to fetch the background concepts of Statistical quality control

- The students will be motivated to do research work.

- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examinations.

CCIV-Advanced Operations Research (credit-5)

Course Code: 11SCA04CC   **Credits : 5**

Objectives:

To grow expertise in optimization techniques, mathematical modeling which are essential in business intelligence.
To build and simulate the advanced models and skills to implement in real time scenarios and research works

Unit – I

Linear programming-Statement basic theorems and properties-Graphical Method for two- dimensional problems - Simplex method- Two phase method-principle of Duality – Dual Simplex method Transportation problem and its Solution-Assignment problems.

Unit – II

Game theory: two person zero-sum games, - Graphical solution of 2xn and mx2 games –Maxima- Minimax principle, mixed strategies- Dominance principle.

Inventory theory: Costs involved in inventory problems-EOQ-Deterministic Model-Economic lot size models without shortages & with shortages having production rate infinite & finite.

Unit – III

Queuing theory: Characteristics of queuing systems – steady state M/M/1, M/M/C and M/M/K queuing models-problems, replacement theory: Replacement of items – Group replacement

Unit – IV

Network routing problems-Minimal path, Djikshetramethod, PERT & CPM : Arrow network – Time estimates- Earliest expected time, latest allowable occurrence – critical path – Probability of meeting scheduled time of completeness of projects- Calculations on CPM networks, various floats for structures-External path- updating project-Operation time cost trade of curve.

Unit- V

Scope of simulation- types – Role and generation of random number- Uniform Distribution and its importance – Generation of random numbers by the multiplicative congruentialmethod. Monte- Carlo Simulation.

Unit – VI (Advanced topics only for discussion)
Current Contours:
Nonlinear Programming- Dynamic programming-Applications

Books for study

1. Taha, H.A(1982): **Operations Research** , Third Edition, Collier- MacMillan.
2. R. Paneerselvam(2006).:**Operations Research**, Third Edition,. Prentice Hall of India
3. J. K Sharma(2010).**Operations Research, Theory and Applications,** 4th Edition, MacMillan India Ltd
4. J. K Sharma(2010).**Operations Research, Theory and Applications,** 4th Edition, MacMillan India Ltd

Books for references:

1. Ackoff, R.L. and Sasieni, M. W.(1968):**Fundamentals of operations research**, John Wiley.

2. Philips. D.T., Ravindran, A and Solberg, J. J: **Operations research principles and practice.**

Course outcomes:

- The students can create mathematical modeling required in Business intelligence

- They achieve expertise in optimization techniques used in real time scenarios

- The content will give them an idea which is required for NET/SLET examination

- The students will be motivated to do research work

- The students will be equipped with the advanced concepts which are required for internship in research institutes.

- The students will gain ideas for the implementation of techniques in industries, supply chain management, Inventory Management

CCV-Statistical computing in C & SQL Programming-Practical-I

Course Code: 11SCA05CCP   **Credits : 4**

Objectives:

> To inculcate the technical expertise in programming statistical models in C language required in IT Job roles.
>
> To instill ideas and knowledge of database management system with operational functionalities towards the enhancement of job competency.

Unit -I

Summation of odd and even series- Fibonacci series- positive & negative number-Programs in while loop and for loop- factorial, permutation and combination of numbers by using recursive function- Reversing the array-Searching greatest element in an array-Insertion of an element in an array- Swapping of two numbers by call by reference and return by reference-Linear search-sorting-bubble, insertion, quick, selection-program by switch case.

Unit-II

Program on Descriptive Measures- correlation, ratio estimates, Regression Equation Y on X and X on Y-Matrix Addition, Subtraction and Multiplication- program on t-statistic, F-statistic - Program on Probability of Binomial distribution, Poisson, Exponential, Geometric, Generation of random numbers

Unit –III
Database Basics-Creating Databases and Tables Using SQL Commands -Updating and Deleting MySQL Tables. Retrieving Data from a MySQL Database - Inserting Data into a MySQL Database – restricting and Sorting Data through integrity constraints.

Unit – IV
Using WHERE to Filter MySQL Data -Advanced MySQL Data Filtering - AND, OR, NOT and IN - MySQL Wild card Filtering using LIKE. MySQL Regular Expression Searches - Joining Tables in MySQL - An Introduction to MySQL Views - MySQL Calculations and Concatenations – Joining tables, Manipulating Text in MySQL.

Unit – V
MySQL Mathematical Functions - Working with Dates and Times in MySQL - MySQL Data Aggregation Functions. Displaying data from multiple tables, Table creation and retrieval through primary key, foreign key in SQL, sub queries, set operators, Managing tables through DDL statements, Creating and managing Schema objects, retrieval of data using sub queries.

Unit – VI (Advanced topics only for discussion)
Current Contours:

> Pointers- Structures, Linked lists- Stacks and Queues-Hashing-Security

Books for Study and references:

1. E. Balagurusamy (1998) :**Programming ANSI C,7**[th] edition, Tata McGraw Hill Publishing Company Limited.
2. K.R. Venugopal, Rajkumar, T. Ravi Shankar (1998): **Mastering C**, Tai.
3. Vaswani(2016).:**The Complete Reference Mysql,** first edition**,** McGraw Hill.

Course outcomes and objectives:

- The students will achieve programming proficiency and enrich their technical skill sets
- They will gain preliminary ideas about automation of statistical computation and techniques
- The students will be ignited with the concepts of data management system required in IT companies
- The content will give the ideas to accomplish the link with other statistical software to work with big databases
- The students can preferably work in Mysql as database administrator in different domain.

CCVI-Statistical Inference – I

Course Code: 11SCA06CC   **Credits : 5**

Objectives:

To indoctrinate the comprehensiveknowledge in inferential statistics with an objective to fulfill the requirement of Statistical segment in NET/SLET, ISS, UPSC.
To infuse the stimulus of building rule based advanced statistical models including the real problems

Unit – I

Concept and definition of Population, sample, parameter and statistic, Point Estimation: Concept. Estimator – Estimate – Characteristics of a good estimator: Consistency – Invariance property of Consistent estimator, Sufficient condition for consistency – Unbiasedness – Sufficiency – Factorization Theorem – Minimal sufficiency, Efficiency – Most efficient estimator , likelihood equivalence – Uniformly minimum variance unbiased estimator – Rao-Blackwell and Lehmann-Scheffe's theorems.

Unit – II

Mean-squared error- Fisher's information measure.- Cramer-Rao inequality-applications, Minimum Variance Bound(MVB) estimators, Bhattacharya inequality, Chapman-Robbins inequality - Fisher's information matrix- Completeness, ancillary statistic- Basu's theorem-Exponential family of distribution of single parameter and k parameter , complete sufficient statistic, CAN Estimator-Asymptotic relative efficiency

Unit – III

Methods of point estimation – Maximum likelihood method (the asymptotic properties of ML estimators are not included), method of moments, method of least square, method of minimum chi-square and modified minimum chi-square-Asymptotic Maximum Likelihood Estimation.

Unit – IV

Interval estimation : Confidence level and confidence coefficient. Duality between acceptance region of a test and a confidence interval.Pivotal quantity method.Shortest length confidence intervals.

Construction of confidence intervals for population proportion (small and large samples) and between two population proportions (large samples) – confidence intervals for mean, variance of a normal population – difference between mean and ratio of two normal populations.

Unit – V

Bayes estimation-Action-Decision-Loss function-decision rule-Bayes' risk- Odds – Bayes' factor bayes' rule-problems-prior distribution-priors-informative-noninformative-natural conjugate-jeffrey prior-Principle of Equivariance-Minimum risk equivariant estimator-Pitman estimator Credible intervals -Bayes' factor for testing hypothesis –Frequentist test for one-sided hypothesis- Frequentist test for two-sided hypothesis– Comparison-Bayesian Inference for discrete random variables and continuous variables.

Unit – VI (Advanced topics only for discussion)
Current Contours:

Method of scoring and EM algorithm-Applications

Books for Study:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1989) :**An Outline of Statistical Theory**, Vol.II.
2. Kale, B.K.(1999) : **A First Course on Parametric Inference**, Narosa Publishing House, New York.
3. Rohatgi, V.K. (1992) :**An Introduction to Probability Theory and Mathematical Statistics**, Wiley Eastern Ltd., New Delhi.
4. C. RadhakrishnaRao: **Linear Statistical Inference and its Applications,**Wiley; Second edition (2009)

Books for Reference:

1. Dudewicz, E.J., and S.N. Mishra (1988) :**Modern Mathematical Statistics**, John Wiley, NY.
2. Lehman, E.L., and G. Cassella (1998) :**Theory of Point Estimation** (II Edition), Springer, NY.

Course outcomes :

- The students will be motivated to do research work

- The students will accomplish the knowledge about the inferential Statistics in building statistical models which is required for applications in real time problem.

- The content will give them an idea which is required for NET/SLET examination.

- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examinations

- The students will be equipped with the advanced concepts which are required for internship in research institutes.

- The content serves as the core material which helps the students in all aspects and other disciplinary projects.

CCVII-Statistical Inference-II

Course Code: 11SCA07CC   **Credits : 5**

Objectives:

- To implant the ample knowledge in statistical test and its validation and application with an objective to fulfill the requirement of Statistical segment in NET/SLET, ISS, GATE, UPSC, state government examination
- To permeate the ideas of advanced statistical test and applications in data science including the real problems

Unit -I

Testing of hypotheses : Simple and composite hypotheses, two types of errors, level of significance, parametric test for population proportion (small and large samples) and between two population proportions (large samples) ,t-test for single, paired, independent sample mean, significance of observed correlation coefficient and regression coefficient-variance of a normal population(small and large) –z-test –Pearson Correlation, Normality test.

Unit – II

Non parametric-U statistic and its property as an estimator of its expected value., Spearman Correlation-Chi-square -Association of attributes, Tests for goodness of fit, Homogeneity of variance –Fisher exact Test-Run test-Test for randomness-– Median test – Sign test -Wilcoxon's signed-rank test. Mann-Whitney U test-Kolmogorov- Smirvov two sample test. - Kruskal Wallis- Friedman Test-Mc Nemar's test,

Unit – III

Randomized and non-randomized tests, power and size of a test, Most powerful test - Neyman-Pearson lemma-Generalization of Neyman-Pearson fundamental lemma .Unbiased tests – Construction of uniformly most powerful unbiased tests for one-parameter and multi-parameter exponential family applications to standard statistical distribution-similar regions. Locally most powerful (LMP) test – LMP unbiased test.

Unit – IV

Likelihood ratio (LR) test – Asymptotic distribution of LR test statistic – Consistency of LR test – Construction of LR tests for standard statistical distributions. Monotone likelihood ratio property – Uniformly most powerful tests.Applications to standard statistical distributions.

Unit – V

Introduction to sequential procedures – Stopping times – Wald's equation. SPRT : termination property, approximation to stopping bounds and applications to standards distributions. Wald's fundamental identity-OC and ASN functions

Unit – VI (Advanced topics only for discussion)
Current Contours:
Statistical Inference with practical Implementation of big data-Data Science-Data Analytics in Health, environmental science, social science, Biomedical, Bioinformatics

Books for Study :

1. Conover, W.J. (1980) :**Practical Non-parametric Statistics**, (Second Edition), John Wiley and sons, Newyork.
2. C. RadhakrishnaRao: **Linear Statistical Inference and its Applications,** Wiley; Second edition (2009)

3. Gibbons, J.D. and Chakrabarthi, S (1992) : **Non-parametric Statistical Inference** (Third Edition)
4. Goon, A.M., Gupta, M.K., Das Gupta, B. (1973) : **An Outline of Statistical Theory**, Vol.II, The World Press, Calcutta
5. Bagdonavicious, Kruopis, M.S.Nikulin (2011): **Non-Parametric Tests for Complete Data,** (First Edition), John Wiley and sons, USA.
6. Rohatgi, V.K. (1992) :**An Introduction to Probability Theory and Mathematical Statistics**, Wiley Eastern Ltd., New Delhi.

Books for Reference:

1. Kale, B.K. (1999) :**A First Course on Parametric Inference**, Narosa, Publishing House, NewDelhi.
2. Lehmann, E.L. (1986) :**Testing Statistical Hypotheses**, (Second Edition), John Wiley, Newyork.
3. Rohatgi, V.K. (1988) :**An Introduction to Probability Theory and Mathematical Statistics**, Wiley Eastern Ltd., NewDelhi.

Course outcomes:

- The syllabus focuses on statistical techniques used in data science for IT companies

- The content allows to gain knowledge in data analytics for project purposes in industries and medical research

- The students are stimulated with statistical techniques in testing the models and evaluation

- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examination like statistical civil service, statistical investigator

- The content will give them an idea which is required for NET/SLET,GATE examination

- The students will be motivated to do research work

- The content also serves a core part to help the students working as a statistical analyst an d advisor in other disciplinary projects.

- The content gives the statistical techniques that are required to be performed through software as per the requirement in projects

CCVIII-Statistical Quality Control

Course Code: 11SCA08CC   **Credits : 5**

Objectives:

- To cultivate the ideas and applications of sampling plans used in industrial purposes for quality assurance.
- To deliver the intrinsic background of quality control with the extended concepts to be required for six sigma methodologies.

Unit – I

Quality – Basis of SQC – Benefits – Process and Product control – Parts of Control Charts – Shewhart Control Charts for X, R, np, p, c, etc. and their uses, OC and ARL of Control Charts, Control Charts based on C.V.

Unit – II

CUSUM procedures, use of V-mask, Derivation of ARL - Decision Interval Schemes for CUSUM charts. Economic Designs of Control Charts, Pre-control, Relative Precision and Process Capability analysis and Gauge capability analysis, Multivariate Control charts, Hotelling T^2.

Unit – III

Basic Concepts of Acceptance Sampling, Single, Double, Multiple and Sequential Sampling Plans for Attributes-OC,ASN, ATI and AOQ functions- Curtailment of Sampling - Dodge-Romig Tables – LTPD and AOQL protection (Single Sampling Plan only). MIL-STD-105D.

Unit – IV

Variable Sampling: Assumptions, Single and Double Variable Sampling Plans. Application of Normal and Non-central t-Distributions in Variable Sampling. Continuous Sampling Plans:CSP-1, CSP-2 and CSP-3. Special Purpose Plans : Chain Sampling Plans, Skip-lot Plans.

Unit – V

Reliability concepts-components and systems-reliability function-Failure rate function -Interrelationship-System- Lifetime distribution-exponential, Gamma, Weibull- Reliability block diagram– Serial, parallel and mixed systems-K-out-n-systems-cuts and paths-coherent system-Bounds on reliability, Mean time to failure, Mean residual time-one to one correspondence of these function.

Unit – VI (Advanced topics only for discussion)
Current Contours:

Applications of different distribution in Acceptance sampling-Reliability estimation based on failure times under various censored life tests and tests with replacement of failed items

Books for Study and References:

1. Montgomary, D.C. (1985) :**Introduction to Quality Control,** John Wiley.

2. Schilling, E.G. (1982) :**Acceptance Sampling in Quality Control**, Marcel Dekker.

3. Burr, I.W., (1976) :**Statistical Quality Control Methods**, Marcel Dekker.

4. Hsyland&Hsyland (2004):**System Reliability Theory Models, Statistical Methods, and Applications** Second Edition, Wiley

5. H.J. Mittag and H.Rinne (1993) :**Statistical Methods of Quality Assurance**, Germany Chapman & Hall India (UK) – Chapter 3 and 4.

Course outcomes:

- The concepts are given for quality controller in industrial purposes
- The concepts are given for research in sampling with statistical quality control
- Six sigma belt for quality control can be achieved as further progress in quality control
- The students can interlink the sampling techniques in quality control for formulation of new sampling plan which can be used in quality control in industries an d companies
- The students will be motivated to do research work.
- The content gives the statistical techniques that are required to be performed through software as per the requirement in projects.

CCVIX-Statistical Computing in SPSS-Practical-II

Course Code: 11SCA09CCP   **Credits : 4**

Objectives:

- To enrich the technical skills in Data analytics through the statistical methods using software orientation towards job roles.
- To enhance the intuition of the students towards the insights of the theoretical concepts with its application in real time domain through software.

The maximum marks for this paper shall be 100 with 25 marks for internal assessment which comprises, test and record work, and 75 marks for external examination. The candidates should attend 3 questions 25(10 -theoretical calculation, 10-Software, 5-Inference for both) marks each with internal choice. The contents for this paper are the problems related to the papers covered in all the semesters. Problem relating to the areas listed below covered under semester I to II. The core statistical software practical examination is to be conducted at the end of the II semester. The contents for statistical software practical shall be restricted to the following topics which are found in the software SPSS.

1. Diagrammatic representation of data, graphs, charts, histograms.
2. Correlation & Regression – Partial and Multiple Correlations, Linear and Multiple Regression
3. Inferential Statistics for Single through multiple samples (Chi square, t and f test)
4. Non-parametric tests –run test, sign test, Median test, Mann-Whitney U Test, Kruskal Walli's test, Fried man test.
5. Experimental Design: One way ANOVA-two way ANOVA-factorial designs– Multiple comparison tests, -ANCOVA-repeated measure
6. Statistical Quality Control charts – Determination of parameters for constructing basic control charts, such as X, R, S, p, c and u charts.

(Advanced topics only for discussion)
Current Contours:

Recoding data- Multivariate ANOVA -Classification and Decision trees – Artificial Neural Network

Books for Study and References:

1. Andy Field(2011). Discovering Statistics Using SPSS 3rd edition, Sage Publications Ltd

2. George &Mallery(2011). SPSS for Windows Step by Step, 10th edition, Pearson Education in South Asia

Course outcomes and objectives:

- Students will gain the statistical software knowledge which is essential required for projects in all disciplines
- knowledge required for data analytics job in IT sectors will be enriched
- one can work as a freelancer with this software knowledge
- It can enhance the technical skill sets through which the students can train other students of different disciplines
- it gives the ideas of entrepreneurship and also allows the students to work as a statistical advisor.
- The students will get the insights of theory as to use the applications of theory in real time problems through software and summarize the results

CCX-Multivariate Analysis

Course Code: 11SCA10CC   **Credits : 5**

Objectives:

- To augment the advanced statistical analytical skills in Data Sciencewith the orientation towards job roles.
- To link up the students with the insights of existing analytical models with its application in real time domain.

Unit – I

Reviews of Multivariate Distributions, Multiple and Partial Correlation and Regression, Multivariate Normal Distribution, Marginal and Conditional Distributions – Maximum likelihood Estimators of sample Mean and dispersion Matrix.

Unit – II

Distribution of mean vector and Sample Dispersion Matrix – James-Stein Estimator for the Mean Vector, Wishart Distribution and its Properties (without derivation) – Distribution of Total, Partial and Multiple correlation under null case – Maximum likelihood estimators of total, partial and multiple correlation – Test based on total, partial and multiple correlations.

Unit – III

Tests based on Mean Vectors for one and two Multivariate Normal Distributions – Hotelling's $T^2$and Mahalanobis D^2 test statistics with their null and non-null distributions – Related Confidence Regions – Testing and Illustration using likelihood Ratio Criterion.

Unit – IV

Principal Component Analysis, Factor Analysis Underlying Models and Illustrations – Identification Problem, Estimation – Maximum likelihood Method, Centroid Method, Canonical Correlation – Extraction – Properties.

Unit – V

Classification Analysis using Discriminant functions – Clustering techniques – Hierarchical Clustering – Agglomerative techniques, Single Linkage Method, Complete average linkage method – Non-hierarchical method – K-Mean concept of multidimensional scaling and correspondence analysis.

Unit – VI (Advanced topics only for discussion)
Current Contours:

Pruning to efficient clustering – Patterns of dependence- Multivariate techniques through software

Books for Study:

1. Anderson, T.W. (1980) :**An Introduction to Multivariate Statistical Analysis**, Second Edition, Wiley Eastern.
2. Richard A. Johnson Dean.W.Wichern.**Applied Multivariate Statistical**, 5th Edition
3. M.Jambu and Lebeaux, M.O.(1983): **Cluster Analysis and Data Analysis,** North-Holland Publishing Company.
4. Joseph F. Hair, Jr, William C. Black, Barry J. Babin, Rolph E. Anderson (2010) : **Multivariate Data Analysis**, 7th Edition, Prentice Hall

Books for Reference:

1. Kshirsagar, A.M. (1972): **Multivariate Analysis**, Marcel Decker.
2. Morrison, D.F.(1976): **Multivariate Statistical Methods**, Second Edition, McGraw Hill.
3. Afifi,A.A.andAzen, S.P. (1979): **Statistical Analysis – A Computer Oriented Approach**, Academic Press.
4. N.Giri, **Multivariate Statistical Inference**, Academic Press.
5. Reucher, **Multivariate Analysis**, Academic Press.

Course outcomes:

- The content develops research oriented concepts and skills in students about data science.

- Creation of new advanced models building and validation of the models will be incorporated in students.

- The students will be motivated to do research work.

- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examination like statistical civil service.

- The content gives the advanced statistical techniques that are required to be performed through software as per the requirement in projects.

- It can enhance the technical skill sets through which the students can train other students of different disciplines.

Course Code: 11SCA11CC   **Credits : 5**

Objectives:

- To inculcate the concepts of Stochastic modeling incompassing the predictive analytics required for job roles.
- To link up the students with the time dependent analytical tools and techniquesrequired in building models in extracting the knowledge in real time data.

Unit – I

Introduction to Stochastic Processes – Classification of Stochastic Processes, Markov Processes – Markov Chain – Countable State Markov Chain.Transition Probabilities, Transition Probability Matrix. Chapman – Kolmogorov's Equations, Calculation of n-step Transition Probability and its limit.

Unit – II

Classification of States, Recurrent and Transient States – Transient and Chain, Random Walk and Gambler's Ruin Problem.Continuous Time Markov Process : Poisson Processes, Birth and Death Processes, Kolmogorov's Differential Equations, Applications, Stationary processes.

Unit – III

Renewal Processes – Renewal Process in Discrete and Continuous Time – Renewal Interval – Renewal Function and Renewal Density – Renewal Equation – Renewal theorems: Elementary Renewal Theorem. Probability Generating Function of Renewal Processes. Branching Processes – Galton – Watson Branching Process – Properties of Generating Functions – Extinction Probabilities – Distribution of Total Number of Progeny-conditional limit laws.

Unit – IV
Time Series-Applications and Components, Additive and multiplicative-diagnostic checking- trend analysis-linear-parabolic-exponential–logistic-Cyclical variation-methods -seasonal variation –link relative-deseasonalisation of data-irregular variation-Index number-classification-base shifting-splicing-deflating of index number-price index

Unit – V
Auto-covariance and Auto-correlation functions-Linear stationary models-MR, Autoregressive, Autoregressive Moving Average, Linear non-stationary models-Autoregressive Integrated Moving Average - Seasonal Autoregressive Integrated Moving Average-Box Jenkins models-Exponential smoothing-Holt-Winter's and seasonality method

Unit – VI (Advanced topics for only discussion)
Current Contours
Introduction of Hidden Markov model: Evaluation problem of HMM -ARIMA with Stochastic volatility models in finance.

Books for Study:

1. Medhi, J. (1982) :**Stochastic Process**, 4th edition, New Age International Publisher Pvt Ltd.

2. Karlin, S. and Taylor, H.M. (1975) :**A First Course in Stochastic Process**, Vol.I, Academic Press.

3. Box, G.E.P. and Jenkins, G.M. (1976) : **Time Series Analysis - Forecasting and Control**. Holden-Day, San Francisco.

4. Makridakis,Wheelwright&Hndman(2005):**Forecasting – Methods and Applications,** Third edition**,** Wiley

5. Shenoy,Srivastav&Sharma(2009).:**Business Statistics**,1st edition, New age International Publisher.

Books for Reference:

1. Granger, C.W.J. and Newbold, (1984) :**Forecasting Econometric Time Series**, Third Edition, Academic.

2. Anderson, T.W. (1971) :**The Statistical Analysis of Time Series**, Wiley, NY.

3. Kendall, M.G. and Stuart, A. (1966) :**The advanced Theory of Statistics**, Vol.3, Charles Griffin, London.
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Course outcomes :

- The students will be motivated to do research work.
- The content develops research oriented concepts and technical skills in predictive modeling ,data science and data modeler.
- The content of the syllabus includes the statistical techniques used in market analytics, research analytics , finance
- The content gives the statistical techniques that are required to be performed through software as per the requirement in projects
- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examination like statistical civil service, statistical investigator
- It gives the ideas of entrepreneurship and also allows the students to work as a statistical advisor.

CCXII-Data Science using R programming-Practical-III

Course Code: 11SCA12CCP   **Credit : 4**

Objectives:

- To impart the analytical skills compassing the Statistical Methods, predictive analytics, data mining, and machine learning using software and its implications in data science
- To give adequate acquaintance with the technical world to elevate the job competency.

The Maximum Mark for this paper shall be 100 with 25 Marks for Internal Assessment, which comprises Tests, and 75 Marks for External Examination. The candidate should attend 30 questions 1 Mark each and 15 questions 3 marks each with internal choice. The contents for this paper are the problems related to the papers covered in all the semesters. The topics relating to the areas listed below covered under Semester I to III. The Core Statistical Software Practical examination is to be conducted at the end of the III Semester. The contents for Statistical Software Practical shall be restricted to the following topics, which are found in the software "**R** "

- Calculation of Probabilities under various distributions

- Test for normality and homogeneity of variance-Inferential Statistics for Single through multiple samples (Chi-square, t, f, and z test)

- Non-parametric tests Chi-square, Sign test, Mann Whitney test, Kruskal Wallis test, Friedman test

- Experimental Design: One way ANOVA-two way ANOVA- Multiple comparison tests

- Multivariate : Principal component - Factor Analysis

- Control charts

- Importing and exporting data in other formats,

- Correlation & Regression – Multiple Correlations, Multiple Regression, Curve Fitting, Time series and Forecasting models-Regression models-Generalized linear models Logistic, multinomial,

- cluster analysis-hierarchical, K Means

- Time series- Forecasting models- ARIMA-exponential smoothing-Regression models-Linear, multiple-Generalized linear models Logistic, multinomial

- Classification and regression trees- Machine Learning-supervised & unsupervised Learning-

    Current Contours(Advanced topics for only discussion)

- Patterns of dependence and pattern recognition, Techniques used in Image processing
- Job roles like Data Analyst, Data Scientist, Research Analyst, Market Analyst, Financial Analyst

Book for Study and references:

1. Alan Agresti (2002): Categorical Data Analysis. John Wiley & Sons
2. Gardener(2017).: Beginning R- The Statistical Programming Language, 1ˢᵗ edition, Wiley India Pvt ltd
3. *https://cran.r-project.org/doc/contrib/Faraway-PRA.pdf*

Course outcomes :

- Students will gain the statistical software knowledge along with machine learning which is essential required for projects in all disciplines.

- The content develops research oriented concepts and skills in students about data science required for data analytics, data scientist job in IT sectors will be enriched.

- One can work as a freelancer with this software knowledge

- It gives the ideas of entrepreneurship and also allows the students to work as a statistical advisor.

- The content of the syllabus includes the statistical techniques used in market analytics, research analytics, financial analytics.

- The students will be motivated to do research work.

- The students will get the insights of theory as to use the applications of theory in real time problems through software and summarize the results

Course Code: 11SCA13CC   **Credits : 5**

Objectives:

- To pervade the expertise in regression models along with model formulation, assumptions, diagnostic and validation compassing the arena of predictive analytics.
- To gather comprehensive ideas in residual analysis to handle data impurity in models required in data Science.

Unit – I

Simple linear Regression - models-Least square estimation of the parameters, properties of the least square estimator, Estimation by Maximum likelihood method- Multiple linear Regression model-estimation of parameters-Hypothesis testing in multiple linear regression-Confidence intervals, Prediction of new observations

Unit – II

Model Adequacy checking-Residual analysis-PRESS statistic-outliers-Lack of fit- Correcting Model Inadequacies. Transformations- Variance stabilizing- Linearzing model, Box Cox Method- transformation, Regressor variables. Diagnostics for Leverage and Influence -Leverage-Measure of influence-Cook's D-model performance-Detection and treating influential observations.

Unit – III
Polynomial Regression Models - Piecewise polynomial fitting (Splines)-Nonparametric-Kernel-Loess-orthogonal polynomials- Indicator Variables-basic concepts
Multicollinearity-Sources-Effects-Multicollinearity-Diagnostics-Methods for dealing with -multicollinearity–Model respecification-Ridge regression

Unit – IV
Robust regression- Methods of Robust estimation-Least absolute Deviations-M estimators-Properties of Robust estimators- High Break down point estimators- Bound Influence estimator
Nonlinear Regression models- Non-linear least squares- Transformation to a linear model-Parameter estimation-Linearization

Unit-V
Generalized Linear Models-Logistic regression models-Estimation, Interpretation of Parameters- Logit-probit -Multinomial-Ordinal-Poisson Regression-link functions and linear predictors-prediction and estimation-Bootstrapping and Re sampling in regression models

Unit-VI(Advanced topics for only discussion)
Current Contours

Applications of Dynamic regression models-MARS with bootstrapping and artificial neural network in financial data and sales- Time series in regression analysis - Serial Correlation

Books for Study:
1.   Douglas C. Montgomery and Elizabeth A.Peck-**Introduction to linear Regression Analysis**-John Wiley &Sons, New York.
2.   Chatterjee, S, Ali S. Hadi and Price, B (1999): **Regression Analysis by Example**, 3rd edition, John Wiley.
3.   Draper, N. R. & Smith, H(1998) **Applied Regression Analysis, 3rd Ed.** (John Wiley).

Books for References:

1.   Gunst, R.F and Mason, R.L (1980): Regression Analysis and Applications – A Data Oriented Approach, Marcel Dekker.

Course outcomes :

- The content develops research oriented concepts and technical skills in predictive modeling ,data science and data modeler

- The content develops research oriented concepts and skills in students about data science required for data analytics, data scientist job in IT sectors will be enriched

- The content of the syllabus includes the statistical techniques used in market analytics, research analytics , finance

- The content gives the statistical techniques that are required to be performed through software as per the requirement in projects

- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examination like statistical civil service, statistical investigator

- The students will be motivated to do research work

- One can work as a freelancer with this knowledge of regression analysis and also allows the students to work as a statistical advisor.

CCXIV-Data Analysis using Python Programming-Practical -IV

Course Code: 11SCA14CCP   **Credits : 4**

Objectives:

- To encompass the intrinsic and complex statistical models in data Science using software.

The Maximum Mark for this paper shall be 100 with 25 Marks for Internal Assessment, which comprises Tests, and 75 Marks for External Examination. The candidate should attend 30 questions 1 Mark each and 15 questions 3 marks each with internal choice. The contents for this paper are the problems related to the papers covered in all the semesters. The topics relating to the areas listed below covered under Semester I to IV. The Core Statistical Software Practical examination is to be conducted at the end of the IV Semester. The contents for Statistical Software Practical shall be restricted to the following topics, which are found in the software "**Python programming "**

- Importing and Exporting Datasets -Sub setting Dataset- Aggregating dataset -Stacking and Merging dataset - For and While loop - Diagrammatic representation

- Calculation of Probabilities under various distributions

- Test for normality and homogeneity of variance-Inferential Statistics for Single through multiple samples (Chi-square, t, f, and z test)

- Non-parametric tests Chi-square, Sign test, Mann Whitney test, Kruskal Wallis test, Friedman test

- Experimental Design: One way ANOVA-two way ANOVA- Multiple comparison tests

- Multivariate : Principal component - Factor Analysis

- Importing and exporting data in other formats,

- Correlation & Regression – Multiple Correlations, Multiple Regression, Curve Fitting, Time series and Forecasting models-Regression models-Generalized linear models Logistic, multinomial,

- cluster analysis-hierarchical, K Means

Current Contours

- Classification and Regression Tree- Machine Learning-supervised & unsupervised Learning-cluster analysis-hierarchical, K Means.

Books for Study & References

1. Python programming for Absolute Beginner, Third Edition By Michael Dawson – Cengage

2. Python Data Analytics, Fabio Nelli – Apress

Course outcomes :

- Students will gain the statistical software knowledge along with machine learning which is essential required for projects in all disciplines.
- The content develops research oriented concepts and skills in students about data science required for data analytics, data scientist job in IT sectors
- one can work as a freelancer with this software knowledge
- It gives the ideas of entrepreneurship and also allows the students to work as a statistical advisor.
- The content of the syllabus includes the statistical techniques used in market analytics, research analytics , finance
- The content of the syllabus includes the statistical techniques used in market analytics, research analytics , finance
- The students will get the insights of theory as to use the applications of theory in real time problems through software and summarize the results.

CCXV-Project/Dissertation

Course Code: 11SCA15PROJ   **Credits : 5**

Objectives:

To build in depth knowledge and practicesaboutscientific collection and manipulation of data in real world and its limitations.
To suffuse the applications of statistical models and their implementation in projects to extract the knowledge from the data and draw inference about the data.

Project / Dissertation shall be carried out under the supervisor of a Faculty member on the recommendation of the Head of the Department. **Three copies** of the Project / Dissertation should be submitted at least two weeks before the last working day of the fourth semester. The Project / Dissertation with components are:

Internal Assessments	**: 25%**
Evaluation of Project / Dissertation by External	
Examiner and Guide	**: 50 %**
Supervisor and External Examiner by Viva-Voce	**: 25 %**

Current Contours

Project is done for interfacing the students with Statistical skill sets required for handling practical primary data sets with framed questionnaires which is essential for the Job roles like Data Analyst, Project associate in research institute and research associates in medical fields

The Evaluation of the Project / Dissertation will be based on Project Report and a VIVA-VOCE examination to be conducted by the Supervisor and an External Examiner.

Course outcomes :

- The students will achieve experience in Primary data collection
- The students will have ideas of Data handling, Data impurity and Data entry
- The students will get accurate ideas of the building, applications of the Statistical models & evaluation consisting of data science
- one can work as a freelancer with intuition they acquire from this project work
- It gives the ideas of entrepreneurship and also allows the students to work as a statistical advisor.
- One can work in analytics in other disciplinary courses
- The students will get the insights of theory as to use the applications of theory in real time problems through software and summarize the results

CCXVI-Mathematical Methods for Statistics

Course Code: 11SCA16CC   **Credits : 5**

Objectives:

- To deliver the mathematical methods for better understanding of theoretical concepts pertaining to Statistics and inculcate requisiteknowledge essential for NET/SLET/GATE.

Unit - I

Infinite series : Cauchy's criterion for convergence – Alternating series – Absolute and conditional convergence – Test for convergence – Comparison test – Limit comparison test – Geometric series – Integral test – Ratio and root test – Dirichlet's test and Abel's test.

Unit - II

Limit and continuity : Limit of a function – Algebra of limits – Continuity and discontinuity of function – Monotonic function – Bolzano – Weirstrass theorem on continuous function – Intermediate value theorem – Uniform continuity – Derivability of function – Rolle's theorem mean value theorems – (Lagrange's Cauchy's and generalized).

Unit - III

Riemann integral :   Riemann integrability of a function – Algebraic probabilistic – Integration by parts first and second fundamental theorem of integral calculus – First and second mean value theorems – Differentiation under integral sign.

Unit - IV

Finite Dimensional vector space – Sub-spaces – Linear independence – Basis and dimension – Inner product space – Orthogonality and orthonormal basis – Gram – Schmidt orthogonalization process linear transformation – Algebra of matrices, row and column spaces of a matrix, elementary matrices, determinants, rank and inverse of a matrix, null space and nullity of a matrix.

Unit - V

Eigen values and Eigen vectors of a matrix – Characteristic polynomial – Cayley – Hamilton theorem – minimal polynomial. Quadratic forms – Classifications of real quadratic forms – Ranks and signature – reduction of a real quadratic form to diagonal form – Sylvester's law of inertia – Some characterizations of positive definite and non-negative definite quadratic forms.

Unit-VI(Advanced topics for only discussion)
Current Contours
https://archive.org/details/in.ernet.dli.2015.13917

Books for Study:

1. Malik S.C S Arora, **Mathematical Analysis**, Wiley Eastern limited, New Delhi.
2. T.M. (1985). Mathematical Analysis, Naraso Publishing House New Delhi.
3. Ramachandra Rao, A. and Bhimasankaram, P. (1992). Linear Algebra, Tata Mc Graw Hill.

Books for References:

1. Rudin, W. (1976). **Principles of Mathematical Analysis**, Mc Graw Hill, New York.
2. Hadley,G.(1998). **Linear Algebra**, Narose publication House, New Delhi.

Course outcomes :

- The content will give them an idea which is required for NET/SLET examination
- The students will be equipped with the advanced concepts which is required for internship in research institutes
- The students will be motivated to do research work in advanced mathematical topics
- The students will be stimulated to get the ideas to combine the statistical concepts with mathematical methods for research topics and programming skills
- The students will be equipped with the advanced concepts which are required for internship in research institutes.
- The students will gain ideas for the implementation of mathematical techniques associated with the statistical concepts in medical sciences, health sciences

CCXVII-Data Mining

Course Code: 11SCA17CC   **Credits : 5**

Objectives:

- To permeate the ideas of data taxonomy associated with computational and logical methods practiced in data Mining system.
- To give brief ideas about machine learning and Web data mining.

Unit - I

Data Mining-concepts- data Mining functionalities-Classification of Data Mining System-Major issues on Data Mining-Introduction to OLAP, OLAP Technology for Data Mining, Data Warehousing, optimizing data for mining, Data Preprocessing

Unit - II

Data mining Primitives-Query Language, Association rules in large data mining, KDD Process, Fuzzy sets and logic, classification & Prediction-Information retrieval, Dimensional modeling of Data, Pattern Mining, Estimation Error-EM,MLE.

Unit - III

Bayes theorem-chi Squared Statistics Regression-decision tree, Neural network, Genetic algorithms, cluster analysis-outliers, Cluster and Classification, clustering issues, impact of outlier, on clustering, clustering approaches

Unit - IV

Clustering Algorithm-single link, complete link, Average link, Dendogram, Partition Algorithm-MST, Squared Error, K-means, Nearest Neighbour, PAM, GA, categorical Algorithm, large Data base.

Unit - V

Introduction-Webdata, web knowledge, Mining Taxonomy, web content mining, web usage mining Research, Ontology based web mining Research, web mining applications-Customer profiling – Predicting bid behavior of pilots.

Unit-VI(Advanced topics for only discussion)
Current Contours
 Techniques and tools in mining all types data resources through software
https://www.researchgate.net/publication/220695151_Advanced_Data_Mining_Techniques

Books for study and references:

1.   Pieter Adriaans and DolfZantinge – **Data Mining**, Addision Wesley publications.

2.   K.P. Soman, ShyamDiwakar, V. Ajay – **Data Mining theory and Practice**, PHI.

3.   Rhonda Delmater and Monte Hancock – **Data Mining explained**, Digital press.

4.   David Hand, HeikkiMannila and Padhraic Smyth - **Principles of Data Mining**, PHP.

Course outcomes

- Students will gain the data mining, taxonomy and warehousing knowledge along with machine learning which is essential required for projects in all disciplines.
- The content develops research oriented concepts and skills in students about data science required for data analytics, data scientist job in IT sectors
- One can work as a freelancer with data Mining associated with software literacy.
- It gives the ideas of entrepreneurship and also allows the students to work as a statistical advisor.
- The content of the syllabus includes the statistical techniques used in market analytics, research analytics , finance
- The students will get the insights of theory as to use the applications of theory in real time problems through software and summarize the results.

DEPARTMENTAL ELECTIVE COURSES(DEC)

DECI-Linear Models and Design of Experiments

Course Code: 11SCA01DEC   **Credits : 4**

Objectives:

- To cultivate the concepts of experimental models which are used in Agriculture, medical research.
- To impart the ideas of building advanced linear modelswhich eventually increases research skills.

Unit - I

Linear Models and Linear Model Assumptions on Error Components – Fixed / Mixed and Random Component Models – Gauss-Markov set up and its generalization – Linear estimation – Gauss-Markov theorem – BLUE-Test for Linear Hypothesis – Review of Basic Designs and Principles of Experimentation CRD-RBD-LSD.

Unit - II

Multiple Comparisons – Multiple Range Tests – Analysis of Covariance – Construction of Orthogonal Latin Square – Analysis of Graeco Latin Squares, Cross Over Designs, Analysis of Non-Orthogonal Two way dataSimple and Balanced Lattice Designs

Unit - III
Construction and Analysis of Factorial Experiments-2^k, 3^k, S^k -Yates Method**-**Fractional factorials-construction of $1/s^k(s^n)$-Construction and Analysis of Asymmetrical Factorial – complete and partial confounding 2^k, 3^n – Balanced Confounding in Asymmetrical Factorial experiments

Unit - IV
Split PlotDesign – Advantages and Disadvantages - Strip Plot Designs.Concept of Fractional Replication in A Symmetrical Factorial 1/2 and 1/4 in replicate of 2^n, 1/3 replicate of S^n-Incomplete Block Designs, Incidence matrix and its properties, Concept of Connectedness and Orthogonality,Balanced Incomplete Block Designs - Youden Square Design

Unit – V
Partially Balanced Incomplete Block Design- Construction and Analysis **-**Resolvable designs – Design for bioassay- Response Surface experiments – characterizing response surface -First and second order Rotatable Designs.

Unit – VI(Advanced topics for only discussion)
Current Contours
Applications of designing experiments in agriculture, zoology, biochemistry, biomedical sciences, Genetics and Bio-Statistics through data.

Books for Study:

1. Das &Giri(2015).: **Design and Analysis of Experiments**, 2nd edition, New Age International Publisher
2. Montgomory, D.C. (1976) :**Design and Analysis of Experiments**, John Wiley and Sons.
3. Graybill, F.A. (1968) :**An Introduction to Linear Statistical Models**, McGraw Hill.
4. AlokeDey (1986) :**Theory of Block Designs**, Wiley Eastern.

Books for References:

1. Fisher, R.A. (1947) :**The Design of Experiment**, Fourth Edition, Oliver and Boyd.
2. Federar, W.T. (1963) :**Experimental Design Theory and Application**, McMillian and Co., New York Oxford IBM.
3. Kempthorne, O. (1965): **Design and Analysis**
4. Cochran, W.G. and Cox, G.M. :**Experimental Designs**, John Wiley.
5. Nigam, A.K., Puri, P.D and Gupta, V.K. (1988) :**Characterizations and Analysis of Block Design**, Wiley Eastern.
6. Kshirsagar, A.M :**A Course in Linear Models**, Marcel Dekkar.

Course outcomes:

- The students will accomplish research oriented concepts given for statistical techniques required for experimental designs.
- The students will have ideas of usage of experimental designs in agricultural, medical, biomedical projects
- The students will be motivated to use Statistical techniques in industrial use
- The content of syllabus also avails them to fetch the background concepts of Model formulation and validation.
- The students will be motivated to do research work like implementation in image processing, Genetics, Biostatistics.
- The content of syllabus also avails them to face central government examination like Indian Statistical Service and other competitive examinations.

DECII-Demography and Econometrics

Course Code: 11SCA02DEC   **Credits : 4**

Objectives:

- To cultivate the concepts of population studies based on demographic factors and models.
- To pervade the regression models and stochastic modeling using financial data.

Unit – I

Development and scope of Population Studies (Demography) – data; Source and current status – Population Size and grounds in India – Trends and Differential in world population-stationary and stable population-Migration – Components of population growth and change – Urbanizations in developed and developing countries– Methodsof projections.

Unit – II

Mortality – crude, specific, standardized rates – life table – Construction use and interpretation – abdriged life table - Fertility Basic measurements – Gross and Net reproduction rate – cohort fertility Analysis – fertility rates- models.

Unit – III

Nature and scope of Econometrics- Illustrative examples Production and cost analysis-Price and income elastic ties of demand-Single equation linear model static case-Problem of Heteroscedasticity and multi-collinearity problem of aggregation-Ordinary square (OLS) method, Maximum Likelihood Estimate (MLE), Generalized Least squares (GLS) method.

Unit – IV
Simultaneous equation model, problems of identification Estimation using Limited Information Maximum (LIM), K-class estimators, two stages least squares (2-SLS)-Three stage least square estimates (3-SLS),Methods Full Information Maximum Likelihood (FIML)

Unit –V
Simultaneous least squares estimates (LSE) and Integrated least square estimates, Comparison of various estimation methods. Stochastic Regressors-Distributed Lag Models - Method of Instrumental variables-Durbin test

Unit-VI(Advanced topics for only discussion)
Current Contours
Infinite distributed log models – Spurious regression-Vital statistics used in policies and finance

Books for Study:

1. Bogue D.J. – **Principles of Demography** (1976) John, Wiley, New York
2. Gibbs J.P. – **Urban research Methods** – Ban Nortand, New Jersey.
3. Keyflinz.M.O.S.A – **Text Book of Demography** (1976) Vikas Publishers.
4. Kelejion, H.H and Oates Wallance, E. – **Introduction to Econometrics**, Harper and Row Publishers Inc., New York.
5. Gujarati.D. – **Basic Econometrics** (3rd Ed.), McGraw Hill, New York.

Books for Reference:
1. Barclay, G.W – **Techniques of Population Analysis**, John Wiley, New York.
2. Maddala, G.S. – **Econometrics**, McGraw Hill.
3. Klein, L.R. – **A Text Book of Econometrics**, Rao, Peterson Co.
4. Goldberger – **Econometrics Theory**, Wiley Eastern, New Delhi

Course outcomes:

- The students will accomplish the knowledge about the inferential Statistics in building statistical models which is required for applications in real time financial data like stock market.

- The content develops research oriented concepts and skills in students about data science required for data analytics, data scientist job in IT sectors will be enriched.

- The students will be motivated to do research work in Actuarial science, finance, portfolio risk.

- The students will get ideas about the demographic factors that will allow them to acquire knowledge in population studies

- The students will be motivated to do research work in automation of advanced risk and financial predictive modeling with accuracy along with actuarial science.

- One can work as a freelancer with this knowledge of regression analysis and also allows the students to work as a statistical advisor.

DECIII-Survival Analysis and Reliability Theory

Course Code: 11SCA03DEC   **Credits : 4**

Objectives:

- To cultivate the concepts of essential and advanced survival and reliability models for development of research work and analytics in medical sciences.

Unit – I

Survival analysis – Definitions and properties – Lifetime distribution and models – Censoring - types of censoring– Likelihood inference with censored data – Inference procedures for survival function of Parametric models- exponential , Weibull, gamma, geometric distributions- Non parametric- Kaplan-Meir estimator – Plots involving survivor functions-Actuarial estimator,

Unit – II
Log rank test of two groups and several groups.- Parametric regression model - exponential, weibull- Proportional hazard model-Cox PH model- Hazard function estimator-Hazard ratio- Proportional hazard model- Exponential, Weibull, log-logistic

Unit - III

Accelerated failure rate model -Weibull, Log logistic, Gompertz models- Gamma-lognormal - Stratified Cox- Cox PH model for time dependent variables- Frailty model –discrete frailty model-Exponential, Gamma, Shared frailty model

Unit – IV
Counting Process-recurrent event data-CP for robust estimation-Parametric approach using shared frailty- Gamma-survival curves with recurrent events- Competing risk-cause-specific hazard function-censoring in competing risk-Cumulative Incidence curve-Conditional Probability curves-LM approach

Unit – V

Design Issues for randomized trials-Time to event outcomes-determination of number of events and participation in trials. Statistical Modeling in Health and Disease – Models and their formulation – Stochastic Approach – Types of Models – Utility of Models.

Unit – VI(Advanced topics for only discussion)
Current Contours
Implementation of survival models in medical sciences, disease prediction and diagnostic and finance and reliability models through software

Books for Study:

1. David G. Kleinbaum& Klein. (2008) :**Survival Analysis :A Self -Learning Text**, Third edition, Springer International Edition.
2. Barlow, R. E. and Proschan, F. (1985) :**Statistical Theory of Reliability and Life testing**, Holt, Rinehart and Winston.
3.Lawless, J.F. (2003) :**Statistical Models and Methods for Lifetime Data,**John Wiley Eastern
Books for References
4.Sinha, S.k. (1986) :**Reliability and Life Testing**, Wiley.
5. Marvin Rausand (2004)**.System Reliability theory- Models, statistica; methods   and Applications,** John Wiley and Sons.
6.Cox, D.R. and Oakes, D (1984) :**Analysis of Survival data**, Chappman Hall.

Course outcomes :

- The students will gain knowledge in different advanced survival models used in medical research, disease prognosis, health which is beneficial for them for different research institutes like ICMR, NCMR, NIMHANS

- The students will acquire expertise in different advanced reliability models used in quality control for machine which gives them awareness in industrial arena.

- The students will also get the exposure to use the advanced risk models in finance.

- The students will also be stimulated to implement survival and reliability models in other disciplinary research projects through extensive software usage.

- The students will be motivated to do research work in automation of stochastic modeling or machine learning with survival models in disease prognosis and evaluation

DECIV-Actuarial Statistics

Course Code: 11SCA04DEC   **Credits : 4**

Objectives:

- To amalgamate the concepts of insurance and policies for development of financial analytics and risk analytics in banking domain.

Unit – I

Cash Flow- Elements of simpleand Compound Interest (nominal and effective rates of interests). Annuities certain, Present values, accumulated amounts, deferred annuities – Simple problems. Redemption of loans, Sinking funds, The Average yield on the life fund of an insurance office.

Unit – II

Mortality Tables-Construction of mortality tables-comparison of different mortality tables-Life Assurance premiums-Assurance benefits-Life Annuities and temporary annuities-Net premium for assurance plans Net premiums for Annuity plans

Unit – III

Premium conversion-Office premiums – policy values –surrender value and paid up policies-Further life contingencies - methods of valuation – Data for valuation – Surplus and its distribution

Unit – IV

Commutation and Reserves- bounds reserve and Cash values- Retrospective reserves –Insurance Endowment- force of decrement- Risk Models- Multiple Decrement Models- Death uniformity, Single Decrement

Unit – V

Portfolio in finance-risk and return- risk measure-risk attitudes-Capital Asset Pricing Models- Security market line-Portfolio Analysis-Diversification-Markowitz Diversification-Efficient Frontiers

Unit-VI(Advanced topics for only discussion)
Current Contours
https://www.iwu.edu/math/IntroductionToActuarialScience_DerekEngland.pdf
job roles like policy makers in foreign and Indian banks, Actuarial in Insurance companies and banks

Books for Study:

1. Federation of Insurance Institutes study courses : **Mathematical Basic of the Life Assurance F.I.2.1**
2. Donald, D.W.A.(1970): **Compound Interest and annuities**. Heinemann, London
3. Neil, A (1977). **Life contingencies**, Heinemann, London
4. Eric V. Slud(2001).: **Actuarial Mathematics and Life-Table Statistics**
5. Bowers N.L.,GerberH.U,.Hickman, J.C and Nesbitt, C.J.(2006) **Actuarial Mathematics**, Society of Actuaries, Itasca, USA second edition.
6. Frank K. Reilly(2002). : **Investment Analysis and Portfolio management**, 7th edition, South-Western Publishing Co.
7. Spurgeon, E.T(1972) **Life Contingencies,** Cambridge University Press

Books for References:

1. Mccutcheon J.J. and Scot (1989).**Mathematics of Finance**, Heinemann, London
2. Dixit.S.P.Modi .C.S and Joshi R.V. (2000) **Mathematical basics of Life Assurance**, InsuranceInstitute of India, Bombay.

Course outcomes:

- The students will be motivated to do research work in Actuarial science, finance, portfolio risk

- The students will be equipped with the advanced concepts which is required for internship in research institutes working in financial domain

- The students will accomplish the knowledge in building statistical models which is required for applications in real time financial data like stock market

- One can work as a freelancer with intuition as a actuary in financial domain

- It gives the ideas of entrepreneurship and also allows the students to work as a statistical advisor in insurance company, policy makers, Banking Domain

DECV-Statistical Methods for Bioinformatics

Course Code: 11SCA05DEC   **Credits : 4**

Objectives:

- To introduce the intrinsic perception of Bioinformatics and integrate the concepts of statistical methods implementing in Biological data analysis

UNIT I

Introduction to Bioinformatics: Definition and History of Bioinformatics - Internet and Bioinformatics - Introduction to Data Mining - Applications of Data Mining to Bioinformatics Problems and Applications of Bioinformatics.

UNIT II

Bio computing: Introduction to String Matching Algorithms - Database Search Techniques-Sequence Comparison and Alignment Techniques - Use of Biochemical Scoring Matrices - Introduction to Graph Matching Algorithms - Automated Genome Comparison and its Implication - Automated Gene Prediction - Automated Identification of Bacterial Operons and Pathways- Introduction to Signaling Pathways and Pathway Regulation - Gene Arrays - Analysis of Gene Arrays.

UNIT III

Statistical testing and significance for large biological data analysis- statistical testing – parametric and non-parametric tests - Resampling based tests - ad hoc tests - Error controlling - multiple testing problems and procedures- Applications.

UNIT IV

Overview of bioinformatics - Human genome project - Goals of human genome project - Bioinformatics and the internet - Useful bioinformatics sites on World Wide Web - Basic principles of computing in bioinformatics: Running computer software - Computer operating system - Software downloading and installation.

UNIT V

Databases: Data life cycle acquisition, modification, use, archiving, repursoning, disposal - Database technology architecture and management system - Interfaces, software and programming languages - Examples of some bioinformatics database - Use of Databases: Structure databases – visualization of structural data, pattern matching, molecular modeling - Mapping databases – genomic mapping, types of maps - Phylogenetic analysis - an overview – Collaboration.

Unit-VI(Advanced topics for only discussion)
Current Contours

Applications of predictive analytics and data mining in Bioinformatics through software

Books for Study:
1. Bailey, N. T. J. (1995). Statistical Methods in Biology (Third Edition). Cambridge law.
2. Baldi, P. and Brunak, S. (1998). Bioinformatics. The MIT Press.
3. Baldi, P. and Brunak, S. Bioinformatics: The Machine Learning Approach.
4. Bergeron, B. (2003). Bioinformatics Computing. Prentice Hall Inc. Eastern Economy Edition.

Books for References:
5. Jae K. Lee, (2010). Statistical Bioinformatics. Wiley-Blackwell, New Jersey
6. Lesk, A.M. (2002). Introduction to Bioinformatics. Oxford University Press.

Course outcomes:

- The students will gain knowledge in different medical data mining techniques used in medical research, disease prognosis, health which is beneficial for them to work in different research institutes like ICMR, NCMR, NIMHANS

- They can avail the jobs of project associate or internship or research associate through their research work in the different institutes ICMR, NCMR, NIMHANS

- The students will be enriched with the Knowledge of Bioinformatics involving Statistical concepts.

- The students can have ideas about working in diversified field like in molecular biology, Population genetics, Data Mining In Bioinformatics through software.

UECI-Econometrics

Course Code: 11SCA01UEC   **Credits : 3**

Objectives:

- To permeate the applications of basic and advanced regression models in financial domain.

Unit - I

Nature and scope of Econometrics.Illustrative examples Production and cost analysis.Price and income elastic ties of demand. Prices elastic ties of supply. Torquivists model of demand for inferior goods models building bias in construction of models.

Unit - II

Single equation linear model static case. Ordinary square (OLS) method, Maximum Likelihood Estimate (MLE), Generalized Least squares (GLS) method. Problem of Heteroscedasticity and multi-collinearity problem of aggregation.

Unit - III

Single equation linear model, Dynamic case problem of auto correlation, testing for auto correlated disturbances and distributed log methods, Errors in variable models Instrumental variables.

Unit - IV

Simultaneous equation model, problems of identification Estimation using Limited Information Maximum (LIM), Instrumental variables, two stages least square (2-SLS) methods.

Unit - V

K-Class estimators, Full Information Maximum Likelihood (FIML), Simultaneous least square estimates (LSE) and Integrated least square estimates. Three stage least square estimators (3-SLS), Comparison of various estimation methods.

Unit –VI(Advanced topics for only discussion)
Current Contours
Infinite distributed log models – Spurious regression – Co integration and error correction

Books for Study:

1.   Kelejion, H.H and Oates Wallance, E. – Introduction to Econometrics, Harper and Row Publishers Inc., New York.

2.   Johnsdon, J. – Econometric methods (3rd Ed.), McGraw Hill, New York.

3.   Gujarati.D. – Basic Econometrics (3rd Ed.), McGraw Hill, New York.

Books for References:

4.   Maddala, G.S. – **Econometrics**, McGraw Hill.

5.   Klein, L.R. – **A Text Book of Econometrics**, Rao, Peterson Co.

6.   Goldberger – **Econometrics Theory**, Wiley Eastern, New Delhi.

7.   Tintner, G. – **Econometrics**, Wiley Eastern, New Delhi.

Course outcomes:

- The students will accomplish the knowledge about the inferential Statistics in building statistical models which is required for applications in real time financial data like stock market.

- The content develops research oriented concepts and skills in students about data science required for data analytics, data scientist job in IT sectors will be enriched.

- The students will be motivated to do research work in Actuarial science, finance, portfolio risk.

- One can work as a freelancer with this knowledge of regression analysis and also allows the students to work as a statistical advisor.

Course Code: 11SCA02UEC   **Credits : 3**

Objectives:

- To deliver the consolidated statistical methods and techniquesrequired in Biological data analysis

Unit - I

Nature and scope of biological and Clinical experiments and data – Classification of data – Need and nature of tabulation – Charts and Diagrams for data – Bar diagrams, pie diagrams, pictograms, histograms – Frequency curves and their use.

Unit - II

Measures of Central tendency – Mean, Median, Mode, Geometric mean, Use of these averages in biological Studies. Measures of deviation and Standard deviation – Co-efficient of variation – Measure of Skewness and Kurtosis.

Unit - III

Correlation and regression theory – Correlation coefficient – Rank correlation – Regression equations (only problems) – Multiple and Partial correlation and regression.
Basic concepts of sampling – Simple random sample – Stratified sample – Systematic samples.

Unit - IV

Test of significance based on large sample test: for mean – Variance and proportions-test for means, variance and attributes using t, F and Chi-Square distribution. Test for correlation regression coefficients, Chi-Square test for goodness of fit.

Unit - V

Analysis of variance : One way and two way Classifications – Completely Randomized blocks – Randomized Block Design and Latin Square Design (Simple problems based on biological and biochemical data).

Unit –VI(Advanced topics for only discussion)
Current Contours

Statistical Analysis and research methodology in biomedical, bio- chemical and clinical trial projects

Books for Study and Reference:

1.Sundar Rao, Jesudian, Richard :**An Introduction to Biostatistics**, Wiley**.**

2.Alvi E-Lewis :**Biostatistics** - Eastwest Press.

3.Daniel. Wayne :**Bio-Statistics**, Wiley.

4.Campell :**Statistical for Biologist,** Wiley.

Course outcomes:

- The students will gain knowledge in different statistical techniques used in medical research, disease prognosis, health
- They can avail the jobs of project associate or internship or research associate through their research work in the different institutes ICMR, NCMR, NIMHANS
- The students can have ideas about working in diversified field like in molecular biology, Population genetics, Data Mining in Bioinformatics using statistical methods.
- The students will achieve the knowledge of statistical methods which increase their job competency

UECIII-Industrial Statistics

Course Code: 11SCA03UEC   **Credits : 3**

Objectives:

- To convey the basic statistical methods and techniques used in industrial use .

Unit – I

Historical development of Statistical Quality Control – Meaning of Quality improvement – Quality cost – Total Quality Management – Causes of variations – X, R, P and C charts.

Unit – II

Acceptance sampling plans by Attributes – Single Sampling Plan – Double Sampling Plan – OC curves – AOQ, ATI curves, Dodge Roaming AOQL and LTPD plans, MIL – STD 105D plans.

Unit – III

Variable Sampling Plan – One sided and Two sided specifications – Taguchi philosophy and contributions to Quality Improvement (Basic concepts only).

Unit – IV

Test of significance and design of experiments : Tests based on t, F and chi-square distributions – Analysis of variance – One way and Two way classification Complete Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD).

Unit – V

Basic of reliability theory – Life time distribution – Hazard rate – Survival function – MTTF-MRL, Computations of Exponential, Weibull, Gamma and life time distributions.

Unit –VI(Advanced topics for only discussion)
Current Contours

Statistical Analysis in Quality control in industries, six sigma quality control

Books for Study and Reference:

1.Montgomery, DC (1991). **Introduction of Statistical Quality Control**, John Wiley and Sons.

2.Marvin Rausand (2004**).System Reliability theory- Models, methods and Applications,** John Wiley and Sons.

3.Hsyland &Hsyland (2004):**System Reliability Theory Models, Statistical Methods, and Applications** Second Edition, Wiley

4.H.J. Mittag and H.Rinne (1993) :**Statistical Methods of Quality Assurance**, Germany Chapman & Hall India (UK) – Chapter 3 and 4.

5.Das &Giri(2015).: **Design and Analysis of Experiments**, 2nd edition, New Age International Publisher

Course outcomes:

- The students will be well known withsampling planning techniques required in industrial purposes
- The students can have the careeras a quality controller in industries.
- The students can interlink the sampling plan techniques in quality control for experimental designs
- The students will be motivated for research work in industrial statistics

UECIV-Basic Statistical Tools in Data Analysis

Course Code: 11SCA04UEC   **Credits : 3**

Objectives:

- To convey the basic statistical methods and techniques used in Data Analytics

Unit – I

Concepts on probability distribution- pdf, cdf, Joint distributions, conditional distributions, independence, expectations-conditional expectation, variance, covariance and problems, Transformations of random variables, use of Jacobians-problems

Unit- II

Bernoulli trials,binomial,Poisson,geometric,hypergeometric, negative binomial, Uniform, exponential, gamma, Weibull, Normal and their relationship and problems-moment generating function

Unit-III

Descriptive Statistics-Correlation –properties-types-scatter method-correlation coefficient -Pearson, Spearman-Problems-regression-regression equation- Angle between regression lines-central limit theorem-problems-Testing of hypotheses : hypotheses, two types of errors, level of significance, parametric test for population proportion between ,test for single, paired, independent sample mean, analysis of variance

Unit-IV

Non parametric test -U statistic -Tests for goodness of fit – Chi-square and Kolmogorov-Smirvon tests. Test for randomness-– Median test – Sign test – Run test, Wilcoxon's signed-rank test. Kolmogorov- Smirvov two sample test. Mann-Whitney U test.-Kruskal Wallis test.

Unit- V

Sampling-concepts-population-estimate- sampling error-Sample size, types- Simple random-Stratified-Systematic- Data reduction-Factor analysis, cluster analysis

Unit –VI(Advanced topics for only discussion)
Current Contours

Advanced Statistical techniquesand research methodology in projects

Books for Study:
1.   SuddhenduBiswas& G.L Sriwastav((2011): **Mathematical Statistics**, First Edition ,
        Narosa Publishing House
2.   Hogg, Tanis, Rao(2011):**Probability and Statistical Inference**, seventh edition, Pearson
        Education
3.   Cochran, W.G.(1972): **Sampling Techniques**, Wiley Eastern Private Limited.
4.   Sukhatme, P.V. and Sukhatme, B.V.(1977): **Sampling Theory of Survey with Applications**, Asia
        publishing House.
5.   Conover, W.J. (1980) :**Practical Non-parametric Statistics**, (Second Edition), John Wiley and
        sons, Newyork.
6.   Bagdonavicious, Kruopis, M.S.Nikulin (2011): **Non-Parametric Tests for Complete Data,** (First

Edition), John Wiley and sons, USA.

Books for References :

1.   Kale, B.K. (1999) :**A First Course on Parametric Inference**, Narosa, Publishing House, NewDelhi.
2.   Lehmann, E.L. (1986) :**Testing Statistical Hypotheses**, (Second Edition), John Wiley, Newyork.
3.   Rohatgi, V.K. (1988) :**An Introduction to Probability Theory and Mathematical Statistics**, Wiley Eastern Ltd., NewDelhi.

Course outcomes:

- The students will be well known withbasic statistical methods required in carry out the analytical part of their projects

- The students will acquainted with statistical skills which they can implement in their area of interest for further progress in research

- The students can interlink the sampling techniques which will be essential for Data collection in their projects.

- The students will be motivated for analytical research work in medical science, Biomedical science, Biochemistry, Library Science, Mathematics, Sociology etc. in other disciplines also.

VACI-Decision Tree and Machine Learning

Course Code: 17ST01VAC   **Credits : 2**

Objectives:

- To motivate towards the world of data science with a special note in decision theory and machine learning

Unit-I

Decision tree-concepts-construction of rules-Basic concepts-Constructing of Classification trees-Inductive decision(ID) tree-version3 for nominal attributes-Information entropy-Building Tree – gain-High branching Attributes-Top-down ID –C4.5

Unit-II

Chi-Square Automatic Interaction Detection (CHAID)-algorithm and description-Applications-Classification and Regression Trees (CART)-Impurity measure – Ginni Index- Applications-Twoing index-ordered index

Unit-III

Regression Trees-concepts-Tree Based Regression-Least Square Regression trees-greedy criterion-re-substitution- over- fitting-Pruning-types-Subtree replacement and raising-Pruning algorithms-Cost complexity –Minimum error-Pessimistic-Critical value

Unit-IV

Model estimation-resampling methods-Cross-validation-Leave-one out-rotation-Bootstrap-Algorithms for Classification and Regression-Naïve Bayes-Problem of zero frequency-Missing values and Numeric attributes-Multiple regression-Logistic regression-K-Nearest Neighbour Classification and prediction-

Unit-V

Machine learning - Genetic algorithm- Support Vector Machines-Applications-Cluster Analysis- Methods of Similarity-Methods of distance measurement-Similarity co=efficient-Similarity matrix- types of clustering techniques-Neural Network

Unit –VI(Advanced topics for only discussion)
Current Contours

Two phase clustering algorithm (CHAMELEON)-Visualization of Multidimensional Data-COBWEB Conceptual Clustering Algorithm

Job roles like Data Analyst, Data Scientist,, Financial Analyst,   Market Analyst, Research Analyst, Risk Analyst

Books for Study and References:

1. Soman, Diwaker& Ajay (2012).''Insight into Data Mining'' Theory and Practice, 1st edition, PHI Learning Private Limited.
2. Pieter Adriaans and DolfZantinge – **Data Mining**, Addision Wesley publications.
3. Rhonda Delmater and Monte Hancock – **Data Mining explained**, Digital press.

4. David Hand, HeikkiMannila and Padhraic Smyth - **Principles of Data Mining**, PHP.

Course outcomes

- Students will gain the data mining, knowledge along with machine learning which is essential required for projects in all disciplines.
- The content develops research oriented concepts and skills in students about data science required for data analytics, data scientist job in IT sectors
- One can work as a freelancer with data Mining associated with software literacy.

VACI-Minor Project in Data Science

Course Code: 17ST02VAC   **Credits : 2**

Objectives:

- To generate hands on experience and intuition in handling Big data and to extract knowledge from the data

Minor Project shall be carried out under the supervisor of a Faculty member on the recommendation of the Head of the Department. **Three copies** of the Project / Dissertation should be submitted at least two weeks before the last working day of the third semester. The Project with components are:

Internal Assessments   **: 25%**

Evaluation of Project / Dissertation by External

Examiner and Guide   **: 50 %**

Supervisor and External Examiner by Viva-Voce   **: 25 %**

The Evaluation of the Project will be based on Project Report and a VIVA-VOCE examination to be conducted by the Supervisor and an External Examiner.

Current Contours

Minor Project is done for interfacing the students with Statistical skill sets required for handling practical big data sets for the Job roles like Data Analyst, Data Scientist , Financial Analyst, Market Analyst, Research Analyst, Risk Analyst

Course outcomes:

- The students will widen their knowledge and expertise in mining Big data
- The students will have ideas of Data handling, Data impurity in Big data
- The students will get accurate ideas of the building models, applications of the Statistical models & evaluation, decision theory and machine learning in data science

BHARATHIDASAN UNIVERSITY,   **TIRUCHIRAPPALLI – 620 024.**
M.Sc. Biochemistry   **Course Structure under CBCS**
(For the candidates admitted from the academic year 2016-2017 onwards)

Semester	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks Int.	Marks Extn.	Total
I	Core Course – I (CC)	Chemistry of Biomolecules	6	4	3	25	75	100
	Core Course – II (CC)	Analytical Techniques	6	4	3	25	75	100
	Core Course – III (CC)	Enzymes and Enzyme Technology	5	4	3	25	75	100
	Core Course – IV (CC)	Cell Biology and Physiology	5	4	3	25	75	100
	Core Practical- I (CP)	Practical – I (Biochemical Techniques and Enzymology)	8	4	3	40	60	100
	Total		**30**	**20**				**500**
II	Core Course – V (CC)	Metabolism and Regulation	6	5	3	25	75	100
	Core Course – VI (CC)	Molecular Biology	6	5	3	25	75	100
	Core Practical - II (CP)	Practical – II (Molecular and Microbial Techniques)	8	4	3	40	60	100
	Elective – I (EC)	Biostatistics	5	5	3	25	75	100
	Elective – II (EC)	Microbiology	5	5	3	25	75	100
	Total		**30**	**24**				**500**
III	Core Course – VII (CC)	Immunology	6	5	3	25	75	100
	Core Course – VIII (CC)	Clinical Biochemistry	6	5	3	25	75	100
	Core Practical - III (CP)	Practical – III (Clinical Biochemistry)	8	4	3	40	60	100
	Elective – III	Genetic Engineering	5	5	3	25	75	100
	Elective – IV	Developmental Biology	5	5	3	25	75	100
	Total		**30**	**24**				**500**
IV	Core Course –IX (CC)	Endocrinology	5	5	3	25	75	100
	Core Course – X (CC)	Bioinformatics	5	5	3	25	75	100
	Core Practical- IV (CP)	Practical – IV (Phytochemistry, Soil Analysis and Immunological Techniques)	8	4	3	40	60	100
	Elective – V	Ecology and Environmental Sciences	5	4	3	25	75	100
	Project Work	Dissertation=80 Marks [2 reviews –20+20=40 marks Report Valuation = 40 marks] Viva = 20 Marks	7	4	-	-	-	100
	Total		**30**	**22**				**500**
	Grand Total		**120**	**90**				**2000**

Core Paper   -   10

Core Practical   -   4

Elective   -   5

Note:

1. Theory   Internal   25 marks   External   75 marks

2. Practical   "   40 marks   "   60 marks

3. Separate passing minimum is prescribed for Internal and External

  a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
  b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
  c) The passing minimum not less than 50% in the aggregate.

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CORE COURSE I

CHEMISTRY OF BIOMOLECULES

Objectives:

To understand the basis of macromolecules and their structure.

Unit I

Carbohydrates: Structure and biological functions of Mono, di and Polysaccharides. Types of polysaccharides: Homo polysaccharides -chitin, fructans, mannans, xylans, and galactans. Structure and biological importance of Hetero polysaccharides- sugar derivatives- glycosaminoglycans, proteoglycans. Glycoprotein – Blood group and bacterial cell wall polysaccharides, O- linked and N- linked oligosaccharides, marine polysaccharides and Lectins.

Unit II

Aminoacids and its general properties. Classification of amino acids. The peptide bond– Chemical synthesis of peptides –Merrifield method. Proteins– classification and general properties. Orders of protein structure, Primary- Ramachandran plot, Secondary structure– the α-helix, β- pleated sheet. Collagen triple helix. Protein sequencing methods.

Unit III

Super secondary structure– helix– loop helix, the hairpin β -motif and the β-α-β-motif. Tertiary and quaternary structure- Forces stabilizing tertiary and quaternary structure- Structure of myoglobin, Structure of hemoglobin– oxygen binding and changes in conformation. Methods of isolation, characterization and purification of proteins.

Unit IV

Lipids: Definition and classification of lipids. Biological significance of lipids. Types of Fatty acids-Essential, Non essential. Structure and biological functions of phospholipids, sphingolipids, glycolipids. Steroids – structure and functions of cholesterol, bile acids, sex hormones, ergosterol. Structure and biological role of prostaglandins, thromboxanes and leukotrienes.

Unit V

Nucleic acid: Structure of purines, pyrimidines, nucleosides and nucleotides. DNA double helical structure. A, B and Z forms of DNA. Triple and quadruple structures.DNA super coiling and linking number. Properties of DNA: buoyant density, viscosity, hypochromicity, denaturation and renaturation – the cot curve. DNA sequencing– chemical and enzymatic methods. Chemical synthesis of DNA. RNA– types and biological role- Secondary, tertiary structures of RNA.

Reference Books:

1. Biochemistry Zubay 4th edition William C.Brown Publication, 1998.
2. Harper's Biochemistry 29th edition McGraw Hill, 2012.
3. Biochemistry Stryer 5th edition .W.H Freeman, 2002.
4. Principles of Biochemistry.7th edition Lehninger Nelson Cox Macmillan worth Publishers, 2013.
5. Biochemistry. Davidson and Sittmann, NMS 4th ed. Lippincott William's and Wilkins, 1999
6. Biochemistry – Voet and Voet. J O H N WI VP & *Publisher* Kaye Pace Associate Publisher, 2011.
7. Biochemistry Student Companion, by Berg, 7th Edition Berg, Jeremy M. / Tymoczko, John L. / Stryer, Lubert Published by W. H. Freeman, 2011.
8. 8.Chemistry of natural Products , Sujata V. Bhat, Bhimsen A. Nagasampagi, Meenakshi Sivakumar First Edition – 2005.

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CORE COURSE II

ANALYTICAL TECHNIQUES

Objectives:

1. To understand the working principles, construction and applications of the instruments used in the studies related to various disciplines of biological sciences.
2. To apprise the importance of research and to learn the art of publication.

Unit I

Electrochemical techniques – Principles, Electrochemical cells and reaction – pH and buffers. Measurement of pH – glass electrode and titration curves. Ion selective and gas sensing electrodes, oxygen electrode, and their applications. Methods for studying cells and organelles. Methods for lysis of plant, animal and microbial cell Sub-cellular fractionation. General scheme for purification of bio-components.

Unit II

Chromatographic techniques – General principle; adsorption and partition chromatography. Techniques and application of paper, column, thin layer, normal phase and reverse phase - ion-exchange chromatography, exclusion chromatography, affinity chromatography, GLC and HPLC, HPTLC.

Unit III

Centrifugation: Principles, differential and analytical centrifugation, density gradient centrifugation; Analysis of sub cellular fractions, ultracentrifuge and its application.
Tracer technique: Nature of Radioactivity: Patterns of decay, half life and its application, Geiger Muller Counter- principle and applications. Scintillation counter – Principle, types and applications. Use of isotopes in biological studies.

Unit- IV

Electrophoresis: Principles, electrophoretic mobility, factors influencing electrophoretic mobility – paper, disc, slab gel electrophoresis. Isoelectric focusing, 2D PAGE, blotting techniques, capillary electrophoresis. Pulse field Electrophoresis, Isotachophoresis.

Unit - V

Spectroscopy: Laws of absorption and absorption spectrum.CD, ORD, Principle, instrumentation and applications of UV-visible spectrophotometry, ESR, NMR, IR and spectrofluorimetry. Basic principles of turbidimetry and nephelometry. Principle, instrumentation and applications of luminometry.

Atomic spectroscopy – principle and applications of atomic flame and flameless spectrophotometry. Use of lasers for spectroscopy. MALOF TOF.

Reference Books:

1. Principles and Techniques of Practical Biochemistry, Keith Wilson & John Walker, Cambridge   University Press, India. 2005.
2. Biophysical Chemistry (Principles and Techniques) 4th Edition, Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath,   Himalaya Publishing House, India, 2014.
3. Bioanalytical Techniques, Abhilasha Shourie and Shilpa S Chapadgaonkar, the Energy and Resources Institute, TERI, India, 2015.
4. Methods and Techniques, 2nd ed, C.R. Kothari, Research Methodology, New Age International Publishers. India, 2004.
5. Introduction to Instrumental Analysis, Braun, R.P.,Tata McGraw Hill, India, 1987.
6. Textbook of Biochemistry, West, E.S. and Todd, W.R, MacMillan, Germany, 1985.
7. Research Methodology, Methods and Techniques 2nd Edition, C.R. Kothari, New Age International Publishers. New Delhi, 2004.
8. Fundamentals of Bio Analytical Techniques and Instrumentation, Ghosal Sabari and Srivastava A. K., PHI Learning Pvt. Ltd. India, 2009.
9. Introduction to Spectroscopy. 3rd Edition. Pavia, Brooks/Cole Pub Co., New Delhi, India, 2000.
10. Basic Instrumentation, K. K. Machve, Neha Publishers & Distributors, India 2010.

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CORE COURSE III

ENZYMES AND ENZYME TECHNOLOGY

Objectives:

1. To understand the concepts and classes of enzymes
2. To study about enzyme kinetics and applications of enzymes.

Unit I

Historical aspects of enzymology. Nomenclature and classification of enzymes, according to IUB-EC-1964. Intracellular localization of enzymes, homogenization techniques, isolation and fractionation of enzymes - classical methods of purification and crystallization - separation based on molecular size, electric charge, solubility difference and selective adsorption, criteria of purity, units of enzyme activity. Turn over number, specific activity. Active site definition, organization and determination of active site residues.

Unit II

Thermodynamic terms and basic concepts - types of thermodynamic systems. Enthalpy and biochemical reactions, biological thermodynamic standard state, activation energy and free energy. Biological oxidation, redox reactions. High-energy phosphate compounds, role of ATP in biological system; energy transfer; acyl-phosphate group transfer. Types of energy transformation in living systems; energy in photosynthesis. Phosphorylation types. Organization of electron carriers and enzymes in mitochondria, chloroplast and microsomes and their inhibitors, cyanide resistant respiration.

Unit III

Kinetics of catalyzed reaction: Single substrate reactions, bisubstrate reactions, Concept and derivation of Michaelis – Menten equation, Line-weaver burk plot, Briggs Haldane relationship. Determination and significance of kinetic constants, Limitations of Michaelis-Menten Kinetics. Inhibition kinetics - competitive, non-competitive and uncompetitive. Allosteric inhibition, cooperative, cumulative, feedback inhibition.

Unit IV

Criteria of chemical reactions - Collision & transition state theories, specificity of enzymes. Mechanism of catalysis: Proximity and orientation effects, general acid-base catalysis, covalent and electrostatic catalysis - nucleophilic and electrophilic attacks, catalysis by distortion, metal ion catalysis.Theories on mechanism of catalysis. Coenzymes - structure and function, Mechanism of enzymes action: mechanism of action of lysozyme and chymotrypsin. Multienzymes system - Mechanism of action and

regulation of pyruvate dehydrogenase, and fatty acid synthase complex. Isoenzymes.

Unit V

Applications of enzymes in Industry. Immobilization and Immobilized enzymes. Various methods of immobilization - ionic bonding, adsorption, covalent bonding (based on R groups of amino acids), microencapsulation and gel entrapment. Applications of immobilized enzymes. Biosensors – glucose oxidase, cholesterol oxidase, urease and antibodies as biosensors. Abzymes and Ribozymes. Enzymes of clinical importance - diagnostic significance and therapeutic effects. Enzyme Engineering.

Reference Books

1. Modern concepts in Biochemistry (Alllyn and Bascon Inc. Boston) Bohinski, R.C: 1987.
2. Inorganic, Organic and Biological Chemistry – Caret,(W.M.C. Brown Publ. USA 1993.
3. Enzymes (Longman, London) - Dixon, M. and Webb, J.F.: 1979.
4. Principles of Biochemistry (Worth Publ. Inc. USA) - Lehninger, A.H,+ 1993.
5. Biochemistry: A case Orientede Approach (The C.V. Mosby Co., St. Louis) - Montgomery, R, 1990.
6. Biochemistry- Rawn, J.D, (Neil Patterson Publ. North Carolina) - 1989.
7. Biochemistry- Stryer, I, (II Ed) W.H. Freeman & Co., New York) 1988.
8. Biochemistry - Voet, D. and Voet, J.G, (John Wiley & Sons Inc., New York) 1990.
9. Principles of Biochemistry- White, A., (McGraw Hill Book Co., New York) 1959.
10. Fundamentals of Enzymology- Price and Stevens: (Oxford University Press) 1999.
11. Handbook of Proteolytic Enzymes - Alan J. Barrett, J. Fred Woessner, Neil D. Rawlings , 2012.
12. Fundamentals of Enzymology (Oxford Science Publications) 2nd Edition, Nicholas C. 1989.
13. Enzymes: Biochemistry, Biotechnology, Clinical Chemistry Kindle Edition-T Palmer , 2007.

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CORE COURSE IV

CELL BIOLOGY AND PHYSIOLOGY

Objectives:

To understand on integrative physiology at several levels of organization from molecules to living organisms, microscopic structures to macroscopic organization, and cellular properties to organ functions.

Unit I

Tissues: Types of tissue. Epithelium – organization and types. The basement membrane. Bone and cartilage. Major classes of cell junctions – anchoring, tight and gap junctions. Major families of cell adhesion molecules (CAMs) – the cadherins (classical and desmosomal). The integrins. The extracellular matrix of epithelial and nonepithelial tissues. ECM components – collagen, elastin, fibrillin, fibronectin, laminin and proteoglycans and tubulins.

Unit II

Biomembranes, cell cycle, cell death: Membrane assembly – importins and exportins. Membrane transport. Diffusion (passive and facilitated) active transport (symport, antiport, Na+ K+ ATPase), ion gradients, ion selective channels, group translocations, porins, endocytosis and exocytosis. The cell cycle : phases, regulation by cyclins and cyclin – dependent kinases. Checkpoints in cell cycle regulation. Programmed cell death – Brief outline of apoptosis. Differences between apoptosis and necrosis.

Unit III

Blood: Composition and functions of blood. Separation of plasma and serum. Plasma proteins in health and disease. Red blood cells – formation and destruction. Important aspects of RBC metabolism. The RBC membrane – principle proteins (spectrin, ankyrin, glycophorins). Anaemias. Composition and functions of WBCs. Blood coagulation – mechanism and regulation. Fibrinolysis. Anticoagulants.

Unit IV

Body Fluids: Lymph – composition and functions. CSF – composition and clinical significance. Formation of urine – structure of nephron, glomerular filtration, tubular reabsorption of glucose, water and electrolytes. Countercurrent multiplication, tubular secretion. Composition, functions and regulation of saliva, gastric, pancreatic, intestinal and bile secretions. Digestion and absorption of carbohydrates, lipids, proteins and nucleic acids.

Unit V

Neuromuscular System: Structure of neuron. Propagation of action potential: structure of voltage – gated ion channels. Neurotransmitters - examples, release and cycling of neurotransmitters. The neuromuscular junction – activation of gated ion channels. The acetylcholine receptor. Structure of skeletal muscle. Muscle proteins – myosin, actin, troponin and tropomyosin and other proteins. Sequence of events in contraction and relaxation of skeletal muscle. Pathophysiology of Duchenne muscular dystrophy. Cardiac muscle – $Ca2^+$ -Na^+ exchanger, $Ca2+$ -ATPase. Brief outline of channelopathies. Cardiac myophathy. Smooth muscle – regulation by $Ca2+$ and nitric oxide. Source of energy for muscle contraction.

Reference Books

1. Molecular Cell Biology 5th ed., Lodish, WH Freeman (for unit 1, 2, 5) 2003.
2. Harper's Biochemistry 26th ed- Murray, McGraw Hill (unit 2 Biomembranes, unit 3, unit 4, unit 5 muscle) 2003.
3. Principles of Biochemistry- Smith et al. Mammalian Biochemistry. McGraw Hill 7th ed. (for unit 3, unit 4) 1983.

References:

1. Cell and Molecular Biology. De Robertis and De Robertis. Lea and Febiger 8th ed (1987).
2. Molecular Biology of the Cell - Alberts , 4th ed. Garland Sci. 2002.

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CORE PRACTICAL I

BIOCHEMICAL TECHNIQUES AND ENZYMOLOGY

Objectives:

1. To assay the activity of enzymes from different sources.
2. To stimulate their interest in learning the structure, function and kinetics of enzyme and their role as catalyst and regulator of cell metabolism and to serve as foundation for more advanced enzymology courses

1. Estimation of proteins by Lowry / Brad ford method
2. Estimation of phospholipids by phosphorous assay
3. Estimation of sodium and potassium by Flame photometry
4. Effect of pH, temperature and substrate concentration for amylase and urease and determination of Vmax & Km
5. Effect of inhibitor on activity of any one enzyme
6. Effect of activator on activity of any one enzyme
7. Desalting of proteins by dialysis
8. Separation of polar and non polar lipids by TLC
9. Rf value calculation of various amino acids using TLC and PC
10. Separation of serum proteins by paper electrophoresis

Reference Books:

1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001.
2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005.
3. Biochemical methods – S.Sadasivam, New Age International Pub, 2000.
4. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000.
5. Enzyme Kinetics – A modern Approach. AG Marangani, John Wiley & Sons, 2003.
6. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub, 2000.

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CORE COURSE V

METABOLISM AND REGULATION

Objectives:

To understand the metabolic pathways and regulatory mechanisms.

Unit I

Bioenergetics: Free energy and entropy. Phosphoryl group transfers and ATP. Enzymes involved in redox reactions. The electron transport chain– organization and role in electron capture. Electron transfer reactions in mitochondria. Oxidative phosphorylation- F1/F0 ATPase- structure and mechanism of action. The chemiosmotic theory. Inhibitors of respiratory chain and Oxidative phosphorylation – uncouplers, ionophores. Regulation of oxidative phosphorylation. Mitochondrial transport systems- ATP/ADP exchange, malate /glycerophosphate shuttle.

Unit II

Carbohydrate metabolism: Glycolysis and gluconeogenesis– pathway, key enzymes and co-ordinate regulation. Pyruvate dehydrogenase complex and the regulation of this enzyme through reversible covalent modification. The citricacid cycle and regulation. The pentose phosphate pathway. Metabolism of glycogen and regulation.

Unit III

Lipid metabolism: Lipogenesis-Control of acetyl CoA carboxylase-Role of hormones-Effect of diet on fatty acid biosynthesis. Regulation of biosynthesis of triacylglycerol, phospholipids and cholesterol. Metabolism of triacylglycerol during stress. α, β,γ, Oxidation of fatty acids– Role of carnitine cycle in the regulation of β -oxidation. Ketogenesis and its control. Lipoprotein metabolism exogenous and endogenous pathways.

Unit IV

Metabolism of amino acids, purines and pyrimidines: Overview of biosynthesis of nonessential amino acids. Catabolism of amino acid– transamination, deamination, ammonia formation, the urea cycle and regulation of ureogenesis. Importance of glutamate dehydrogenase. Overview of Catabolism of carbon skeletons of amino acids. Metabolism of purines- de novo and salvage pathways for purine biosynthesis-Purine catabolic pathway. Metabolism of pyrimidines -biosynthesis and catabolism. Regulation of biosynthesis of nucleotides.

Unit V

Metabolic integration and hormonal regulation: Key junctions in metabolism– glucose-6-phosphate, pyruvate and acetyl CoA. Metabolic

profiles of brain, muscle, liver, kidney and adipose tissue. Metabolic interrelationships in various nutritional and hormonal states– obesity, aerobic, anaerobic endurance, exercise, pregnancy, lactation, IDDM, NIDDM and starvation.

Reference Books

1. Biochemistry- Stryer, Freeman. 5th ed, 2002.
2. Harper's Biochemistry- Murray, 29th ed. Mc. GrawHill, 2011.
3. Principles of Biochemistry. 7th ed, Nelson Cox. Lehninger's McMillan Worth, 2013.
4. Biochemistry- Donald Voet, J.G. Voet, John Wiley, J O H N WI VP & Publisher Kaye Pace
5. Biochemistry- 2nd ed- Kuchel and Ralston. Schaum's Outlines McGraw Hill, 1998.
6. Biochemistry NMS.4th ed- Davidson and Sittman. Lippincott.Willams and Wilkins, 1999.
7. Biochemistry 4th ed- Campbell and Farrell, Brooks/Cole Pub Co. 2002.
8. Metabolic Regulation-Keith N. Frayn, 2009.

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MOLECULAR BIOLOGY

Objectives:

1. To understand the basic structure and functioning of the genetic materials - DNA.
2. To emphasize the molecular mechanism of DNA replication, repair, transcription, protein synthesis and gene regulation in various organisms.

Unit I

Eukaryotic and Prokaryotic chromosomes: Structure of prokaryotic Chromosomes Structure of eukaryotic chromosomal DNA, banding pattern, c-value, complexity heterochromatin, centromere, nuclear organizer, telomeres, Kinetic complexity of DNA, cot curve, and classes of DNA sequences. Histones, Non-histone proteins, and their properties, structure of nucleosome, role of histones in chromatin folding, concept of gene.

Unit II

Replication: Review of replication in bacteria, plasmid and viruses, Models of DNA replication.DNA replication in prokaryotes and eukaryotes. Eukaryotic DNA polymerases and their roles, origin of replication, Autonomously Replicating Segments (ARS) in yeast, elongation, lagging strand synthesis, and termination.

Recombination: DNA recombination: Homologous, site specific and transposition, Homologous recombination: Holliday Model, Messelsson - Radding Model, Rec BCD pathway. Site specific recombination: Lambda phage integration, and excision rearrangement, of immunoglobulin genes. Transposition: Prokaryotic transposition, conservative and replicative transposition. Eukaryotic transposable elements, yeast and Drosophila transposons.

Unit- III

Transcription: Review of prokaryotic transcription, transcription in eukaryotes: Eukaryotic RNA polymerases and their subunit structure, Class I, II and III promoters, upstream elements, enhancers and silencers, General transcription factors, Class I, II, III genes and their functions, elongation factors, TBP structure and its role in transcription, mediators. Structure of transcription activators, zinc fingers, homeodomains, helix loop helix, bZIP, beta barrels, Post transcriptional modification.

Unit - IV

Translation: genetic code and its features. Wobble hypothesis. Translation machinery, initiation, elongation and termination of translation in prokaryotes and eukaryotes. Translational proof reading, translational

inhibitors, post-translational modifications, chaperones and protein targeting- translocation, heat shock proteins, glycosylation; SNAPs and SNAREs. Bacterial signal sequences. Mitochondrial, chloroplast and nuclear protein transport. Endocytosis - viral entry. Ubiquitin TAG protein destruction.

Unit - V

Chromosomal changes and consequences: Changes in the chromosome number and chromosome structure and its related genetic disorders. Mutation: definition, chemical basis and types. Types of mutagens. Mutant types - lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis. DNA repair mechanism: thymine dimer, light activation, excision, recombinational, SOS and mismatch repair. Cancer Biology: genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

Reference Books:

1. The Cell- A Molecular Approach Geoffrey Cooper, Robert E Harsman, 3rd ed ASM Press 2004.
2. Molecular Cell Biology, Lodish et.al. 5th ed., WH Freeman & Company 2003.
3. Cell and Molecular Biology De Robertis and De Robertis.. 8th ed Wolters Kluwer India Pvt Ltd 2001
4. Molecular Biology of the Cell Alberts et al 4th ed. Garland Science Inc. 2002.
5. David Freifelder, 2008. Molecular Biology. (Ed: 2). Narosa Publications, New Delhi.
6. Cell and Molecular Biology, Gerald Karp, 4th ed John Wiley & Sons, Inc, New York 2004.
7. Text book of Principles of Molecular Biology- Cram, 2015.

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CORE PRACTICAL II

MOLECULAR AND MICROBIAL TECHNIQUES

Objectives:

To introduce students to various practical aspects of Molecular biology.

Practical:

1. Isolation of plasmid & Genomic DNA
2. Estimation of DNA by diphenylamine method
3. Estimation of RNA by orcinol method
4. Separation of DNA by Agarose Gel Electrophoresis
5. Separation of protein by SDS-PAGE
6. Purification of enzyme by ammonium sulphate precipitation Microbial Techniques
7. Staining technique - Grams staining
8. Determination of bacterial growth curve
9. Media preparation and Culture techniques - pour plate, spread plate and streak plate method
10. Antibiotic Resistance
11. Biochemical Characterization of Bacteria

1. Indole test
2. Methyl Red test
3. Triple Sugar Iron Agar test
4. Voges Proskauer test
5. Citrate Utilization test
6. Catalase test
7. Urease test
8. Oxidase test
9. Nitrate test

Reference Books]

1. Manuals in Biochemistry – Dr. J. Jayaraman, New Age International Pub, 2000.
2. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000
3. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub, 2000.
4. Laboratory manual in Biochemistry T.N.Pattabiraman. All India publishers, 1998.
5. Lab Manual in General Microbiology - N Kannan, Palaniappa Brothers, 2000.
6. Lab Manual in Microbiology - Dr P Gunasekaran, New Age International Pub, 2000.

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ELECTIVE I

BIOSTATISTICS

Objectives:

1. The course emphasizes on various statistical methods and its significance.
2. The students are expected to understand the concepts and solve relevant problems pertaining to each topic.
3. To provide sufficient background to be able to interpret statistical results in research.

Unit I

Statistical survey – Organizing, planning and executing the survey. Source of data - Primary and secondary data, collection, observation, interview, enquiry forms, questionnaire schedule and check list. Classification and tabulation of data. Diagrammatic and graphic presentation of data.

Unit II

Measures of central tendency - arithmetic mean, median, mode, quartiles, deciles and percentiles. Measures of variation - range, quartile deviation, mean deviation, standard deviation, Coefficient of variation. Correlation analysis - Scatter diagram, Karl's Pearson's coefficient of correlation and Spearman's rank method. Regression analysis.

Unit III

Probability - Definition, concepts, theorems (proof of the theorems not necessary) and calculations of probability - Simple problems. Theoretical distributions – Binomial, Poisson and normal distribution - Simple problems (proof of the theorems not necessary).

Unit IV

Sampling distribution and test of significance – Concepts of sampling, Testing of hypothesis, errors in hypothesis testing, standard error and sampling distribution, sampling of variables (large samples and small samples.). Student's "t" distribution and its applications. Chi-square test and goodness of fit. Analysis of variance - one way and two way classification. Duncan's Multiple Range test. Design of experiment- Completely randomized block design, Randomized block design.

Unit V

Scientific Methodology: Selection of research problems – hypothesis – definition and characteristics. Experimental approaches – biological, physical and chemical methods. Sources of information: Journals, e-journals, books, biological abstracts, Preparation of index cards, Review writing, Article writing – structure of article. Selection of journals for publication- Impact factor – Citation index and H index. Proposal writing for funding.IPR and Patenting – Concept and types.

Reference Books:

1. Statistical Methods, 4th Edition- Gupta, S.P, Sultan Chand & Son Publishers. 2012.
2. Biostatistical Analysis, 5th Edition- Zar, J.H, Pearson Education, 2010.
3. Biostatistics - Daniel, W.W. A Foundation for Analysis in Health Sciences, 10th Edition, John Wiley and Sons, Inc.,1999.

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ELECTIVE II

MICROBIOLOGY

Aim: To provide wide knowledge on general microbiology

Objectives:

To understand the metabolic reaction occurs in the microbial cells, it helps the student to gain basic information about microbiology.

Unit I

Morphology and Ultra structure: Ultra structure of bacteria, fungi, algae and protozoa. Classification of microbes, molecular taxonomy. Cell walls of eubacteria (peptidoglycan) and related molecules. Outer membrane of Gram– negative bacteria. Cell wall and cell membrane synthesis, flagella and motility, cell inclusions like endospores, gas vesicles. Purple and green bacteria, cyanobacteria, homoacetogenic bacteria, Acetic acid bacteria, Budding and appendaged bacteria, spirilla, spirochaetes, Gliding and sheathed bacteria, Pseudomonads, Lactic and propionic acid bacteria. Endospore forming rods and cocci, Mycobacteria, Rickettsia and Mycoplasma. Archaebacteria.

Unit II

Microbial growth and metabolism: Microbial growth– definition. Mathematical expression of growth, growth curve, measurement of growth and growth yields, synchronous growth, continuous culture, factors affecting growth. Microbial metabolism– overview. Photosynthesis in microbes.Role of chlorophylls, carotenoids and phycobilins, Calvin cycle. Chemolithotrophy; Hydrogen– iron– nitrite oxidising bacteria; nitrate and sulfate reduction; methanogenesis and acetogenesis, fermentations– diversity, syntrophy-role of anoxic decompositions. Nitrogen metabolism, nitrogen fixation, hydrocarbon transformation.

Unit III

Microbiological Techniques: Methods in microbiology. Current methods in microbial identification. Pure culture techniques. Theory and practice of sterilization. Principles of microbial nutrition, construction of culture media, Enrichment culture techniques for isolation of chemoautotrophs, chemoheterotrophs and photosynthetic microbes.

Unit IV

Viruses: Bacterial, plant, animal and tumor viruses. Classification and structure of viruses. Lytic cycle and lysogeny. DNA viruses; positive and negative strand, Double stranded RNA viruses. Replication; example of Herpes, pox, adenoviruses, Retroviruses. Viroids and prions.

Unit V

Medical Microbiology: Disease reservoirs; Epidemiological terminologies. Infectious disease transmissions. Respiratory infections caused by bacteria and viruses; Tuberculosis, sexually transmitted diseases including AIDS; Vector borne diseases, water borne diseases. Public health and water quality. Pathogenic fungi. Antimicrobial agents, Antibiotics. Penicillins and cephalosporins, Broad spectrum antibiotics. Antibiotics from Prokaryotes, Antifungal antibiotics– Mode of action, Resistance to antibiotics. Lantibiotics.

Reference Books

1. Brock Biology of microorganisms- Madigan, 10th ed. Prentice Hall, 2002.
2. Microbiology 4th ed- Davis, Lippincott Williams and Wilkins, 1989.
3. Microbiology - Joklik, Zinsser's Mc Graw-Hill Professional, 1995.
4. Microbiology 5th ed- Pelczar, Mc Graw Hill, 2000.
5. General Microbiology 5th ed- Stainer Ry, Prentice Hall 1986.
6. Medical Microbiology- Brooks, Jawetz, Melnick and Adelberg's Lange Med, 1998.
7. Textbook of Microbiology & Immunology: Edition- Subhash Chandra Parija et al. 2014.
8. Medical Microbiology: 7th -Patrick R. Murray 2012.

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CORE COURSE VII

IMMUNOLOGY

Objectives:

To understand about immune response and immunological techniques

Unit I

Elements of Immunology. Types of immunity- innate and acquired. Humoral and cell mediated immunity. Central and peripheral lymphoid organs- Thymus, bone marrow, spleen, lymph nodes and other peripheral lymphoid tissues- GALT. Cells of the immune system- lymphocytes, mononuclear phagocytes- dendritic cells, granulocytes, NK cells and mast cells, cytokines.

Antigens vs immunogens – types – determinants – Haptens - Factors influencing immunogenicity. Immunoglobulins structure, classification and functions. Isotypes, allotypes and idiotypes.

Unit II

Complement activation and its biological consequences. Theories of Antibody formation. – Factors influencing antibody production – Genetic basis of antibody diversity.

T-cell, B-cell receptors, Antigen recognition- processing and presentation to T-cells. Interaction of T and B cells. Immunological memory. Effector mechanisms- macrophage activation. Cell mediated cytotoxicity, immunotolerance, immunosuppression.

Unit III

MHC genes and products. Polymorphism of MHC genes, role of MHC antigens in immune response, MHC antigens in transplantation. Transplantation types. Immune responses to infectious diseases- Viral, bacterial and protozoal. Tumor antigens-immune response to tumor antigens-immunotherapy. AIDS and other immunodeficiency disorders. Autoimmunity - Autoimmune diseases – pathogenesis - treatment. Hypersensitivity - types & Mechanism.

Unit IV

Immunization practices- active and passive immunization. Vaccines- killed, attenuated- toxoids. Recombinant vector vaccines- DNA vaccines, synthetic peptide vaccines- anti idiotype vaccines. Hybridomas - production of polyclonal and monoclonal antibodies. Principles, techniques and application. Genetically engineered antibodies.

Fractionation of leucocytes by density gradient centrifugation. Identification of lymphocytes and their subsets in blood. Leukocyte migration inhibition technique. Delayed type hypersensitivity technique.

Unit V
Agglutination and precipitation: Techniques - Immuno-electrophoresis, RIA, immunoblotting assay, Avidin- biotin mediated immuno assay. Immunohistochemistry- immunofluorescence, immunoferritin technique. Cytokines assay: ELISA and ELISPOT, Abzymes.

Experimental animal models: inbred strains, SCID mice, nude mice, knockout mice cell culture system: Primary lymphoid culture cloned lymphoid cell lines.

Reference Books

1. Essential Immunology, 10th ed - Roitt's, Blackwell Sci, 2001.
2. Immunology, 4th ed- Kuby, Richard A, Goldsby et al. WH Freeman & Co. 2003.
3. Cellular and Molecular Immunology- Abbas, W.B. Saunders Company, 2000.
4. Immunobiology- 5th ed Janeway, C. (Ed), Paul Travers. Garland Publ. 2001.
5. Immunology- Eli Benjamini AU, A short course. 4th ed. Wiley-Liss, 2000.
6. NMS Series in Immunology- 3rd ed, Lippincott Williams & Wilkins.
7. Fundamentals of immunology- Bier, Springer Verlag, 1986.
8. Cellular and Molecular Immunology: 7th Edition, Abul K, 2011.

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CORE COURSE VIII

CLINICAL BIOCHEMISTRY

Objectives:

1. To impart thorough knowledge about the biochemical basis of various diseases and disorders.
2. To study various diagnostic and therapeutic methodologies available for diseases and disorders.

Unit I

Disorder of carbohydrate and lipid metabolism Disorders of carbohydrate metabolism– glycogen storage diseases, galactosemia, fructose intolerance and fructosuria. Blood sugar homeostasis: Role of tissues and hormones in the maintenance of blood sugar. Hypoglycemia, hyperglycemia, glycosuria. Diabetes mellitus – classification, metabolic abnormalities, diagnosis and management. Disorders of lipid metabolism – lipoproteinaemias. Lipid storage diseases – Gaucher's, Tay Sach's Niemann Pick disease. Fatty liver. Atherosclerosis.

Unit II

Disorders of amino acid and nucleic acid metabolism Disorders of amino acid metabolism– amino aciduria, Phenylketonuria, Hartnup disease, alkaptonuria, albinism, cystinuria, cystinosis, homocystinuria and maple syrup urine disease. Disorders of purine, pyrimidine metabolism: Hyperuricemia and gout. Hypouricemia. Orotic aciduria. Serology: C reactive protein test, Rheumatoid arthritis (RA) test.

Unit III

Liver function test and gastric function test Jaundice- Causes, consequences, biochemical findings, treatment in jaundice, hepatitis and cirrhosis. Liver function test. Tests related to excretory (bile pigments) synthetic (plasma proteins, prothrombin time) detoxifying (hippuric acid, NH3, aminopyrine) and metabolic (galactose) functions. Gall stones. Gastric function tests- Stimulation tests – insulin and pentagastrin. Peptic ulcer, gastritis and Zollinger Ellison syndrome.

Unit IV

Renal function test and metabolic disorders: Kidney function- Biochemical findings in glomerulonephritis, renal failure and nephritic syndrome. Nephrolithiasis. Kidney function tests - Glomerular function tests – inulin, urea and creatinine clearance tests, renal plasma flow, plasma microglobulin. Tubular function tests – water load, concentration and acid excretion tests. Abnormal constituents of urine. Clinical enzymology - Serum enzymes and isoenzymes in health and disease – Transaminases (AST, ALT) acid. Alkaline phosphatases, amylase, LDH and CK.

Unit V

Oncology: Cancer cell – morphology and growth characteristics. Biochemical changes in tumor cells. Differences between benign and malignant tumors. Tumor markers – AFP, CEA and HcG Agents causing cancer – radiation, viruses, chemicals. Multistep carcinogenesis – initiation, promotion, progression. Oncogenes and proto- oncogenes – mechanisms of proto-oncogene activation. Tumor suppressor genes – p53.

Reference Books:

1. Clinical Chemistry in diagnosis and treatment, Philip. D. Mayne & Edward Arnold, 6th ed ELBS.1994.
2. Textbook of Clinical Chemistry, 3rd ed- Tietz, WB Saunders, Burtis & Ashwood, 1999.
3. Principles of Internal Medicine. Harrison's Vol 1 & 2, 16th edition Mc Graw Hill.2005.
4. Biochemistry and disease.Cohn and Roth, Williams and Wilkins, 1996.
5. The Metabolic & Molecular Basis of inherited Diseases, Vol 1 - 4 8th ed Serives, Vallersty, Tata McGraw Hill Companies, 2001.
6. Clinical Biochemistry – Metabolic & Clinical Aspects, William J.Marshall, Stephen K.Bansert, Churchill Livingstone, 1995.
7. Clinical Chemistry – Principles, procedures, correlations – Bishop, Lippincott.2000.
8. Textbook of Biochemistry with Clinical Correlation Thomas M Devlin 2nd ed Wiley & Sons. 2006
9. Clinical Biochemistry-Allan GAW Michael J, an Illustrated Colour Text, 5th Edition, 2013.
10. Harper's Biochemistry 25th Edition-Peter A. Mayes (Author), Robert K. Murray, 1999.

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CLINICAL BIOCHEMISTRY

Objectives:

To study the various diagnostic and therapeutic methodologies available for diseases and disorders.

I. Hematological studies

1. Blood Grouping and Rh typing.
2. Estimation of hemoglobin content.
3. Total RBC count.
4. Total WBC count.
5. Determination of clotting time
6. Total platelet count.
7. Determination of Prothrombin time
8. Determination of ESR.

II. Biochemical analysis of urine & blood

Collection, preservation (blood and urine)

1. Estimation of blood glucose
2. Estimation of serum total proteins and A: G ratio
3. Estimation of serum cholesterol
4. Estimation of blood and urine urea
5. Estimation of serum and urine calcium
6. Estimation of serum and urine uric acid
7. Estimation of serum bilirubin.
8. Estimation of serum creatinine
9. Estimation of serum AST / ALT
10. Estimation of serum acid phosphatase / alkaline phosphatase

III. Urology

Urine - Qualitative tests of urine. Abnormal constituents - Reducing sugar-Benedict test, protein: -Heat and acetic acid test, and sulfosalicylic acid method, Ketone bodies-Rothera's test, Bile pigment (Fouchet method), bile salt (Hay's test), Urobilinogen-Ehrlich aldehyde test and Bence Jones protein test.

Reference Books

1. Practical Clinical Biochemistry- Varley's by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition ,1988.
2. Laboratory manual in Biochemistry, T.N.Pattabiraman. All India publishers, 1998.
3. Practical Biochemistry for Students, Varunkumar Malhotra, Jaypee Bros, 1986.
4. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub, 2000.
5. Medical Lab Technology Vol I& II, Kanai L Mukerjee New Delhi: Tata Mcgraw Hill Publishing Company, 1996.
6. Practical Biochemistry – Plummer, New Delhi: Tata Mcgraw Hill Publishing Company, 2000.
7. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005.

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GENETIC ENGINEERING

Objective:

To understand and learn the emergence and early development and application of technology.

UNIT I

Introduction to genetic engineering and rDNA technology, gene cloning, specialized tools and techniques, benefits of gene cloning. Isolation and purification of DNA: Preparation of total Cellular DNA, plasmid DNA, bacteriophage DNA, plant cell DNA, isolation of mRNA from mammalian cells.

UNIT II

Vectors and enzymes in cloning: Cloning and Expression vectors- Plasmids pBR, pUC, phages (M3, λ), yeast vectors, cosmids, phagemids, agrobacterium, PAC, BAC, YAC, MAC, HAC vectors, Plant and Animal viruses as vector, binary and shuttle vectors, expression vectors for prokaryotes and eukaryotes, expression cassettes. Restriction endonucleases, ligases, S1 nuclease, reverse transcriptase, polymerase, alkaline phosphatase, terminal transferase, methods of ligation.

UNIT III

Construction of genomic and cDNA libraries, selection and screening of recombinants, probes- types, synthesis and uses of probes. Blotting techniques (Southern, Northern and Western), PCR- types and applications, Sequencing: DNA and RNA, site directed mutagenesis. Chromosome walking, jumping, DNA finger printing and foot printing.

UNIT IV

Methods of gene transfer: Microinjection, electroporation, particle bombardment gun (biolistic), ultrasonication, liposome mediated and direct transfer. Restriction analysis of DNA, molecular markers- RFLP, RAPD, VNTR, SSR, AFLP, STS, SCAR, SNP. Microarrays. Genomics (human genomic project) and proteomics – types and applications.

UNIT V

Applications of Genetic Engineering: Recombinant insulin, somatotropin, vaccines, role of genetic engineering in diagnosis and cure of diseases, gene therapy, transgenic plants (herbicide resistant, pesticide resistant, and antisense RNA technology and its application). Transgenic animals. IPR, Patenting, Ethical, legal issues and hazards of genetic engineering.

Reference Books:

1. Principles of Gene Manipulation and Genomics, Seventh edition, S.B. Primrose and R.M. Twyman, 2006 Blackwell Publishing, USA.
2. Molecular Biotechnology- Principles and applications of Recombinant DNA, Bernard R. Glick, Jack J. Pasternak, and Cheryl L. Patten. — 4th ed., ASM Press, Washington, DC , USA
3. Gene cloning and DNA analysis : an introduction / T.A. Brown.—6th ed- Brown, T.A. (Terence A.) , Wiley-Blackwell. 2010.
4. Elements of Biotechnology, P.K. Gupta, Rastogi Publications, 2nd edition 3rd reprint, 2015-2016.
5. A text book of Biotechnology, R.C.Dubey, S.Chand Publications, 2014
6. An Introduction to Genetic Engineering, Third Edition, Desmond S. T. Nicholl, Cambridge University Press, USA
7. Genetic Engineering – Basics, New Applications and Responsibilities, Edited by Hugo A. Barrera-Saldaña, Published by InTech, Croatia, 2011.

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ELECTIVE IV

DEVELOPMENTAL BIOLOGY

Objectives:

1. To study the cellular basis of development.
2. To elucidate the early development process of humans.

Unit I

Basic concepts: General concept of organisms development: Potency, commitment, specification, induction, competence, determination & differentiation; morphogenetic gradients; cell fate & cell lineages; genomic equivalence and cytoplasmic determinants; imprinting. General principles of cell-cell communication in development: cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, paracrine factors.

Unit II

Fertilization, development and sex determination in humans: Gametogenesis - Sperm & Egg formation; ultra structure of sperm and ovum, egg types, egg membrane. Fertilization, cleavage, Morula, Implantation, blastulation, gastrulation, formation of germ layers, axis formation - anterior and posterior. Sex determination - chromosomes and environment.

Unit III

Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, amphibia and chick; organogenesis – vulva formation in Caenorhabditis elegans; eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development-larval formation, metamorphosis; environmental regulation of normal development; sex determination.

Unit IV

Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in Arabidopsis and Antirrhinum.

Unit V

Implications of developmental biology: Medical implications of developmental biology - genetic disorders in human development, environmental assaults on human development, Future therapies, Environmental regulation of animal development - Environment as a part of normal development, Polyphenisms, plasticity and Learning.

Reference Books

1. Developmental Biology, (Ed: 9) - Gilbert S.F. Sinauer Associates Inc. Massachusetts, USA, 2010.
2. Developmental Biology, TMH Edition, Berrill N.J, 1974.
3. Animal Regeneration- Diwan A.P., Dhakad N.K., Anmol Publications Ltd, India, 1996.
4. Developmental Biology- Browder L.W., Erickson C.A., and Jeffery W.R, Saunder College Publishing House, Philadelphia, USA, 1991.
5. Genetics, 3rd edition- Strickberger, Prentice Hall of India, 2002.
6. Genes VII- Benjamin Lewin, Oxford University Press, 2000.
7. Genetics- Sarin C, Tata McGraw–Hill Publishing Co., Ltd., New Delhi, 1990.
8. Genetics- Gupta PK, Rastogi Publications, Meerut, India, 1996.
9. Molecular Biology of the Cell, (Ed: 3) - Alberts B, Garland Science, USA, 2002.
10. Evolutionary Developmental Biology (2nd edition) - Brian K. Hall, Kluwer Academic Publishers, 1999.

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ENDOCRINOLOGY

Aim:

To obtain sound knowledge in Hormonal Biochemistry.

Objective:

1. Inculcate through understanding of mechanism of action of Hormones.
2. Clinical endocrinology plays a vital role in clinical Biochemistry and Metabolism.
3. This syllabus substantiate understanding other subject

Unit I

Hypothalamic and pituitary hormones: Hormones – classification, biosynthesis, circulation in blood, modification and degradation. Hormone receptors – structure and regulation. Mechanism of hormone action. Hypothalamic and pituitary hormones. Hypothalamic releasing factors. Anterior pituitary hormones: biological actions, regulation and disorders of growth hormones, ACTH, gonadotrophins and prolactin. Leptin. Posterior pituitary hormones – biological actions and regulation of vasopressin. Diabetes insipidus and SIADHsecretion. Oxytocin. Hypopituitarism.

Unit II

Thyroid and parathyroid hormones: Thyroid hormones – synthesis, secretion, regulation, transport, metabolic fate and biological actions. Antithyroid agents. Thyroid functions tests. Hyper and hypothyroidism. Hormonal regulation of calcium and phosphate metabolism. Secretion and biological actions of PTH, calcitonin and calcitriol. Hypercalcemia and hypocalcemia Rickets and osteomalacia.

Unit III

Adrenal hormones: Adrenal cortical hormones.Synthesis, regulation, transport, metabolism and biological effects. Adrenal function tests. Cushing's syndrome, aldosteronism, congenial adrenal hyperplasia, adrenal cortical insufficiency. Adrenal medullary hormones – synthesis, secretion, metabolism, regulation and biological effects of catecholamines. Phaeochromocytoma.

Unit IV

Gonadal, G.I. and pancreatic hormones: Gonadal hormones: Biosynthesis, regulation, transport, metabolism and biological actions of androgens. Hypogonadism and gynecomastia. Biosynthesis, regulation, transport, metabolism and biological effects of oestrogen and progesterone. The menstrual cycle. Pregnancy – diagnostic tests and biochemical changes.

Foetal monitoring. Amenorrhea. Pancreatic hormones – synthesis, regulation, biological effects and mechanism of action of glucagons, somatostatin and insulin. Insulin receptor. Brief account of gastrointestinal hormones.

Unit V

Signal transduction: Fundamental concepts and definitions of signals, ligands and receptors, endocrine, paracrine and autocrine signaling. Receptors and signaling pathways – cell surface receptors, ion channels, G-protein coupled receptors, receptor kinases (tyr, ser/thr).Signal transduction through cytoplasmic and nuclear receptors. The Ras-raf MAP kinase cascade, second messengers – cyclic nucleotides, lipids and calcium ions. Crosstalk in signaling pathways.

Reference Books:

1. Williams Textbook of Endocrinology – Wilson and Foster 13th ed. 2015.
2. Mechanisms of hormone action – Autind and Short, 1980.
3. Harper's Biochemistry – Murray et al. 26th ed. McGraw Hill, 2003.
4. Principles of Biochemistry – Mammalian Biochemistry, Smith et al. McGraw Hill, 1983.
5. Williams et al, Textbook of Endocrinology, 2015.

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CORE COURSE X
BIOINFORMATICS

Objective:

1. The purpose of studying this paper is to apply computational facility in different fields of life sciences, physical and chemical sciences.
2. After completion, students could learn drug designing through computer based modification programs using synthetic or natural source.
3. Most important application of Bioinformatics is in the field of drug discovery where it reduces more than 60% of the time, money and labor.

Unit I

Bioinformatics – An overview, Definition & History; Bioinformatics databases & tools on the Internet- NCBI, EBI, PIR, Swiss-Prot, GenBank; pattern and motif searches- BLOCKS, PRINTS, PFAM

Unit II

Proteins – Amino acids — Levels of protein structure – Ramachandran Map. Protein Secondary structure prediction - Chou-Fasmann rules, Gamier-Osguthorpe-Robson (GOR) methods; Predicting 3D structure – homology modeling, threading - fold recognition and ab initio methods - Rosetta – CASP.

Unit III

Biological Sequence analysis – Pairwise sequence comparison – Sequence queries against biological databases – BLAST and FASTA - Multiple sequence alignments – Phylogenetic alignment.

Algorithms and Matrices: Scoring matrices- PAM and BLOSUM; dynamic programming Algorithms, Needleman and Wunsch, Smith-Waterman;

Unit IV

Protein structure visualization tools – RasMol, HEX, Argus Lab Swiss PDB Viewer - Structure –Classification, alignment and analysis – SCOP, CATH, FSSP, UNIX.

Unit V

Functional Genomics (Metabolism and Regulation) in Biochemistry – Sequencing genomes– Genome databases on the web, Prokaryotic Genome Database with comparison with Human genome, HGP, GENECLUSTER, DNA Microarray, SWISS-2DPAGE Database, TIGR,WIT, CYTOSCAPE and DRUG DISCOVERY.

Reference Books

1. Bioinformatics-Sequence and Genome Analysis- David W.Mount, Cold Spring Harbor Laboratory Press (2004).
2. Introduction to Bioinformatics, Attwood, T.K. and D.J. Parry-Smith, Pearson Education Ltd., New Delhi (2004).
3. Bioinformatics – Westhead, D.R., Paris J.H. And R.M. Twyman, Instant Notes: Viva Books Private Ltd, New Delhi (2003).
4. Introduction to Bioinformatics, Arthur M. Lesk, Oxford University Press, New Delhi (2003).
5. Bioinformatics- Sequence, structure and databanks, Higgins D. and W. Taylor (Eds), Oxford University Press, New Delhi (2000).
6. Bioinformatics; A practical Guide to the Analysis of Genes and Proteins, Wiley-Interscience, Baxevanis, A. and B.F. Ouellette , Hoboken, NJ (1998).
7. Introduction to computational Biology, Michael, S. Waterman, Chapman & Hall, (1995).

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CORE PRACTICAL IV

PHYTOCHEMISTRY, SOIL ANALYSIS AND IMMUNOLOGICAL

Objectives:

1. To learn the strategies of biochemical research.
2. To provide ample opportunity for the students to specialize in basic and advanced methods used in investigation focusing on biology applications.

Practical:

1. Qualitative and quantitative phytochemical analysis - alkaloids, flavanoids, steroids, tannins, Saponins
2. Antibacterial activity by disc diffusion method
3. *In vitro* antioxidant activity – any two methods
4. Estimation of soil mineral contents-pH, nitrate, nitrite, sulphate, phosphate, calcium, magnesium, chloride, fluoride, silica and ammonia

Immunology

1. Laboratory safety precautions and good laboratory practices
2. Haemagglutination titration
3. Widal test - rapid slide test for typhoid
4. VDRL test - test for syphilis
5. Latex agglutination test for rheumatoid factor and Pregnancy
6. Immunoelectrophoresis
7. Skin Prick Test.

Reference Books:

1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001.
2. Manuals in Biochemistry – Dr. J. Jayaraman, New Age International Pub, 2000.
3. Practical Biochemistry – Plummer, New Delhi: Tata Mcgraw Hill Publishing Company, 2000.
4. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005.
5. Biochemical methods – S.Sadasivam, New Age International Pub, 2000.
6. Microbiology Lab Manual - John P. Harley 7th edition McGraw Hill Medical Publication division.2007.
7. Diagnostic Enzymology – D.Hawcroft, John Wiley & sons, 1987.
8. Lab Manual in General Microbiology - N Kannan, Palaniappa Brothers, 2000.
9. Lab Manual in Microbiology - Dr P Gunasekaran, New Age International Pub, 2000.

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ELECTIVE COURSE V

ECOLOGY AND ENVIRONMENTAL SCIENCES

Objectives:

To study the physical and biological characters of the environment and the inter-relationship between biotic and abiotic components of nature as well as relationship among the individuals of the biotic components

Unit I

Environment – Physical environment: atmosphere (air), hydrosphere, lithosphere properties, interelationship with living organisms. Abiotic and biotic environment and their interactions. Species interactions; types, interspecific competition, herbivory, carnivory, pollination, symbiosis. Population ecology – Population characteristics, population growth curve, population regulation, life history strategies (r and K selection); concept of meta population demes and dispersal, interdemic extinctions, age structured populations.

Unit II

Community ecology: Nature of communities, community structure and attributes, levels of species diversity and its measurement, edges and ecotones. Concept of habitat and niche, types of niche, niche width and overlap, fundamental and realized niche, resource partitioning, character displacement.

Unit III

Ecological succession and Ecosystem Ecology: Ecological succession types, mechanisms, changes involved in succession, concept of climax. Ecosystem structure, function, energy flow and mineral cycling (C, N, P, S), primary production and decomposition, structure and function of terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine) ecosystem.

Unit IV

Pollution: Environmental pollution, global environmental change, biodiversity; status, monitoring and documentation, major drivers of biodiversity change, biodiversity management approaches.

Unit V

Biogeography and Conservation Biology ; Major terrestrial biomes, theory of island biogeography, biogeographically zones of India. Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

Reference books

1. Cell Biology, Genetics, Molecular Biology, Evolution And Ecology, P.S. Verma and V.K.Agarwal, S. Chand Company Ltd 2005.
2. Ecology and Environmental Biology, T.K.Saha, Books and Allied (P) Ltd, Kolkata 2011.
3. Modern concepts of Ecology, H.D.Kumar, 8th ed, Vikas Publishing House Pvt Ltd, 2008.
4. Fundamentals of Environment Biology, Dr. Biswarup Mukherjee, Silverline publications, 2008.
5. A Hand Book of Environmental Science, S S Negi, 2008.
6. A Text Book of Environmental Pollution, P.Panday, 2010.
7. A Text Book of Environmental Science, V. Thakur, 2012.
8. A Textbook of Environmental Science, Prabhat Patnaik, 2011.
9. A Textbook of Ecology, S.K. Dubey, 2012.

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M.Sc. Bioinformatics
(Two Year Programme)

(2018 - 2019 Batch onwards)

DEPARTMENT OF BIOINFORMATICS

SCHOOL OF LIFE SCIENCES

BHARATHIDASAN UNIVERSITY

TIRUCHIRAPPALLI - 620 024

FIRST YEAR – I SEMESTER

CODE	NATURE	COURSE	L	P	C	Pre Req	Co Req
MSCBI011	CORE	Cell Biology and Biodiversity	4	-	4	14	24
MSCBI012	CORE	Bioinformatics Resources and Applications	4	-	4	16	26
MSCBI013	CORE	Computer Programming - I	4	-	4	25	
MSCBI014	CORE	Molecular Biology and Genetic Engineering	4	-	4	43	
MSCBI015	LAB	Practical – XIII : Computer Programming - I Lab	-	6	4		
MSCBI016	LAB	Practical – XIV : Bioinformatics Resources and Applications Lab	-	6	4		
		Total	**16**	**12**	**24**		

CELL BIOLOGY AND BIODIVERSITY

COURSE CODE: MSCBI011/MSFBI071   CREDIT: 4

COURSE OBJECTIVES

- To understand the basic concept of cell organelles structure, function, cell growth, metabolism and diseases
- To learn the Concepts and theories of Organic evolution – Mechanisms producing genetic diversity Origin of species.

UNIT -I BIOLOGY OF CELLS

Prokaryotic and Eukaryotic cells – Cell organelles and its functions – Differences and similarities in plant and animal cells – Cell surface and Cellular interactions – Cell membrane and Permeability: Membrane organization – Membrane proteins – Transport across the plasma membrane – Mechanisms of transport in animals and in vascular plants – Cell Cycle and Cell division (mitosis & meiosis).

UNIT- II BIOLOGICAL THERMODYNAMICS

Active sites and structure of an Enzyme – Mechanism of an enzyme action – Cell energetics and respiration: Energy, life's driving force, energy capture – photosynthesis, role of ATP in energy cycle - Fats and protein as alternate energy sources. Key Biomolecules – lipids, polysaccharides, proteins, and nucleic acids – chemical bonds in biomolecules

UNIT- III OVERVIEW OF PROTEIN AND NUCLEIC ACID STRUCTURE

Cell signaling – Signaling pathways- TGF Receptors and the Direct Activation of Smads, Cytokine Receptors and the JAK-STAT Pathway, Receptor Tyrosine Kinases and Activation of Ras Programmed cell death types, MAP Kinase Pathways, Phosphoinositides As Signal Transducers from RTKs and Cytokine Receptors, Pathways That Involve Signal-Induced Protein Cleavage. Cell death and its regulation – apoptosis. Analysis of cell death images – SEM & TEM images.

UNIT - IV EVOLUTION

Concepts and theories of Organic evolution – Mechanisms producing genetic diversity – Origin of species – Hardy-Weinberg equilibrium – Adaptive radiation – Patterns of evolution. Biodiversity: Genetic, Species and Ecosystem diversity – Values and Uses of Biodiversity – Conservation of Biodiversity – Databases on Biodiversity – Biodiversity and Biotechnology.

UNIT -V BIOLOGY OF ENVIRONMENT

Basic ecological principles – Dynamics of an ecosystem – Energy flow in an ecosystem – Community ecology – Human impact on resources and ecosystems – Environmental pollution – Population ecology – Co evolution - Importance of biodiversity in homeostasis of an ecosystem.

UNITVI Current Contours: (For Continuous Internal Assessment only)

Spermatogenesis, oogenesis and fertilization- cleavage – development – organogenesis-making synthetic cells, cell biology of bacteria, prions, *RNA gene regulation*, kinases, large-scale analysis and/or *bioinformatics*, and *innovative* studies/techniques in cell biology.

MATERIALS FOR STUDY AND REFERENCE

1. E.D.P. De Robertis and E.M.F. De Robertis, Jr., Cell and Molecular Biology, 8th Edition, B.I. Waverly Pvt Ltd, New Delhi, 1996.
2. Robert H.Tamarin, Principle of Genetics, The McGraw Hill Companies, Inc., 1999.
3. Mukherji, S. and Ghosh, A.K., Plant Physiology, Tata McGraw Hill Publishing Company Limited, New Delhi, 1996.
4. Donald T. Haynie, Biological Thermodynamics, Cambridge University Press, 2001.
5. J. M. Berg, J. L. Tymoczko and L. Stryer, Biochemistry, 5th Edition, W. H. Freeman & Co. New York (2002).
6. J.L. Jain, Fundamentals of Biochemistry, S. Chand & Company LTD, 1999.
7. Krishnamurthy K.V., An Advanced Textbook on Biodiversity – Principles and Practice, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 2003.
8. Jha, A.P. Genes and Evolution, Macmillan India Ltd, 1993.
9. Sharma, P.D., Elements of Ecology, Rastogi Publications, Meerut, 1989.
10. Odum, E.P., Fundamentals of Ecology. W.B.Saunders Company, Philadelphia, 1971.
11. J.L. Chapmann & M.J.Reiss, Ecology- Principles and Applications, Cambridge University Press, 1999.
12. Harvey Lodish, Molecular Cell Biology –5th Edition

WEB RESOURCE LINKS

➢ www.cellbio.com
➢ www.molbiolcell.org
➢ www.nature.com/molcellbio/index.html
➢ www.biology-questions-and-answers.com/cell-biology-review.html
➢ www.johnkyrk.com

COURSE OUTCOMES

After completion of this course student would be able to

➢ Understand the facts on the functions of cell organelles.
➢ Know the details on the process of cell division.
➢ Comprehend the mechanism of enzyme action and influencing factors.
➢ Appreciate the various types of chemical bonds seen in bio molecules.
➢ Familiar with the facts about JAK - STAT pathway.
➢ Study the aspects of the origin of species.
➢ Be aware of the features of JAK-STAT Pathway.
➢ Learn the impact of human on resources and ecosystems.

BIOINFORMATICS RESOURCES AND APPLICATIONS

COURSE CODE: MSCBI012/MSFBI072   CREDIT: 4

 COURSE OBJECTIVES

➢ To learn about the bioinformatics databases, databanks, data format and data retrieval from the online sources.
➢ To make students understand the essential features of the interdisciplinary field of science for better understanding biological data.
➢ To provide the student with a strong foundation for performing further research in bioinformatics.

UNIT- I BIOINFORMATICS AN OVERVIEW
History of Bioinformatics – Goal of bioinformatics as a separate discipline – Emerging branches of Bioinformatics: Genomics, Proteomics, Systems Biology, Chemoinformatics –Accessing Bioinformatics resources/databases – NCBI PubMed, EBI, EMBL and ExPASy – Applications and Limitations of Bioinformatics.

UNIT- II BIOLOGICAL SEQUENCE AND STRUCTURE FILE FORMATS
Genbank, Fasta and Swiss-Prot formats – Sequence Databases : Nucleotide Sequence Databases – GenBank, EMBL, DDBJ – Protein Sequence Databases – SWISS-PROT, TrEMBL, UniProt PIR – ExPASy tools: ProtParam – Genome Databases – GOLD, TIGR – Derived Databases – Prosite, PRODOM, Pfam, PRINTS, CATH, SCOP, DALI – Structure databases – PDB, MMDB, MDL MOL – Protein Structure Visualization Tools: RasMol, Swiss PDB Viewer.

UNIT -III SEQUENCE ANALYSIS
Sequence analysis of biological data – models for sequence analysis and their biological motivation – Basic concepts of sequence similarity, identity and homology – Definitions of homologues, orthologues and paralogues – Sequence Alignment: Dot matrix – Scoring matrices: PAM and BLOSUM Substitution matrices – Alignment scores and gap penalties – Pairwise Sequence Alignments: Local and Global alignment using LALIGN – Database searching tools– BLAST and FASTA algorithms – Various versions of basic BLAST and FASTA.

UNIT -IV MULTIPLE SEQUENCE ALIGNMENTS
Basic concepts of various approaches for MSA – progressive, hierarchical – CLUSTALW and TCOFEE and their application for sequence analysis - Phylogeny: Concept of dendrograms and its interpretation – Phylogenetic analysis – Maximum Parsimony and UPGMA methods – Phylogenetic trees – Rooted and unrooted trees – Phylogeny programs: PHYLIP, PAUP, MEGA.

UNIT -V GENOMIC DATABASES
GOLD, GDB – Microbial Genome Databases – IMG/M: Integrated Microbial Genomes & Microbiomes - NCBI Genome Databases – Mapviewer – Gene Finding Tools – prokaryotic and eukaryotic tools – Genescan, GLIMMER and MUMMER – Metabolic pathway databases – KEGG – Microarray databases – Informatics solutions for genomics, proteomics, metabolomics and interactomics.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Advanced Genome Analysis Techniques - Comparative Genome Analysis - Open Problems about Evolution and Phylogeny - Open Problems about Protein Structure and Function

MATERIALS FOR STUDY AND REFERENCE

1. Arthur M. Lesk, Introduction to Bioinformatics, Oxford University Press, New Delhi, 2003.
2. David W. Mount, Bioinformatics – Sequence and Genome analysis, Cold Spring Harbor Laboratory Press, New York, 2001.
3. G. Gibson & S.V.Muse, A Primer of Genome Science, Sinauer Associates, Inc. Publishers, 2002.
4. A. Baxevanis and B.F. Ouellette. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, Wiley- Interscience, Hoboken, NJ, 2005.
5. A. M.Campbell & L. J. Heyer, Discovering Genomics, Proteomics & Bioinformatics, CSHL Press, 2003.

WEB RESOURCE LINKS

➢ www.Bioinformatics.org
➢ www.bioinfo.mbb.yale.edu/mbb452a/intro/
➢ www.biology.ucsd.edu/others/dsmith/Bioinformatics.html

COURSE OUTCOMES

After completion of this course student would be able to

➢ Realize an overview of bioinformatics and applications.
➢ Understand the details about nucleotide sequence databases.
➢ Know the details about the BLAST tool.
➢ Describe the facts about metabolic pathway databases.
➢ Grasp the aspects of the NCBI map viewer.
➢ Study the features of Rooted and Unrooted phylogenetic trees.
➢ Be aware of the facts of pair wise sequence alignments.
➢ Learn the details about the structure databases.

COMPUTER PROGRAMMING – I

COURSE CODE: MSCBI013 /MSFBI073   CREDIT: 4

COURSE OBJECTIVES

- ➢ To learn the character sets, data types, statements, functions, structure, input/output operations, pointers and files
- ➢ To understand the fundamental programming concepts and methodologies which are essential to building good C/C++ programs, HTML, DHTML and XML

UNIT -I FUNDAMENTAL OF COMPUTING AND PROGRAMMING
Introduction to Computers – Need for Programming in Life Sciences – Characteristics, Evolution, Generations and Classification of Computers – Basic Computer organization Computer Software – Internet – Browsers, Search engines – Email – Internet resources for Life Sciences – Web page design tools - HTML, DHTML and XML – Introduction to operating Systems - Windows Commands, UNIX / Linux - basic commands – Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudocode

UNIT-II BASICS AND CONTROL STRUCTURES IN C
Introduction to C - Identifiers and Keywords - Constants, Variables and Data types - Operators and expressions - Data Input and Output – Control Structures - *if* and *switch* statements - *while*, *do-while* and *for* statements – *goto* statement - Arrays – Character strings - Simple programs.

UNIT- III FUNCTIONS, STRUCTURES AND FILE I/O IN C
User defined Functions in C - Defining and accessing functions - Passing arguments - Function prototypes - Recursion – Storage classes – Pointer Declarations - Passing pointers to functions - Pointers and arrays - Operations on pointers - Dynamic memory allocation – User defined data types in C - Structures - Declaring structures and Accessing members - Array of structures – Unions – File operations - open, close, reading and writing - Preprocessor directives - Macros - Command line arguments - Simple programs.

UNIT -IV BASICS OF OOPS AND C++
Object Oriented Programming (OOP) – Introduction – Basic concepts – Classes, Objects, Data abstraction and encapsulation – Inheritance – Polymorphism – Dynamic Binding and Message Passing – Object oriented Languages – Applications – Introduction to C++ – History – Applications – Procedure-Oriented Programming – Structure of C++ Program – Tokens, expressions, keywords, Identifiers, constants, Operators, Data types – Standard input and output statements - Declaration of variables.

UNIT- V CONTROL STRUCTURES, CLASS AND OBJECT IN C
Branching statements – *if* and *switch* statements– looping statements – *while*, *do-while* and *for* statements – *goto* statement – sample programs – Functions, Function prototype – Inline Functions – Default arguments – Function overloading – Sample Programs – Creating a class – Defining member functions – Creating objects – Accessing class members – Arrays within a class – Arrays of objects – Friend function – Local classes – Simple programs – Comparison between C and C++.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Data Warehouse & Data Mining - Security And Attacks - Machine Learning - Dynamic linking-most notably dlm_open and friends-Signals, forking and interprocess communication-Threading, and related advanced concepts such as thread local storage

MATERIALS FOR STUDY AND REFERENCE

1. Peter Norton, Introduction to Computers 6th Edition, Tata McGraw-Hill Pub. Co.Ltd., New Delhi, 2006.
2. Pradip Dey, Manas Ghoush, Computer Fundamentals and Programming in C, Oxford University Press, New Delhi, 2006.
3. Sumitabha Das, UNIX Concepts and Applications, 3rd Edition, Tata McGraw-Hill, New Delhi, 2003.
4. E.Balagurusamy, Programming in ANSI C, 4th Edition, Tata McGraw-Hill Publishing Company Limited, 2002.
5. Byron S. Gottfried, Schaum's outline of Theory and Problems of Programming with C, Tata McGraw-Hill, New Delhi, 1991.
6. Brain W. Kernighan and Dennis. M. Ritchie, The C Programming Language, 2nd Edition, Prentice-Hall of India, 1988.
7. S.Parthasarathy, Essentials of Computer Programming in C for Life Sciences, 2nd Edition, Ane Books, New Delhi, 2011.
8. E. Balaguruswamy, Object Oriented Programming with C++, 3rd Edition, Tata Mc- Graw Hill Publications, New Delhi, 2004.
9. Robert Lafore, Object Oriented Programming in C++, 4th Edition, Galgotia Publications, New Delhi, 2002.

WEB RESOURCE LINKS

➢ http://www.dmoz.org/Computers/Security/Malicious_Software/Viruses/
➢ http://www.office.microsoft.com
➢ http://openoffice.org
➢ http://www.exforsys.com/tutorials/c-language
➢ http://www.grassrootsdesign.com/
➢ https://www.tutorialspoint.com/index.htm

COURSE OUTCOMES

After completion of this course student would be able to
➢ Describe the details about the basic structure and classification of computers.
➢ Find the aspects of the various operators available in C.
➢ List the details about the Internet, Web browsers and Search engines.
➢ Relate the knowledge about the structure of C++ and its applications.
➢ Write the aspects about the file handling in C with examples.
➢ Explain the facts about the basic concepts of OOPs with applications.
➢ Create a class, objects, defining member functions, accessing class members in C++.
➢ Discuss the aspects of the Function Prototyping in C++.

MOLECULAR BIOLOGY AND GENETIC ENGINEERING

COURSE CODE: MSCBI014/MSFBI074   CREDIT: 4

COURSE OBJECTIVES

➢ To understand the molecular basis of the cell structure, function and to familiarize the recent development and techniques in the field of molecular biology, Gene regulation in prokaryotes and eukaryotes, operon concept.

UNIT- I SEQUENCE ORGANIZATION

Sequence organization of prokaryotic and eukaryotic DNA – Mitochondria and chloroplast DNA– DNA replication – transcription and translation – codon and anticodon concepts – inhibitors of transcription and translation – Gene as the unit of expression – spontaneous mutation, induced mutation – reversed and suppression mutation – DNA repair mechanism

UNIT- II GENE REGULATION AND GENE TRANSFER

Gene regulation in prokaryotes and eukaryotes – operon concept – lac, trp – promotor, attenuator– terminator and operator – transcription factors – allosteric enzymes and feedback inhibition – repression – Gene transfer mechanisms - transformation, conjugation, transduction – Genetic linkage and crossing over and genetic mapping of chromosomes

UNIT -III rDNA TECHNOLOGY

Basics of recombinant DNA technology – Restriction enzymes and mapping of DNA – Introduction to cloning – cloning vectors – plasmid & phage vectors – expression of the clones, gene selection, maximizing gene expression

UNIT -IV DNA SEQUENCING

DNA sequencing – DNA sequencing by base specific cleavage and by primed enzymatic synthesis – insertions and deletions – chromosome walking, selection, immunological identification of clones – PCR & RFLP, RAPD techniques, bio-chips and DNA finger printing – whole genome sequencing – Next Generation Sequences

UNIT - V APPLICATIONS

Applications of recombinant DNA technology – Site Directed Mutagenesis – commercial aspects of recombinant proteins - cloning in plants – direct transfer of DNA into plant cells – transgenic plants – transgenic animals – gene transfer by nuclear injection – gene therapy – pharmaceuticals– anti-sense RNA technique – siRNA

UNIT-VI Current Contours: (For Continuous Internal Assessment only)

PCR primer design and optimization will be covered in theory and practice. Quantitative (real-time) PCR is covered in detail, and lab activities using different primer systems are performed. Systems for gene knockdown and knockout are examined, including lab exercises using RNA interference (RNAi).

MATERIALS FOR STUDY AND REFERENCE

1. Benjamin Lewin, Genes VIII, Pearson - Prentice Hall International Edition, New Delhi, 2004.
2. Freifelder D. Molecular Biology, Jones and Bartlett Publishers Inc. 1987.
3. **Watson, J.D.**, *et al.,* Recombinant DNA, 2nd Edn., Scientific American Books, New York, 1992.
4. Winnacker E. L. From Genes to Clones, VCH Weinhein, Germany, 1987.
5. Prokop, Ales, Bajpai, Rakesh K., and Ho, Chester S., Recombinant DNA Technology and Applications, McGraw-Hill, New York, 1991.
6. Nicholl D.S.T., An Introduction to Genetic Engineering, 2ndEdn., Cambridge University Press, UK, 2002.
7. Griffiths A.J.F., Gelbart W.M., Lewontin, R.C., Miller J. H. Modern Genetic Analysis (Integrating Genes and Genomes), 2nd Edn., W.H. Freeman, New York, 2002.
8. T. A. Brown, Genomes, 2ndEdn., BIOS Scientific Publishers, Ltd., Oxford, UK, 2007.

WEB RESOURCE LINKS

➢ http://www.cellbiol.com/education.php
➢ http://www.cellbiol.com/sequence_tools.php/#basic-tools
➢ http://www.cellbiol.com/sequence_tools.php/#basic-tools

COURSE OUTCOMES
After completion of this course student would be able to

➢ Predict the features of the genetic linkage and crossing over.
➢ Outline the facts about the mitochondrial and chloroplast DNA.
➢ Understand the aspects of spontaneous mutation.
➢ Restate the mechanism of gene transfer.
➢ Examine the features of cloning vectors.
➢ Provide an outlook of the DNA sequencing by base specific cleavage and by primed enzymatic synthesis.
➢ View the immunological identification of clones.
➢ Write an exposure on the Site Directed Mutagenesis.

COURSE CODE: MSCBI015 /MSFBI075   CREDIT: 4

COURSE OBJECTIVES

> ➢ To learn the character sets, data types, statements, functions, structure, input/output operations, pointers and files
> ➢ To understand the fundamental programming concepts and methodologies which are essential to building good C/C++ programs, HTML, DHTML and XML

Write C programs for the following

1. a) Find the biggest of three given numbers using *if-else* statement.
   b) Compute all possible roots of quadratic equation using *if-else* statement.
2. a) Compute the nature of the solution based on the pH value using *switch – case* statement.
   b) Find the molecular weight of a given protein sequences with n amino acids.
   c) Find the molecular weight of a given DNA sequence, after checking for phosphorylation.
3. a) Find the sum of n natural numbers using *while* statement.
   b) Find the factorial of a given integer number using *for* statement.
4. a) Reverse the given integer number and store it in a variable using *do-while* statement.
   b) Compute the sum of individual digits up to a single digit of a given number.
5. a) Compute the average of n given sequence length.
   b) Arrange the n given number in ascending order.
6. a) Reverse a given DNA sequence (without using the built in string function).
   b) Print the triple letter code and full name foe a given single letter code of the amino acid.
   c) Arrange the given protein names in alphabetical order.
7. a) Swap two PDB Ids using function .
   b) Generate n fibonacci numbers using 'static' storage class (define a function).
   c) Swap two given PDB Ids using pointers (use a separate function to swap).
   d) Compute the addition of two matrices (use different functions for each operation).
8. To declare a structure for student details and also to read and display the details of two students.
9. a) Copy protein sequence from one file to another.
   b) Computing base composition of a given nucleotide sequence. Read the sequence from a data file.

Write C++ programs for the following

10. a) Calculate Body Mass Index (BMI) value.

    b) Calculate pH of the solution using H^+ ion.

    c) Calculate pH of the solution using OH^- ion.

11. a) Calculate Average Molecular Weight of DNA.

    b) Check the Palindrome of a given sequence.

12. Compute multiplication & Division of two numbers using inline functions.

13. Compute Simple Interest using Default Arguments.

14. Write a C++ program with the following specifications :

    Define a class to represent a gene sequence data. Include the following members:

- ➢ Data members:
    - ✓ Name of the gene
    - ✓ gene id
    - ✓ length
    - ✓ a,t,g,c content
- ➢ Member functions:
    - ✓ To read data for a gene
    - ✓ To compute a,t,g,c content
    - ✓ To display all the details of a gene

    Write a main program to test the program by reading n gene sequences data

15. Compute Volume of Cube, Cylinder & Rectangular Box using function overloading.

16. Find the sum of two complex numbers using overloaded constructors for data input and operator overloading.

17. Enter protein details using Classes & Objects.

18. Compute area and perimeter of a rectangle using multiple inheritance.

19. Compute the Mean Value using friend function.

20. Enter student details using Classes & Objects.

Web Designing

21. Create a web page to get a nucleotide sequence data and display the base composition.

22. Create a web page for your department with links to important biological database sites.

Note: Test all your programs on different platforms (windows, linux/unix).

COURSE OUTCOMES

After completion of this course student would be able to

- ➢ Apply the knowledge on compute area and perimeter of a rectangle using multiple inheritances.
- ➢ Use the ability to compute the mean value using friend function.
- ➢ Explain the capacity to compute multiplication and division of two numbers using inline function.

- Identify the potential to compute all possible roots of quadratic equation using if-else statement.
- Synthesize the talent to declare a structure for student details and also to read and display the details of two students.
- Construct the skills to compute the nature of the solution based on the pH value using switch – case.
- Create the aptitude to find the factorial of a given integer number using for statement.
- Compose the ability to swap two PDB Ids using function.

BIOINFORMATICS RESOURCES AND APPLICATIONS

COURSE CODE: MSCBI016/MSFBI076   CREDIT: 4

COURSE OBJECTIVES

- ➢ To learn about the bioinformatics databases, databanks, data format and data retrieval from the online sources.
- ➢ To make students understand the essential features of the interdisciplinary field of science for better understanding biological data.
- ➢ To provide the student with a strong foundation for performing further research in bioinformatics.

1. Search on NCBI – PubMed bibliographic search – different options – author name, keyword in title, abstract, title and/or abstract, related articles – different display options
2. Search on EMBL for nucleic acid sequences
3. Study of sequence formats by ReadSeq and TranSeq
4. Perform a similarity search of PIR database for the given protein sequence
5. Perform a similarity search of UniProt database for the given protein sequence
6. Computation of protein sequence features using PROTPARAM tool
7. Retrieving genomic information using GOLD database
8. Perform pairwise sequence alignment for a set of two analogous proteins
9. Motif searching in derived databases PRINTS and BLOCKS databases
10. Structure exploration using PDB
11. To list SCOP lineages and CATH architecture description for a set of proteins
12. Structure visualization using RASMOL software
13. Structure visualization using PYMOL software
14. Pairwise sequence alignment by LALIGN tool
15. Sequence similarity search using NCBI-BLAST tool
16. To retrieve amino acid sequences (in FASTA format) of Bowman-Birk inhibitors from different species (monocots and dicots) and perform multiple alignment with ClustalW to evaluate their homology. To compare and comment on the conservation disulfide bridge pattern between monocots and dicots.
17. Searching metabolic pathway information in KEGG database and MetaCyc
18. MEGA –
      i)   To perform phylogenetic analysis by neighbor joining method using the Kimura two-parameter model for a set of nucleotide sequences.
      ii)   To perform phylogenetic analysis by neighbor joining method using the Dayhoff PAM matrix for a set of amino acid sequences (ribonucleases).

COURSE OUTCOMES

After completion of this course student would be able to

- ➢ Find the literature information of above protein and note the results.
- ➢ Retrieve the collagen protein sequence from any two different organisms and perform word matches Dotmatcher and notes the result.
- ➢ Explain the protein three dimensional structure (ID: 3THC) from PDB database and perform the following actions using RasMol and note the results.
- ➢ Learn the skills to retrieve and write down the elastin protein secondary structure information.
- ➢ Discuss the expertise to draw the structure of the Cyanocobalamin.
- ➢ Identify and retrieve the target protein sequence (ID: P51511) and use that sequence as a query and find out the protein family, domain , functional sites and observe the phylogenetic tree from ten different organisms.
- ➢ Construct a model protein structure of P01333 using ModBase, ModWeb, Swiss-Model server.
- ➢ Build a model for Astragalin using ChemSketch and conformational parameters.

FIRST YEAR – II SEMESTER

CODE	NATURE	COURSE	L	P	C	Pre Req	Co Req
MSCBI021	CORE	Experimental Techniques for Biomolecules	5	-	5	35	
MSCBI022	CORE	Mathematical and Statistical Techniques	6	-	6	31	41
MSCBI023	CORE	Molecular Modelling and Drug Designing	5	-	5	45	
MSCBI024	LAB	Practical – XV : Molecular Modelling, Drug Designing and Statistical Packages Lab	-	5	4		

MSCBI025
 	
MSCBI025.1
MSCBI025.2
MSCBI025.3
	ELECTIVE	**Elective – V**
		  Structural Bioinformatics
		  Molecular Microbial Pathogenesis
		  Drug and Pharmaceutical Technology
			5		5	53	54

MSCBI026	Non-Major ELECTIVE	**Non-Major Elective – I :** Computer Programming for Life Sciences	3	-	2		
		Total	**24**	**5**	**27**		

EXPERIMENTAL TECHNIQUES FOR BIOMOLECULES

COURSE CODE: MSCBI021/MSFBI081   CREDIT: 5

COURSE OBJECTIVES

- ➢ To study the biomolecules using electrophoresis, chromatography, spectrometry techniques
- ➢ To identify their properties, - Proteins structure determination by X-ray diffraction, theory of Nuclear Magnetic Resonance

UNIT – I ISOLATION AND PURIFICATION OF PROTEINS

Crystallization of protein – Crystal Structure – Bravais Lattice – Symmetry elements and operations – Point groups – Space groups – Bragg's law – X-ray diffraction - Proteins structure determination by X-ray diffraction - Phase determination - Calculation of electron density map - Interpretation of electron density map - Refinement of the structures - Electron crystallography of proteins – High throughput techniques in Crystallography

UNIT – II ELECTRONIC ENERGY LEVELS

Electronic transitions – selection rules – types of spectra – IR, UV – visible spectroscopy - Measurement of Infrared (IR) spectrum – Theory of IR spectroscopy – IR spectra of polyatomic molecules – biological examples – Theory of UV - visible spectroscopy – application of UV spectra to proteins – measurement of molecular dynamics by fluorescence spectroscopy

UNIT – III NUCLEAR MAGNETIC RESONANCE

The principle of Nuclear Spin – Spin flipping – theory of Nuclear Magnetic Resonance – spectral parameters in NMR – intensity, chemical shift, spin-spin coupling, relaxation times, line widths, nuclear Overhauser effect (NOE), chemical exchange, paramagnetic centers – application of NMR in biomolecular structure determination.

UNIT – IV ELECTROPHORESIS AND CHROMATOGRAPHY TECHQUIES

Principles of electrophoresis – SDS PAGE – Molecular weight determination of proteins - 2D-gel electrophoresis – capillary electrophoresis - principles of chromatography – Column & ion exchange chromatography – applications

UNIT – V PROTEOMICS AND GENOMICS TECHNIQUES

Micro array techniques and their applications in biology - Mass spectroscopy - ESI and MALDI-TOF - protein finger printing.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Molecular aspects of nucleic acid dynamics; differential gene function and its control; regulation of morphogenesis

REFERENCES BOOKS

1. W. Kemp, Organic Spectroscopy, 3rdEdn., ELBS, McMillan, London, 1991.
2. C.N. Banwell and E.M.McCash, Fundamentals of Molecular Spectroscopy, 4thEdn., Tata McGraw Hill, New Delhi, 1995.
3. I.Howe, D.H.Williams and R.D.Bowen, Mass Spectrometry, Principles and Spplications, 2ndEdn., McGraw Hill, London, 1981.
4. Gary Siuzdak, Mass Spectroscopy for Biotechnology, Academic Press, 1995.
5. Cunico, Gooding and Wehr, Basic HPLC and CE of Biomolecules, Bay Bioanalytical Lab, 1998.
6. Van Holde, Principles of Physical Biochemistry, Prentice Hall, 2000.
7. Helen C. Causton, John Quackenbush and Alvis Brazma, A Beginner's Guide: Microarray Gene Expression Data Analysis, Blackwell Publishing, USA, First Indian Reprint, 2004.
8. Vasantha Pattabhi and N. Gautham, Biophysics, Narosa Publishing House, New Delhi, 2002.

WEB RESOURCE LINKS

➢ http://global.oup.com/uk/orc/chemistry/lchem2e/01student/biomolecules/01amino/

➢ https://docs.chemaxon.com/display/docs/Biomolecules

➢ https://sites.google.com/a/wrps.net/cns-ontl/cns-2nd-semester-weblinks/unit-7-resources---lab/chemical-tests-to-identify-biomolecules

COURSE OUTCOMES

After completion of this course student would be able to

➢ Understand the facts about X-ray crystallography.
➢ Use the knowledge about the applications of various spectroscopic techniques.
➢ Learn the aspects of instrumentation and working principle of NMR.
➢ Analyze the details about the applications of electrophoresis.
➢ Examine the principle and instrumentation of mass spectroscopy and its uses.
➢ Explain the principle and mechanism of magnetic field and electric filed.
➢ Identify the aspects of the ion exchange chromatography applications in detail.
➢ Describe the principle and technique of electro spray ionization.

MATHEMATICAL AND STATISTICAL TECHNIQUES

COURSE CODE: MSCBI022/MSFBI082   CREDIT: 6

COURSE OBJECTIVES

- ➢ To introduce the basic concept of differential equation and classification, find the solution for first and second order equations.
- ➢ To provide the basic concept of Biostatistics. Select from, use and interpret results of, descriptive statistical methods effectively

UNIT – I NATURE OF BIOLOGICAL AND CLINICAL EXPERIMENTS
Collection of experimental data - Measures of central tendency of a set of observations - Purpose of statistical investigations - arithmetic mean - mean of grouped data - median – mode - range, mean deviation, variants and standard deviation.

UNIT – II CORRELATION AND REGRESSION

Scatter diagram – Karl Pearson's Coefficient of Correlation - Correlation Coefficient for a bivariate frequency distribution - Rank correlation - Linear regression - Principles of least squares – Student's 't' test for mean, difference of means – paired 't' test for difference of means– test for correlation and regression coefficients – Chi-square test for goodness of fit and independence of attributes - Simple problems based on biochemical data.

UNIT – III BASIC CONCEPTS OF PROBABILITY
Sample space and events - The use of counting methods in probability - Addition law - Conditional probability - Simple problems involving the estimation of probabilities - Normal Distribution and Binomial and Poisson distributions – Z-score, P-value and E-value – Hidden Markov models – Neural networks – applications in bioinformatics - Needleman and Wunsch algorithm, Smith-Waterman algorithm.

UNIT – IV MATRICES AND VECTORS

Matrix algebra – Types of matrices – determinant – inverse, rank of matrix – solution of simultaneous equations – rotation matrices and co-ordinate transformation

Vectors: Vector algebra - addition and subtraction of vectors – product of vectors, dot & cross products - scalar triple product – vector calculus – gradient, divergence, curl of a vector & identities – applications.

UNIT – V BASIC DIFFERENTIATION OF ALGEBRAIC AND TRIGONOMETRIC FUNCTIONS
Maxima and Minima - Integration of simple functions - Definite and non-definite integrals – Table of integrals – Numerical methods for differentiation and integration – applications to systems biology

UNIT - VI Current Contours: (For Continuous Internal Assessment only)

Single DNA sequence analysis:- Signal modelling- Pattern analysis- Multiple DNA/protein sequence analysis- Detailed study of pairwise alignment algorithms and substitution matrices

MATERIALS FOR STUDY AND REFERENCE

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11th Edn., Sultan Chand & Sons, New Delhi, 2002.
2. D.W. Jordan and P. Smith, Mathematical Techniques, 3[rd]Edn., Oxford University Press, New Delhi, 2002.
3. L. Forthofer, Introduction to Biostatistics, Academic Press, 1995.
4. Robert R. Sokal and F.J. Rohlf, Introduction to Biostatistics (Biology-Statistics Series), W.H. Freeman & Company, New York, 1987.
5. E. Batschelet, Introduction to Mathematics for Life Scientists, 2nd Edn., Springer International Student Edn., Narosa Publishing House, New Delhi, 1991.

WEB RESOURCE LINKS

➢ http://mste.illinois.edu/hill/dstat/dstat.html
➢ https://www.probabilitycourse.com/
➢ http://web.pdx.edu/~newsomj/statlink.htm

COURSE OUTCOMES

After completion of this course student would be able to

➢ Understand the aspects of the bond length, bond angle and torsion angle subtended at the C – alpha (CA) atom in the main chain.
➢ Know the facts about the various steps involved in hypothesis testing.
➢ Comprehend the ability to perform the Smith-Waterman and Needleman-Wunch algorithm of finding the optimal pairwise sequence alignment.
➢ Study the facts about the Hidden Markov models and neural networks with their applications.
➢ Become acquainted with the knowledge to distinguish between mean deviation and standard deviation and to compute them for number of amino acids in a PDB file.
➢ Distinguish between the coefficient r and rank correlation coefficient r.
➢ Find the solution for ODE's using Taylor's series, Euler's method, improved and modified Euler method, RungeKutta for first and fourth order.
➢ State and prove Baye's theorem and to explain its applications in bioinformatics.

MOLECULAR MODELLING AND DRUG DESIGN

COURSE CODE: MSCBI023 / MSFBI083   CREDIT: 5

COURSE OBJECTIVES
- To understand the drug stereochemistry drug design and molecular modeling in drug design.

UNIT – I INTRODUCTION TO THE CONCEPTS OF MOLECULAR MODELING
Molecular structure and internal energy - Application of molecular graphics – Energy minimization of small molecules – Empirical representation of molecular energies – Use of force fields and the molecular mechanics method –Discussion of global energy minimum.

UNIT – II MOLECULAR DYNAMICS AND SIMULATIONS

The techniques of molecular dynamics and Monte Carlo Simulation for conformational analysis - ab initio – Density-Functional Theory and semiemperical methods.

UNIT – III MACROMOLECULAR MODELING

Design of ligands for known macromolocular target sites. Drug-receptor interactions.Classical SAR/QSAR studies and their Implications to the 3-D modeler. 2-D and 3-D database searching - pharmocophore identification and novel drug design.

UNIT – IV FINDING DRUG TARGETS
Finding new drug targets to treat disease - New targets for anti-cancer drugs - Drugs that rescue mutant p53's.

UNIT – V ENZYMES
Enzyme background – Theories of enzyme inhibition - Enzyme inhibition as a tool for drug development – Structured-based drug design – structural bioinformatics in drug discovery - Examples.

UNIT - VI Current Contours: (For Continuous Internal Assessment only)

'Mathematical *modeling* for systems biology'- Computational Systems Biology Stochastic modeling and analysis

MATERIALS FOR STUDY AND REFERENCE

1. Andrew Leach, Molecular Modelling: Principles and Applications 2ndEdn.,Addison Wesley Longman, Essex, England, 1996.
2. Alan Hinchliffe, Modelling Molecular Structures, 2ndEdn., John- Wiley, 2000.
3. Alan Hinchliffe, Molecular Modelling for Beginners, John-Wiley, 2008.
4. N. Cohen (Ed.), Guide Book on Molecular Modeling in Drug Design, Academic Press, San Diego, 1996

5. D. Frenkel and B. Smith, Understanding Molecular Simulations From Algorithms to Applications, Academic Press, San Diego, California, 1996.
6. C. Rauter and K. Horn, X-ray Crystallography and Drug Design, Elsevier, 1984.
7. M. Kalos and P. A. Whitlock, Monte Carlo Methods, John Wiley & Sons, New York, 1986.
8. J.A. McCammon and S.C. Harvey, Dynamics of Proteins and Nucleic Acids,Cambridge University Press, Cambridge, 1987.
9. D.C. Rapaport, The Art of Molecular Dynamics Simulation, Cambridge University Press, Cambridge, England, 1995.
10. Shyve Cox Gad, Drug Discovery Hand Book, Wiley Inter Science, 2005.

WEB RESOURCE LINKS

➢ https://www.ncbi.nlm.nih.gov/Structure/MMDB/mmdb.shtml
➢ www.zyvex.com/nanotech/compChemLinks.html
➢ www.zyvex.com/nanotech/compChemLinks.html

COURSE OUTCOMES

After completion of this course student would be able to

➢ Learn the aspects of protein kinase inhibitors in drug discovery.
➢ Realize the features about structure-based and ligand-based virtual screening.
➢ Understand the details on the impact of SAR/QSAR studies to the 3D modeller.
➢ Be aware of an outlook on the techniques in drug discovery.
➢ View on structural bioinformatics in drug discovery.
➢ Describe the features about the two types of energy minimization methods.
➢ Name the details on the types and usage of force field.
➢ Explain the principles and applications of molecular modelling.

MOLECULAR MODELLING, DRUG DESIGNING AND STASTICAL PACKAGES LAB

COURSE CODE: MSCBI024/MSFBI084   CREDIT: 4

COURSE OBJECTIVES
  ➢ To understand the drug stereochemistry drug design and molecular modeling in drug
    design.

1. To perform the consensus secondary structure prediction for a given protein sequence at
   NSP@ by selecting six different methods
2. To identify the fold for a given protein sequence using 3-D PSSM fold recognition server
3. To find the structural neighbours of a given protein (2TRX) according to SCOP, CATH,
   FSSP and CE. To find out if any particular structure is identified by all these classifications.
4. Protein structure prediction and validation
      a. Primary feature computing by PROTPARAM
      b. Secondary structure by SOPMA
      c. 3D structure by PSI-BLAST tool, SWISS-MODEL and SAVS server (MODELER
         software)
5. Protein structural alignment and classification
      a. Pairwise structural alignment by DALITE server
      b. Multiple structural alignments by DALI/ConSurf server
      c. Structural classification by SCOP and CATH servers
6. Data mining for retrieval chemical information form PUBCHEM and Ligand databases
7. Retrieving pharmacological information from Pharma base and MSDchem database
8. Prediction of binding affinity of ligand by protein-ligand interaction/ReLiBase database
   tools
9. Ligand design and analysis by ISIS ChemDraw, VMD and TSAR software
10. Protein-protein interaction prediction by Hex and Discovery Studio software
11. Protein-ligand interaction prediction by ArgusLab and Discovery Studio software
12. Pharmacophore identification of ligand by TSAR software
13. Binding site identification of target by Q-site finder server
14. Molecular properties prediction by VEGAZ software
15. Molecular dynamics simulation by GROMAS and INSIGHT II software
16. Molecular force field analysis by TINKER software
17. Drug activity test by ADMETox tools
18. Linear discriminate analysis of set of ligand structures by TSAR software
19. Regression analysis of set of ligand structures by TSAR
20. Cluster analysis of dissimilar set of ligand structures by TSAR software
21. Analysis of hydrophobic features of target by BioEdit software

COURSE OUTCOMES:

After completion of this course student would be able to

- ➢ Draw the 3D structure of Tyr-Ala-Trp cyclic peptide and generate its smiles notation and physiochemical properties.
- ➢ Estimate Single-Point Energy, Electronic Excitation Spectra and Optimizing the Geometry of 1Q20.
- ➢ Draw the 3D structure of Beta maltose and generates its physiochemical properties.
- ➢ Analyze the docking studies of 1N8Y protein with its 5 suitable inhibitors.
- ➢ Convert SDF of CID_190 into Mol2 Format.
- ➢ Depict the 3D structure of Cyclic Oligomer and estimate it physiochemical properties.
- ➢ Analyze the docking studies of 1M6B protein with its 5 suitable inhibitors.
- ➢ Convert the SMILES of CID 159296 into MOL2 format.

STRUCTURAL BIOINFORMATICS

COURSE CODE: MSCBI025.1 /MSFBI085.1   CREDIT: 5

COURSE OBJECTIVES

➢ To study introduction of structural bioinformatics, conformational analysis of proteins, nucleic acids, protein structure prediction, and molecular interactions.

UNIT - I INTRODUCTION

Overview of structural bioinformatics – understanding structural basis for biological phenomena– challenges in structural bioinformatics – integration of structural data with other data.

UNIT- II PROTEIN STRUCTURES

Conformational Analysis of proteins – Forces that determine protein structure – polypeptide chaingeometries – Ramachandran Map – potential energy calculations – observed values for rotation angles.

UNIT - III STRUCTURAL ANALYSIS

Conformational analysis of nucleic acids – general characteristics of nucleic acid structure – geometries, glycosidic bond – rotational isomers and ribose puckering - forces stabilizing ordered forms – base pairing– base stacking.

UNIT - IV STRUCTURE PREDICTION

Structure Prediction Methods – Homology Modeling – Fold Recognition Methods – a*b initio* methods – Rosetta – CASP – prediction of secondary structure – Chou-Fasman, Garnier-Osguthorpe-Robson (GOR) methods (qualitative aspects only) – transmembrane structure prediction – solvent accessibility calculations and prediction.

UNIT - V MACRO-MOLECULAR INTERACTIONS

Interactomes – macromolecular interactions – protein-protein interactions – protein-DNA interactions – protein-ligand interactions – interactions databases – BIND, ProNIT – Docking – principles and methods.

UNIT - VI Current Contours: (For Continuous Internal Assessment only)

Genome sequencing – Proteomics – Phylogeny – Gene expression – Protein-protein interaction network

MATERIALS FOR STUDY AND REFERENCE

1. C.R.Cantor & P.R.Schimmel, Biophysical Chemistry Part - I, W.H. Freeman & Co., San Fransisco, 1980.
2. C. Branden and J. Tooze, Introduction to Protein Structure, Garland Publishing Inc., NewYork, 1999.
3. P.E. Bourne and H. Weissig (Eds.) Structural Bioinformatics, John-Wiley and Sons, 2003.

WEB RESOURCE LINKS

➢ https://blast.ncbi.nlm.nih.gov/Blast.cgi
➢ http://www.bind.ca/
➢ https://cgap.nci.nih.gov/

COURSE OUTCOMES:

After completion of this course student would be able to

➢ Know the facts about the basic concepts on macromolecular structures and their interactions with special emphasis on computational biology.
➢ Give an outline of understanding the structural basis for biological phenomena.
➢ Explain the details on the conformational analysis of proteins using computational methods.
➢ Describe the features about the forces that determine the conformational analysis of nucleic acids and carbohydrates.
➢ Learn the aspects on the methods involved in protein structure prediction.
➢ Use the knowledge on the principles and methods of macromolecular interactions.
➢ Examine the aspects of the structural genomics.
➢ Assess and develop the drug discovery processes.

MOLECULAR MICROBIAL PATHOGENESIS

COURSE CODE: MSCBI025.2/MSFBI085.2   CREDIT: 5

COURSE OBJECTIVES

- ➢ To describe some of the various activities of microorganisms that are beneficial to humans , some staining techniques
- ➢ To define the science of microbiology and describe some of the general methods used in the study of microorganisms.

UNIT I-AN OVERVIEW

Historical perspective - discovery of microscope, Louis Pasteur's contributions, Robert Koch's postulates, early discoveries of microbial toxins, toxic assays, vaccines, antibiotics and birth of molecular genetics and modern molecular pathogenesis studies, Various pathogen types and modes of entry.

UNIT -II HOST-DEFENSE AGAINST PATHOGENS AND PATHOGENIC STRATEGIES

Attributes & components of microbial pathogenesis, Host defense: skin, mucosa, cilia, secretions, physical movements, limitation of free iron, antimicrobial compounds, mechanism of killing by humoral and cellular defense mechanisms, complements, inflammation process, general disease symptoms, Pathogenic adaptations to overcome the above defenses.

UNIT -III MOLECULAR PATHOGENESIS (WITH SPECIFIC EXAMPLES)

Virulence, virulence factors, virulence-associated factors and virulence lifestyle factors, molecular genetics and gene regulation in virulence of pathogens, Vibrio Cholerae: Cholera toxin, co-regulated pili, filamentous phage, survival *E.coli* pathogens: Enterotoxigenic *E.coli* (ETEC), labile & stable toxins, Entero- pathogenic *E.coli* (EPEC), type III secretion, cytoskeletal changes, intimate attachment; Enterohaemerrohogic *E.coli* (EHEC), mechanism of bloody diarrhoea and Hemolytic Uremic Syndrome, Enteroaggregative *E.coli* (EAEC). Shigella: Entry, macrophage apoptosis, induction of macropinocytosis, uptake by epithelial cells, intracellular spread, inflammatory response, tissue damage Plasmodium: Life cycle, erythrocyte stages, transport mechanism and processes to support the rapidly growing schizont, parasitiparous vacuoles, and knob protein transport, Antimalarials based on transport processes. Influenza virus: Intracellular stages, Neuraminidase & Haemagglutinin in entry, M1 & M2 proteins in assembly and disassembly, action of amantidine.

UNIT- IV   EXPERIMENTAL STUDIES ON HOST-PATHOGEN INTERACTIONS

Virulence assays: adherence, invasion, cytopathic, cytotoxic effects. Criteria & tests in identifying virulence factors, attenuated mutants, molecular characterization of virulence factors, signal transduction & host responses.

UNIT -V MODERN APPROACHES TO CONTROL PATHOGENS

Classical approaches based on serotyping. Modern diagnosis based on highly conserved virulence factors, immuno & DNA-based techniques. New therapeutic strategies based on recent findings on molecular pathogenesis of a variety of pathogens, Vaccines - DNA, subunit and cocktail vaccines.

UNITVI Current Contours: (For Continuous Internal Assessment only)

Microbial pathogenesis, the molecular mechanisms of bacterial virulence and host-pathogen Recent advances in bacteriology.

TEXT BOOKS

1. Iglewski B.H and Clark V.L "Molecular basis of Bacterial Pathogenesis", Academic Press, 1990.
2. Peter Williams, Julian Ketley & George Salmond, "Methods in Microbiology: Bacterial Pathogenesis, Vol. 27", Academic Press, 1998.

MATERIALS FOR STUDY AND REFERENCE

1. Recent reviews in Infect. Immun., Mol. Microbiol, Biochem. J., EMBO etc.
2. Nester, Anderson, Roberts, Pearsall, Nester, "Microbiology: A Human Perspective", McGraw-Hill, 3rd Edition, 2001.
3. Eduardo A. Groisman, Principles of Bacterial Pathogenesis, Academic Press, 2001.

WEB RESOURSE LINKS

➢ http://www.microbeworld.org/
➢ https://www.asm.org/
➢ http://commtechlab.msu.edu/sites/dlc-me/zoo/

COURSE OUTCOMES

After completion of this course student would be able to

➢ List the scientific accomplishments of Louis Pasteur and Robert Koch.
➢ Describe the aspects on the various pathogen types and their modes of entry in to the host.
➢ Write the features about the cellular defence mechanisms.
➢ Explain the details about the signal transduction process.
➢ Compare the attributes about the virulence assays.
➢ Predict the aspects on the types of vaccines.
➢ Analyze the new therapeutic strategies.
➢ Investigate the details about the inflammation process.

DRUG AND PHARMACEUTICAL BIOTECHNOLOGY

COURSE CODE: MSCBI025.3/MSFBI085.3   CREDIT: 5

COURSE OBJECTIVES

> To know therapeutic categories such as vitamins, Drug and Pharmaceutical Industry: Therapeutic agents, their use and economics

UNIT- I INTRODUCTION

Development of Drug and Pharmaceutical Industry: Therapeutic agents, their use and economics-Regulatory aspects.

UNIT- II DRUG METABOLISM AND PHARMACOKINETICS

Drug metabolism: physico chemical principles, radio activity-pharma kinetic action of drugs on human bodies.

UNIT- III   IMPORTANT UNIT PROCESSES AND THEIR APPLICATIONS

Bulk drug manufacturers- Type of reactions in bulk drug manufacture and processes- Special requirement for bulk drug manufacture.

UNIT- IV MANUFACTURING PRINCIPLES

Compressed table- wet granulation-dry granulation or slugging-direct compression-tablet presses-coating of tablets, capsules-sustained action dosage forms-parental solution-oral liquids-injections-ointment-topical applications- Preservation, analytical methods and test for various drug and pharmaceuticals-packing: packing techniques, quality management, GMP.

UNIT- V PHARMACEUTICAL PRODUCT AND THEIR CONTROL

Therapeutic categories such as vitamins-laxatives- analgesics- nonsteroidal contraceptives-Antibiotics, biologicals- hormones.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Cutting edge *research techniques* in *drug design* and *molecular* pharmacology, and in evaluating mechanisms of *drug action* at the *molecular* level through to complex *integrated* systems

MATERIALS FOR STUDY AND REFERENCE

1. Leon Lachman et al, *Theory and Practice of Industrial Pharmacy*, 3 Edition, Lea and Febiger, 1986.
2. Remington's, *Pharmaceutical Science*, Mark Publishing and Co.

WEB RESOURSE LINKS

- vle.du.ac.in/mod/book/view.php?id=12963&chapterid=27926

- https://www.ck12.org/c/chemistry/amino-acids/?by=community

- www.bioinformatics.org/strap/createStrapLinks2.html

COURSE OUTCOMES

After completion of this course student would be able to

- Justify the details about the pharma kinetic action of drugs on human bodies.
- Inspect the facts about the drug metabolism.
- Synthesize the details about the bulk drug manufacturers.
- Characterize the vitamins, laxatives and analgesics.
- Describe the details about the drug development and pharmaceutical industry.
- Explain the types of reactions in bulk drug manufacture and processes.
- Illustrate the facts about the hormones.
- Use the details about the analytical methods and test for various drug and pharmaceuticals.

NON MAJOR ELECTIVE – I COMPUTER PROGRAMMING FOR LIFE SCIENCES

COURSE CODE: MSCBI026 /MSFBI086   CREDIT: 5

COURSE OBJECTIVES

➢ To learn the character sets, data types, statements, functions, structure, input/output operations, pointers, files, fundamental programming concepts and methodologies which are essential to building good C/C++ programs.

UNIT- I INTRODUCTION

Introduction to Computers – Need for Programming in Life Sciences – Hardware – Input and output devices, CPU, memory. Software – Programming languages – Operating Systems – Windows. Internet usage- Browsers – Internet Explorer, Mozilla – Search engines – Email – Internet resources for Life Sciences – Literature Databases- NCBI-PUBMED – protein and nucleic acid sequence databases-PIR, Swiss-prot, GenBank, PDB, and SCOP.

UNIT- II VARIABLES AND ASSIGNMENT

History of C – Identifiers and Keywords – Constants and Variables- Operators – arithmetic, unary, relational, logical, assignment, conditional- Hierarchy of operators – Input and output statements- Formatted input and output – Example programs form Life Sciences.

UNIT- III CONDITIONS AND LOOPS

Control Statements in C – Branching Statements if-else, Switch-case, and goto -Looping statements while, do while and for statements – Example Programs from Life Sciences.

UNIT- IV FUNCTIONS

User Defined Functions in C- Defining and Accessing Functions-Passing Arguments – Function prototypes-Introduction to Pointers, Advantages of Pointers, and Pointer Declarations – Pointers and Arrays - Example programs from Life Sciences.

UNIT- V STRUCTURES AND UNIONS

Structures and Unions data files – f open (), f close (), reading and writing – Example programs form Life Sciences.

UNIT-VI Current Contours: (For Continuous Internal Assessment only)

Data Warehouse & Data Mining - Security And Attacks - Machine Learning - Dynamic linking-most notably dlm_open and friends-Signals, forking and interprocess communication-Threading, and related advanced concepts such as thread local storage

MATERIALS FOR STUDY AND REFERENCE

1. Peter Norton, Introduction to Computers 6th Edn., Tata McGraw-Hill Pub. Co.Ltd., New Delhi, 2006.
2. Byron S. Gottfried, Schaum's Outlines Programming with C, 2nd Edn., Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 1996.
3. E. Balagurusamy, ANSI C, 2nd Edn., Tata McGraw-Hill Pub.Co. Ltd., New Delhi, 1998.
4. Y.Kanetkar, Let us C, 4th Edn., BPB Publications, New Delhi, 1991.
5. Frank H. Stephenson, Calculations for Molecular Biology and Biotechnology, Elsevier India Pvt, Ltd., New Delhi, 2004.
6. S. Parthasarathy, Essentials of programming in C for Life Sciences, 2nd Edn., Ane Books India New Delhi, 2011.

WEB RESOURCE LINKS

- http://www.dmoz.org/Computers/Security/Malicious_Software/Viruses/
- http://www.office.microsoft.com
- http://openoffice.org
- http://www.exforsys.com/tutorials/c-language
- http://www.grassrootsdesign.com/

COURSE OUTCOMES

After completion of this course student would be able to

- Understand the basics of a computer and its structure.
- Give an overview on the bioinformatics databases and tools through internet.
- Explain the basics of description, character set and variables of C language.
- Learn the aspects of basic operators and input/output statements in C.
- Discuss the basics of branching and looping control statements.
- Write the facts on the definition, accession and passing arguments in functions in C.
- Relate the facts on the definition and accession of structure in C and Union concepts.
- Explain the features on the basics of pointers and file handling in C language.

SECOND YEAR – III SEMESTER

CODE	NATURE	COURSE	L	P	C	Pre Req	Co Req
MSCBI031	CORE	Genomics and Proteomics (OR) Microarray Techniques and Applications	5	-	5		
MSCBI032	CORE	Computer Programming - II	6	-	6	61	62
MSCBI033	LAB	Practical – XVI : Computer Programming - II, Genomics and Proteomics Lab	-	5	4		

MSCBI034
 MSCBI034.1
 MSCBI034.2
 MSCBI034.3
	ELECTIVE	**Elective VI**
		   Systems Biology
		   Cheminformatics
		   Cancer Biology
			5	-	5	42	52

MSCBI035
 MSCBI035.1
 MSCBI035.2
 MSCBI035.3
	ELECTIVE	**Elective – VII**
		   Applied Bioinformatics
		   Enzyme Engineering and Technology
		   Metabolomics and Metabolic Engineering
			5	-	5	55	

MSCBI036	Non-Major ELECTIVE	**Non-Major Elective – II :** Basics of Bioinformatics	3	-	2		
		Total	**24**	**5**	**27**		

GENOMICS AND PROTEOMICS

COURSE CODE: MSCBI031/MSFBI091   CREDIT: 5

COURSE OBJECTIVES
- ➢ To study prokaryotic and eukaryotic genomes , general methods of genome sequencing techniques, genome analysis and annotations, genome mapping techniques and applications of genomics.
- ➢ To understand the proteins enclosed by the genes with respect to structure, function, protein – protein interactions, techniques for separation and analysis, database and applications.

UNIT –I GENOME AND GENOME SEQUENCING

Genome structure and organization – Eukaryotic genome - Organelle genome- Genomics of Microbes and Microbiomes – Genome sequencing technologies – Next generation sequencing – Genome assembly and finishing methods – Comparative genomics and its applications

UNIT- II FUNCTIONAL GENOMICS

Functional genomics - Large scale gene expression analysis –Experimental methods - Computational tools for expression analysis-Hierarchical clustering – Gene expression analysis– STS-EST-GSS-Assessing levels of gene expression using ESTs - cDNA databases – Transcriptome analysis and applications

UNIT –III SYSTEMS BIOLOGY

Molecular systems biology – Introduction – methodologies – constraint and kinetic modeling – Biomass objective function - metabolic simulation - biotechnological applications – Molecular network biology – Medical and clinical genomics - Pharmacogenomics and drug discovery – Agriculture genomics and its applications

UNIT –IV PROTEOME TECHNOLOGY

Proteome – structural and functional features – Qualitative proteome technology (Gel-based and Gel-free) – Quantitative proteome technology – Functional proteome technology – Methods, algorithms and tools in computational proteomics - Proteome databases – Protein engineering resources

UNIT –V INTERACTOMICS AND PROTEOMICS

Interactomics - Techniques to study protein-protein interactions - Modelling of proteomic networks – Interactome databases - Label-free nanotechnologies in proteomics – Modificomics – Proteomics applications in clinical and biomedicine - Application of proteomics in agricultural biotechnology – Industrial proteomics and its applications

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Computational *Proteomics* and. Metabolomics- Sequence comparison. – Genome sequencing. – *Proteomics*. – Phylogeny. – Gene expression - Enzymology

MATERIALS FOR STUDY AND REFERENCE

1. Baxevanis D and Ouellette BFF, *Bioinformatics: A practical guide to the analysis of genes and proteins* (3rd Ed), John Wiley & Sons,Inc. 2005.
2. Baxevanis D and Ouellette BFF, *Bioinformatics: A practical guide to the analysis of genes and proteins* (2rd Ed), John Wiley & Sons,Inc. 2002.
3. Brown TA, *Genomes* (2nd Ed), BIOS Scientific Publishers, Oxford,UK, 2002.
4. Sensen CW, *Essentials of Genomics and Bioinformatics*,Wiley-VCH, 2002.
5. Sensen CW, *Hand book of Genome Research*, Wiley-VCH Verlag GmBh & Co, Weinheim, 2005.
6. Pennigton SR and Dunn MJ, *Proteomics*, Viva Books Pvt. Ltd, NewDelhi, 2002.
7. Sándor Suhai, *Genomics and Proteomics: Functional and Computational Aspects*, Kluwer AcademicPublishers, 2002.

WEB RESOURCE LINKS

➢ www.genomic.org.uk/

➢ https://www.britannica.com/science/genomics

➢ https://www.sciencedirect.com/journal/genomics

COURSE OUTCOMES

After completion of this course student would be able to

➢ Provide the details about current genomic and proteomic perspective of model organisms.
➢ Gain the knowledge on the computational methods for gene expression analysis.
➢ Explain the details about constraint-based metabolic modelling and metabolic simulation.
➢ Describe the methods, algorithms and tools involved in computational proteomics analysis.
➢ Use the proteome tools for protein identification from experimental data.
➢ Understand the salient features of Interaction databases.
➢ List the details of comparative genomics and its applications.
➢ Use the knowledge on Transcriptome analysis and applications.

COMPUTER PROGRAMMING – II

COURSE CODE: MSCBI032/MSFBI092   CREDIT: 6

COURSE OBJECTIVES

➢ To have a thorough understanding of perl concepts, Working Environment - Navigating in UNIX.

UNIT -I INTRODUCTION TO PERL

Constants and variables – Scalar, Arrays and Hashes – CPAN – Array-Based Character Manipulation – Input and Output Statement - Perl Interpreter – Operators – Control statements - if, elsif, else, unless, while, do-while, until, do-until, for and foreach – Simple programs

UNIT-II PERL REGULAR EXPRESSIONS AND PATTERNS

Perl debugger – Subroutines and Functions – Perl Regular Expressions – Metacharacters – Patterns – FILE Handling – Perl one liners using command-line options – Bioinformatics application programs – String comparison – Searching databases

UNIT -III BIOPERL AND INTRODUCTION TO PYTHON

Introduction to BioPERL – Modules – Bio::SeqIO, Bio::PrimarySeq, Bio::Seq, Bio::Search, Bio::DB (getting files from web, run local blast using modules) – simple Bioinformatics application programs. Introduction to Python – History, Installation, Interpreter, Running Python Program - Output, Input and the raw input – Syntax and Style - Comments – Operators – Variables and Assignment – Basic data types in Python-Numbers, Strings, Lists, Tuples and Dictionaries - Code Blocks UseIndentation

UNIT- IV CONTROL STATEMENTS, FUNCTIONS, MODULES AND REGULAR EXPRESSION

Conditional and Loop statements – if-else-elif, while, for, break, Continue, Pass-else statement - Built-in Function – Files and the open Built-in Function – Functions - definition, Modularizing Python code using Functions, Function Parameter Options, Passing Arguments, Generators – Introduction to Modules - Using Modules, Importing Modules, Creating Modules, Packages

UNIT -V WEB PROGRAMMING AND BIOPYTHON

Regular Expressions – Introduction, syntax, Special Symbols and Characters for REs, the *re* module – compiling a pattern - Bioinformatics Examples – Introduction to Web Programming -

Web Surfing with Python - Creating Simple Web Clients, Building CGI Application, Related Modules. Introduction to Biopython – Sequence objects - Sequences and Alphabets, MutableSeq objects - simple Bioinformatics application programs

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Exception handling, the debugger, and the Perl symbol table. It overlaps Intermediate Topics in Perl and Object-Oriented Programming.

MATERIALS FOR STUDY AND REFERENCE

1. L.Wall, T.Christiansen and J.Orwant, Programming Perl, 3rdEdition, O'Reilly,2000.
2. J. Tisdall, Mastering Perl for Bioinformatics, O'Reilly,2003.
3. Rex A. Dwyer, Genomic PERL, Cambridge Univ. Press, UK,2003.
4. Harshawardhan P. Bal, PERL programming for Bioinformatics, Tata McGraw-Hill, New Delhi,2003.
5. htrtp://bioperl.org
6. David Ascher, Mark Lutz "Learning Python," 2/e, O'Reilly MediaPublishers,2003.
7. Alex Martelli "Python in a Nutshell," O'Reilly Media Publishers,2007.
8. http://www.biopython.org

WEB RESOURCE LINKS

➢ https://www.tutorialspoint.com/perl/index.htm
➢ lwp.interglacial.com/ch12_03.htm
➢ www.perlmonks.org/?node_id=585436

COURSE OUTCOMES
After completion of this course student would be able to

➢ Understand the Perl features, applications and Perl interpreter with debugger in Perl and Python.
➢ Explain the details about the data types and operators in Perl and Python.
➢ Write the control statements and subroutines and functions in Perl and Python.
➢ Describe the basics of Regular Expression and Pattern matching in Perl and Python.
➢ List the details about modules in Python.
➢ Handle the files in Perl and Python with application to bioinformatics.
➢ Discuss the details on BioPerl modules and BioPython modules.
➢ Create the web page using python programming.

COMPUTER PROGRAMMING – II, GENOMICS AND PROTEOMICS LAB

COURSE CODE: MSCBI033 /MSFBI093   CREDIT: 4

COURSE OBJECTIVES

➢ To have a thorough understanding of perl concepts, Working Environment - Navigating in UNIX.

Computer Programming – II

1. a. Write a simple Perl program to get a DNA sequence andprint.
    b. Write a Perl program demonstrate joining two DNAfragments.
2. a. Write a Perl program to demonstrate Array Handling using aminoacids.
    b. Write a Perl program to demonstrate printing array in differentways.
    c. Write a Perl program to demonstrate Array creation by splitting the mRNAsequences.
3. Write a Perl program to demonstrate Hash Tables using nucleotidebases.
4. Write a Perl program to demonstrate assignment, logical andconditional.
5. Write a Perl program to counting the nucleotides of a DNAsequence.
6. Write a Perl program to find the complementary DNA sequence usingsubroutines.
7. Write a Perl program to demonstrate regular expressions using DNA basepairs.
8. Write a Perl program to find a motif in DNAsequence.
9. a. Write a Perl program to convert DNA to mRNA in a given nucleotide sequencefile.
    b. Write a Perl program to get the 3D coordinates of a given protein PDB structurefile.

10. Write a BioPerl program to fetch the multiple sequences from SWISS-PROTdatabase.
11. Write a Python program to demonstrate the basic I/O using interactive and batchmode
12. Write a Python program to demonstrate the different string operations andmethods.
13. Write a Python program to demonstrate the basicoperators.
14. Write a Python program to demonstrate the searching, replacing, and parsing nucleotide text using regularexpressions.
15. Write a Python program to calculate the molecular weight of a double-strandedDNA.
16. Write a Python program to calculate the bond length between two atoms in PDBfile.
17. Write a Python program to fetch a protein sequence, opening and finding the length of the SWISS-PROTdatabase.

Genomics and Proteomics

COURSE OBJECTIVES
➢ To study prokaryotic and eukaryotic genomes , general methods of genome sequencing techniques, genome analysis and annotations, genome mapping techniques and applications of genomics.
➢ To understand the proteins enclosed by the genes with respect to structure, function, protein – protein interactions, techniques for separation and analysis, database and applications.

1. Genome-scale tree
2. Prediction of genomesynteny
3. Prediction of genomecorrelation
4. Prediction of origin ofreplication
5. Comparative genomics for orphan genediscovery
6. Genome-wide discovery for gene clusterprediction
7. Comparative metabolomics for putative subsystemdiscovery
8. Metabolitefingerprinting
9. Metabolicreconstruction
10. Prediction of regulatoryelements
11. Gene expressionanalysis
12. 2D gelanalysis
13. Prediction of protein bulkproperties
14. Functional prediction of hypotheticalproteins

15. Site directedmutagenesis

16. Peptidefingerprinting
17. Prediction of protein modificationsites
18. Protein-protein interaction network modeling
19. Prediction of virulencefactors
20. Prediction of host-microbeinteraction

COURSE OUTCOMES
After completion of this course student would be able to

➢ Use the BioPerl program to fetch the multiple sequences from SWISS-PROT database.
➢ Employ the Python program to calculate the bond length between two atoms in PDB file.
➢ Utilize the Perl program to convert DNA to mRNA in a given nucleotide sequence file.
➢ Understand the details about the comparative Metabolomics for putative subsystem discovery.
➢ Discuss the details on the steps and tools involved for metabolic reconstruction.
➢ List the details about functional prediction of hypothetical proteins using combined bioinformatics approaches.
➢ Use the BioPerl program to fetch the multiple sequences from SWISS-PROT database.
➢ Demonstrate the basic operators with Python program

SYSTEMS BIOLOGY

COURSE CODE: MSCBI034.1/MSFBI094.1   CREDIT: 5

COURSE OBJECTIVES

➢ To know Advanced Measurement Systems, Introduction to Biological Networks and Basic Concepts, Systems biology software project

UNIT -I INTRODUCTION AND BIOLOGICAL NETWORKS

Introduction - System-level Understanding of Biological Systems - Advanced Measurement Systems - Introduction to Biological Networks and Basic Concepts – Metabolic, Signaling and Regulatory networks - Why build and study models? - Characterizing dynamic states - Formulating and studying dynamic network models - Properties of dynamic states - Network structure versus dynamics

UNIT- II STANDARD MODELS AND APPROACHES IN SYSTEMS BIOLOGY

Metabolism- enzyme kinetics and thermodynamics- Michaelis-Menten Kinetics - metabolic networks- metabolic control analysis - Signal transduction- introduction- function and structures- interactions- structural components - signaling selected biological processes - mathematical models - prediction of biological systems.

UNIT -III E-CELL PROJECT

E-CELL: Organization - History - Research group - modeling methods – formalism - techniques numerical simulation algorithm-mathematical analysis methods-software environment-projects models-applications chemotaxis - molecular clock-circadian rhythms-oxidation stress-multi- enzyme systems.

UNIT- IV SYSTEMS BIOLOGY SOFTWARE

Systems biology software project: About the project-model inter change-code use-bio-models- online services-SBML Layout viewer-SBML validation-simulation translator-model repository- SBW broker - Jurnac-J-designer- BioSpice – BioUMC - CellDesigner – Cytoscape - Dizzy- Oscillator- Virtual cell - virtual rice project.

UNIT -V INTRODUCTION TO SYNTHETIC BIOLOGY

Introduction – Definition – Synthetic Biology versus Systems Biology - Synthesis and Engineering Tools - DNA Synthesis - Protein Engineering - Pathway Engineering - Genome Engineering - Computational and Theoretical Tools – Genomics, Proteomics and Metabolomics Tools - Applications in Synthetic Biology – Molecular, Pathway and Whole Cell Levels - Challenges and Future Perspectives.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Applications chemotaxis - molecular clock, Signal transduction- introduction- function and structures- interactions

MATERIALS FOR STUDY AND REFERENCE

1. Hiroaki Kitano (Editor), Foundations of Systems Biology, MIT Press,2001.
2. Bernhard Ø. Palsson, Systems Biology – Simulation of Dynamic Network States, Cambridge Univ. Press, UK,2011.
3. E.Klipp, et al. Systems Biology in Practice, Wiley-VCH, Weinheim,2005.
4. Huimin Zhao (Ed.), Synthetic Biology: Tools and Applications, Academic Press, Elsevier, USA,2013.
5. Arthur M. Lesk, Introduction to Bioinformatics 2nd Edition, Oxford University Press, New Delhi,2005.
6. Jing Liang, Yunzi Luo, and Huimin Zhao, Synthetic biology: putting synthesis into biology, *Wiley Interdiscip Rev Syst Biol Med*, 3,7-20,2011.

WEB RESOURCE LINKS

➢ www.systems-biology.org/

➢ https://www.sysbiol.cam.ac.uk/

➢ https://www.systemsbiology.org/

COURSE OUTCOMES

After completion of this course student would be able to

➢ Describe the comprehensive (or high throughput) measurements of biological systems.
➢ Discuss the details on the factors involved in Biological System Design.
➢ Illustrate the modelling of the prokaryotic gene expression.
➢ Explain the details about the systems biology tools: E-Cell and V-Cell.
➢ Find the networking of genes and protein interaction networks.
➢ Write the applications of Systems biology.
➢ Relate the engineering principles in Synthetic Biology and its applications.
➢ Describe the details about molecular clock hypothesis.

CHEMOINFORMATICS

COURSE CODE: MSCBI034.2/MSFBI094.2   CREDIT: 5

COURSE OBJECTIVES

> ➢ To know therapeutic categories such as vitamins, Drug and Pharmaceutical Industry: Therapeutic agents, their use and economics

UNIT -I   REPRESENTATION OF STRUCTURES

Representationand Manipulation of 2D Molecular Structures- Representation and Manipulation of 3DMolecular Structures.

UNIT- II MOLECULAR DESCRIPTORS AND MODELS

Molecular Descriptors-Introduction- Descriptors Calculated from the 2D Structure- Descriptors Based on 3D Representations- Data Verification and Manipulation- Computational Models-Introduction- deriving a QSAR Equation- Simple and Multiple Linear Regression- Designing a QSAR "Experiment"- Principal Components Regression- Partial Least Squares- Molecular Field Analysis and Partial Least Squares.

UNIT- III   SIMILARITY METHODS

Similarity Methods- Similarity Based on 2D Fingerprints- Similarity Coefficients- 2D Descriptor Methods- 3D Similarity- Selecting Diverse Sets Of Compounds- Cluster Analysis- Dissimilarity-Based selection methods- Cell-Based Methods- Optimization Methods- Comparison and Evaluation of Selection Methods.

UNIT -IV   HIGH THROUGHPUT AND VIRTUAL SCREENING

Analysis ofHigh-Throughput Screening Data- Data Visualization- Data Mining Methods-VirtualScreening-Drug-Likeness and Compound Filters- Structure-Based Virtual Screening- The Predictionof ADMET Properties .

UNIT -V   COMBINATORIAL CHEMISTRY AND LIBRARYDESIGN

Diverse and Focused Libraries- Library Enumeration- Combinatorial Library Design Strategies- Approaches to Product-Based Library Design- Multi objective Library Design- Practical Examples of Library Design.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Cutting edge *research techniques* in *drug design* and *molecular* pharmacology, and in evaluating mechanisms of *drug action* at the *molecular* level through to complex *integrated* systems.

TEXT BOOKS:

1. Andrew R Leach, Valerie J Gillet, *An Introduction to Chemoinformatics*, Kluwer academic publishers, 2003.
2. Tudor I Oprea, Raimund Mannhold, Hugo Kubinyi, Gerd Folkers, *Chemoinformatics in Drug Discovery*, Wiley-VCH, 2006.

MATERIALS FOR STUDY AND REFERENCE

1. Johann Gasteiger, Thomas Engel, *Chemoinformatics- A Textbook*, Wiley-VCH, 2003.
2. Jürgen Bajorath,*Chemoinformatics: Concepts, Methods, and Tools for Drug Discovery*, Humana press, 2004.

WEB RESOURCE LINKS

➢ vle.du.ac.in/mod/book/view.php?id=12963&chapterid=27926

➢ https://www.ck12.org/c/chemistry/amino-acids/?by=community

➢ www.bioinformatics.org/strap/createStrapLinks2.html

COURSE OUT COMES

After completion of this course student would be able to

➢ Provide the details about the manipulation of 2D molecular structures.
➢ Explain the details about the manipulation of 3D molecular structures.
➢ List the details about the multi objective library design.
➢ Write the details of combinatorial library design strategies.
➢ Gain knowledge about the structure-based virtual screening.
➢ Predict the ADMET Properties.
➢ Discuss the detail about the QSAR.
➢ Synthesize the analysis of High-Throughput Screening.

CANCER BIOLOGY

COURSE CODE: MSCBI034.3/MSFBI094.3   CREDIT: 5

COURSE OBJECTIVES

➢ To know Chemical Carcinogenesis Metabolism of Carcinogenesis, Oncogenes / Proto Oncogenes activity and Different forms of therapy, Chemotherapy, Radiation Therapy

UNIT -I   FUNDAMENTALS OF CANCER BIOLOGY

Regulation of Cell cycle- Mutations that cause changes in signal molecules- effects on receptor-signal switches- tumour suppressor genes- Modulation of cell cycle-in cancer- Different forms of cancers- Diet and cancer.

UNIT -II   PRINCIPLES OF CARCINOGENESIS

Chemical Carcinogenesis- Metabolism of Carcinogenesis- Natural History of Carcinogenesis-Targets of Chemical Carcinogenesis- Principles of Physical Carcinogenesis- X-Ray radiation – Mechanism of radiation Carcinogenesis.

UNIT-III   PRINCIPLES OF MOLECULAR CELL BIOLOGY OF CANCER

Oncogenes- Identification of Oncogenes- Retroviruses and Oncogenes- detection of Oncogenes-Growth factor and Growth factor receptors that are Oncogenes- Oncogenes / Proto Oncogenes activity- Growth factors related to transformations.

UNIT -IV   PRINCIPLES OF CANCER METASTASIS

Clinical significances of invasion- heterogeneity of metastatic phenotype- Metastatic cascade-Basement membrane disruption- Three step theory of invasion- Proteinases and tumour cell invasion.

UNIT -V   NEW MOLECULUS FOR CANCER THERAPY

Different forms of therapy- Chemotherapy- Radiation Therapy- Detection of Cancers- Prediction of aggressiveness of Cancer- Advances in Cancer detection.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

 Molecular biology of cancer (oncogene and tumor suppressors) cancer cells, with emphasis on growth control and cell division, genome stability and aneuploidy

TEXT BOOKS:

1. King R.J.B., *Cancer Biology*, Addision Wesley Longmann Ltd, U.K., 1996.
2. Ruddon.R.W.,*Cancer Biology*, Oxford University Press, Oxford, 1995.

REFERENCES BOOKS:

1. Maly B.W.J., *Virology a practical approach*, IRL press, Oxford, 1987.
2. Dunmock.N.J and Primrose S.B., *Introduction to modern Virology*, Blackwell Scientific Publications, Oxford, 1988.

WEB RESOURCE LINKS

➢ https://www.cancer.gov/research/areas/biology
➢ https://biology.mit.edu/faculty-and-research/areas-of-research/cancer-biology/
➢ https://biology.mit.edu/faculty-and-research/areas-of-research/cancer-biology/

COURSE OUTCOMES

After completion of this course student would be able to

➢ Learn the aspects of regulation of cell cycle.
➢ Describe the features of modulation of cell cycle-in cancer.
➢ Explain the facts about the Diet and cancer.
➢ List the details about Natural History of Carcinogenesis.
➢ Demonstrate the mechanism of radiation Carcinogenesis.
➢ Outline the methods of the identification of Oncogenes.
➢ Explain the facts about three step theory of invasion.
➢ Use the knowledge in cancer detection.

APPLIED BIOINFORMATICS

COURSE CODE: MSCBI035.1/MSFBI095.1   CREDIT: 5

COURSE OBJECTIVES

> To study commercial bioinformatics, genome analysis, pharmaceutical bioinformatics and drug discovery, transgenic plants and animals and bar coding

UNIT -I INTRODUCTION

Commercial bioinformatics – Survey of bioinformatics companies in India and abroad – Economics prospects – pharamainformatics – combinatorial chemistry – HT screening – in silico screening - from lead to commercialization

UNIT -II GENOME ANALYSIS

Sequence assembly and Finishing methods – Sequence assemblers – finishing and visualization programmes – Gene expression analysis – Data collection – Image processing - Measures of expression – Finding significant genes –Clustering approaches – SNP – Types – SNP discovery methods –databases and browsers – genotyping - Comparative genomics – algorithms – viewing

–genomic alignments – gene prediction and phylogenetic foot printing

UNIT -III APPLICATION OF GENOMICS

Application of genomics to agriculture – gene discovery and gene function – model systems – technologies – methods to introduce novel genes – Pharmaceutical bioinformatics and drug discovery – Introduction - novel gene discovery – methods for identifying novel targets – protein classification and functional assignments – Disease – target gene relationship – Nanotechnology and its applications – Genomics and proteomics in medicine, diagnostics, drug discovery and target findings.

UNIT- IV INTELLECTUAL PROPERTY RIGHTS (IPR)

IPR –Importance of IPR, Organization –WIPO & WTO – Agreements and Treaties – GATT– TRIPS –Types of IPR – patents – copyrights – trademarks and trade secrets – Plant Breeder Rights(PBR) – Geographical Indications - Technology Transfer (TT) –Traditional Knowledge – Importance of patents – Patenting of biological materials –Patenting of biotechnological inventions –Sharing the benefits from biotechnology transfer – IPR in India –IPR impacts on Biotechnology Research in India – significance biotechnological patents in India.

UNIT -V BIOSAFETY AND BIOETHICS

Biosafety –Topics of concern – Hazards of Genetically Engineered Microorganisms – Bioremediation –Framework of biosafety regulations in India (committees, Pressure points for the Biosafety Regulations –Assessment of structural changes. Ethics – Bioethics–The ethical and social impacts of biotechnology andbioinformatics.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Computational Proteomics and Computational Proteomics and Metabolomics.

MATERIALS FOR STUDY AND REFERENCE

1. T. A. Brown, Genomes, 2nd Edition, BIOS Scientific Publishers, Ltd., Oxford, UK, 2002.
2. Baxevanis D and Ouellette BFF, Bioinformatics: A practical guide to the analysis of genes and proteins, 3rd Edition, John Wiley & Sons, Inc.,2005.
3. Sensen CW, Essentials of Genomics and Bioinformatics,Wiley-VCH, 2002.Jenson, O.N., in Proteomics. A Trends Guide (eds Black Stock, Co- and Mann), Elsevier Science, London,1998.
4. S.R.Pennington and M.J.Dunn, Proteomics, Viva Books Pvt. Ltd., New Delhi,2002.
5. Relevant papers from Drug Discovery Today - Trendsjournals
6. N.R.Subbaram, what everyone should know about patents, 2ndEdition, Pharma Book Syndicate,Hyderabad,2006.
7. Philip W.Grubb, Patents for Chemicals, Pharmaceuticals and Biotechnology- Fundamentals of Global Law practices and strategy, 4th Edition, Oxford University Press,2006.
8. R.C. Dubey, A Textbook of Biotechnology, S.Chand & Company,1993.
9. Ben Mepham, Bioethics-an Introduction for the biosciences, Oxford University Press, 2005.

WEB RESOURCE LINKS

➢ https://abi.inf.uni-tuebingen.de › Teaching › Previous Semesters › WS 2011/12
➢ https://link.springer.com/journal/40282
➢ https://bioinf.mpi-inf.mpg.de/teaching/atngsa_13_14.php

COURSE OUTCOMES

After completion of this course student would be able to

➢ Learn the details about *in silico* screening.
➢ Provide the details about sequence assemblers and finishing method.
➢ Explain the SNP Types and discovery methods and Databases.
➢ Write the Intellectual property rights and details about the types of IPR.
➢ List the details about the Framework of bio safety regulations in India.
➢ Describe the scope of pharmaceutical bioinformatics.
➢ Be familiar with the details about the novel gene discovery.
➢ Understand the details about Microarray techniques.

ENZYME ENGINEERING AND TECHNOLOGY

COURSE CODE: MSCBI035.2/MSFBI095.2   CREDIT: 5

COURSE OBJECTIVES

- To know Classification of enzymes, Kinetics of single substrate reactions, turnover number, Enzyme Inhibition, presteady state kinetics
- To understand Kinetics of multi-substrate reactions, Allosteric enzymes

UNIT- I   INTRODUCTION TO ENZYMES

Classification of enzymes, specificity of enzyme action – monomeric and oligomeric enzymes,- Factors modifying enzyme activity, biotechnological applications of enzymes and applications of enzymes in various industries.

UNIT- II   CHEMICAL NATURE OF ENZYME CATALYSTS

Structural Components of Enzymes – Structure, apoenzymes, prosthetic group, cofactors, Mechanisms of reactions catalysed by enzymes – Metal activated enzymes – metalloenzymes – involvement of co enzymes.

UNIT -III FREE AND IMMOBILISED ENZYME KINETICS

Classification of enzymes, Kinetics of single substrate reactions, turnover number, Enzyme Inhibition, presteady state kinetics, Kinetics of multi-substrate reactions, Allosteric enzymes – The Monad – Changeux – Wyman model (MCW) and The Koshland – Nemethy – Filmer (KNF) model, Temperature and pH effects on enzyme activity. Methods of immobilization of enzymes, Kinetics of immobilized enzymes – Effects of external mass transfer and intra – particle diffusion.

UNIT - IV EXTRACTION AND PURIFICATION OF ENZYMES

Methods of production of enzymes, Extraction of Enzymes –soluble enzymes – membrane bound enzymes – Nature of extraction medium – purification of enzyme – criteria of purity – Determination of molecular weight of enzymes.

UNIT -V INSTRUMENTAL TECHNIQUES IN ENZYMATIC ANALYSIS

Principles – Manometry – Spectrophotometry – Spectrofluorimetry – Electrochemical methods –
Enthalpimetry – Radio chemical methods – Automation in enzymatic analysis.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Metalloenzymes Changeux – Wyman model (MCW) *Advances* in Biological Regulation,
Applied Biochemistry and Biotechnology - Part A *Enzyme Engineering* and Biotechnology

MATERIALS FOR STUDY AND REFERENCE

1. Trevor Palmer and Philip Bonner," *Enzymes*", 2nd edition, East West Press, New Delhi,
   2008.
2. Robert A. Copeland, *"Enzymes-A Practical Introduction* to Structure, Mechanism and
   Data Analysis", 2nd edition, John Wiley and Sons, 2004.
3. Harwey W. Blanch and Douglas S. Clark. "*Biochemical Engineering"* ,CRC Press,1997

WEB RESOURCE LINKS

➢ https://www.omicsonline.org/.../currentissue-enzyme-engineering-open-access.php
➢ www.imedpub.com/scholarly/enzyme-engineering-journals-articles-ppts-list.php
➢ https://www.researchgate.net › ... › Biotechnology › Industrial Biotechnology

COURSE OUTCOMES

After completion of this course student would be able to

➢ Know the aspects of monomeric and oligomeric enzymes.
➢ Use the biotechnological applications of enzymes and applications of enzymes in
  various industries.
➢ Learn the mechanisms of reactions catalysed by enzymes.
➢ Describe the facts about metalloenzymes.
➢ Explain the kinetics of immobilized enzymes.
➢ Understand the methods of production of enzymes.
➢ List the details of Spectrofluorimetry.
➢ Become acquainted with the knowledge on automation in enzymatic analysis.

METABOLOMICS AND METABOLIC ENGINEERING

COURSE CODE: MSCBI035.3/MSFBI095.3   CREDIT: 5

COURSE OBJECTIVES

- ➢ To know importance of metabolic engineering, isotope labelling, bottom up and top down approaches

UNIT -I   INTRODUCTION TO METABOLOMICS

Overview of metabolomics- Metabolomics *in Arabidopsis thaliana*- Lipidomics.

UNIT -II   METABOLOME INFORMATICS

Introduction to the ARM Database- The Genome-Based E-CELL Modeling (GEM) System- Large-Scale Simulation of Metabolism-Metabolomics and Medical Sciences

UNIT-III   INTRODUCTION TO METABOLIC ENGINEERING

Importance of metabolic engineering-comprehensive models for cellular reactions-material balances & data consistency- metabolic pathway synthesis.

UNIT -IV   METABOLIC FLUX ANALYSIS AND ITS APPLICATION

Theory-determination of flux by isotope labeling-Metabolic control analysis- (control coefficients and summation theorems, FCC determination)-Grouping of reactions (gFCC, identification of independent pathways).

UNIT -V   FLUX ANALYSIS OF METABOLIC NETWORKS

Bottom up and Top down approaches- case study-optimization of flux amplification- consistency tests and experiment validation

UNIT-VI ADVANCED TOPICS AND LATEST DEVELOPMENTS (Not for exams)

The study of small metabolites, Bioinformatics, proteomics, systems biology

TEXTBOOKS:

1. M. Tomita, T. Nishioka, *Metabolomics- The Frontier of Systems Biology*, Springer Publications, 2003.
2. Gregory N. Stephanopoulos, *Metabolic Engineering- Principles and Methodologies*, Academic press, First Edition, 1998.

MATERIALS FOR STUDY AND REFERENCE

1. S. Cortassa, *An Introduction to Metabolic and Cellular Engineering*, World scientific public company Ltd., 2002.
2. Wolfram Weckwerth, *Metabolomics: Methods and Protocols*, Humana Press, 2007.

WEB RESOURCE LINKS

➢ **https://www.sciencedirect.com/topics/medicine-and-dentistry/metabolomics**
➢ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4850886/
➢ www.cell.com/cell-metabolism/abstract/S1550-4131(16)30503-4

COURSE OUTCOMES

After completion of this course student would be able to

➢ Know the facts about Lipidomics.
➢ Give an introduction to the ARM Database.
➢ Discuss the aspects of genome-based E-CELL modelling (GEM) system.
➢ Write the importance of metabolic engineering.
➢ Provide the details about metabolic pathway synthesis.
➢ Give an explanation about the determination of flux by isotope labelling.
➢ Explain the aspects of the bottom up and top down approaches in Metabolomics.
➢ Describe the details about the optimization of flux amplification.

NON - MAJOR ELECTIVE- II BASICS OF BIOINFORMATICS

COURSE CODE: MSCBI036 /MSFBI096   CREDIT: 2

COURSE OBJECTIVES

- ➢ To learn about the bioinformatics databases, databanks, data format and data retrieval from the online sources.
- ➢ To make students understand the essential features of the interdisciplinary field of science for better understanding biological data.
- ➢ To provide the student with a strong foundation for performing further research in bioinformatics.

UNIT -I INTRODUCTION

Bioinformatics – An overview, Definition & History; Information Networks – Internet in Bioinformatics – Bioinformatics databases & tools on the Internet.

UNIT -II BIOLOGICAL SEQUENCE ANALYSIS

Biological Sequence analysis – Pair wise sequence comparison – Sequence queries against biological databases – BLAST and FASTA - Multiple sequence alignments - Phylogenetic alignment.

UNIT -III GENOME SEQUENCES

Genomics and Proteomics – Sequencing genomes– Genome databases on the web.

UNIT -IV PROTEIN INFORMATION RESOURCES

Proteins – Amino acids – Peptide bond —— Levels of protein structure - □-helix, β-sheet and β-turns – Ramachandran Map - Super secondary structures – Domains - quaternary structure - DNA and RNA structure - Watson and Crick model - A, B and Z forms of DNA - RNA secondarystructure.

UNIT -V PROTEIN STRCTURE AND VISUALIZATION TOOLS

Protein structure visualization tools – RasMol, Swiss PDB Viewer - Structure – Classification, alignment and analysis – SCOP, CATH, FSSP.

UNIT -VI Current Contours: (For Continuous Internal Assessment only)

Advanced Genome Analysis Techniques - Comparative Genome Analysis - Open Problems about Evolution and Phylogeny - Open Problems about Protein Structure and Function

MATERIALS FOR STUDY AND REFERENCE

1. T.K. Attwood and D.J. Parry-Smith, *Introduction to Bioinformatics*, Pearson Education Ltd., New Delhi(2004).
2. D.R. Westhead, J.H. Paris and R.M. Twyman, *Instant Notes: Bioinformatics* – Viva Books Private Ltd, New Delhi(2003).
3. Arthur M. Lesk, *Introduction to Bioinformatics,* Oxford University Press, NewDelhi (2003).
4. D. Higgins and W. Taylor (Eds), *Bioinformatics- Sequence, structure and databank*s, Oxford University Press, New Delhi(2000).

WEB RESOURCE LINKS

➢ www.Bioinformatics.org
➢ www.bioinfo.mbb.yale.edu/mbb452a/intro/
➢ www.biology.ucsd.edu/others/dsmith/Bioinformatics.html
➢

COURSE OUTCOMES

After completion of this course student would be able to

➢ Explain the features of DNA sequence analysis.
➢ Describe the details about the pair wise sequence alignment methods.
➢ Learn the aspects of the application of bioinformatics.
➢ Illustrate the features of the Watson and Crick model.
➢ Write the importance of bioinformatics.
➢ List the details on protein-protein BLAST and PSI-BLAST.
➢ Outline an overview of bioinformatics and applications.
➢ Identify the details about nucleotide sequence databases.

CODE	NATURE	COURSE	L	T	P	C	
MSCBI041	CORE	Project Work II	-	-	-	12	6 months
		TOTAL				**12**	

PROJECT WORK II

COURSE CODE: MSFBI066   CREDIT: 6

Credits: 6

Project Report   : 75 Marks

Viva voce Exam   : 25 Marks

COURSE OUTCOMES

After completion of this course student would be able to

- ➢ Carrying out literature survey
- ➢ Formulate research problems
- ➢ Framing the objectives for the research problem.
- ➢ Choosing correct methodology for particular problem
- ➢ Obtaining the results for the mentioned objectives
- ➢ Discussing the results for the mentioned objectives
- ➢ Prepare the project report.
- ➢ Understand the importance of adding references to the project report.

BHARATHIDASAN UNIVERSITY   **TIRUCHIRAPPALLI – 620 024**
M.Sc. Biotechnology   **Course Structure under CBCS**
(For the candidates admitted from the academic year 2016-2017 onwards)

Sem	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks Int.	Marks Ext.	Total
I	Core Course - I (CC)	Cell Biology	6	4	3	25	75	100
	Core Course - II (CC)	Microbiology	6	4	3	25	75	100
	Core Course - III (CC)	Biochemistry	5	4	3	25	75	100
	Core Course - IV (CC)	Molecular Biology	5	4	3	25	75	100
	Core Practical - I (CP)	Cell Biology, Microbiology, Biochemistry & Molecular Biology (P)	8	4	3	40	60	100
	TOTAL		**30**	**20**				**500**
II	Core Course - V (CC)	rDNA Technology	6	5	3	25	75	100
	Core Course - VI (CC)	Immunology	6	5	3	25	75	100
	Core Practical - II (CP)	rDNA Technology & Immunology (P)	8	4	3	40	60	100
	Elective Course - I (EC)	Bio Instrumentation	5	5	3	25	75	100
	Elective Course - II (EC)	Bio Informatics	5	5	3	25	75	100
	TOTAL		**30**	**24**				**500**
III	Core Course – VII(CC)	Plant Biotechnology	6	5	3	25	75	100
	Core Course – VIII (CC)	Animal Biotechnology	6	5	3	25	75	100
	Core Practical - III (CP)	Plant and Animal Biotechnology (P)	8	4	3	40	60	100
	Elective Course – III (EC)	Biostatistics, Bioethics and IPR	5	5	3	25	75	100
	Elective Course - IV (EC)	Biotechnology for Entrepreneurs	5	5	3	25	75	100
	TOTAL		**30**	**24**				**500**
IV	Core Course - IX (CC)	Bioprocess Technology	5	5	3	25	75	100
	Core Course - X (CC)	Food Technology	5	5	3	25	75	100
	Core Practical - IV (CP)	Bioprocess and Food Technology (P)	8	4	3	40	60	100
	Elective Course - V (EC)	Environment Biotechnology and Nanotechnology	5	4	3	25	75	100
	Project		7	4	-	-	-	100
	TOTAL		**30**	**22**				**500**
	GRAND TOTAL		**120**	**90**				**2000**

Note:

Project   : 100 Marks
Dissertation   : 80 Marks
Viva Voice   : 20 Marks

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Core Papers       - 10
Core Practical    -  4
Elective Papers   -  5
Project           -  1
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Note:

1. Theory   Internal   25 marks   External   75 marks

2. Practical   "   40 marks   "   60 marks

3. Separate passing minimum is prescribed for Internal and External

   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The passing minimum not less than 50% in the aggregate.

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CORE COURSE I

CELL BIOLOGY

PREAMBLE

Scope: This paper provides a thorough knowledge about structure and function of cells, cellular signaling, protein trafficking, bio molecules and cellular development.

Objective: Understanding the structural and functional aspects of the cell provides the student with a strong foundation in the molecular mechanisms underlying cellular function.

Goal: Students after completion of this paper will be exceptionally well prepared to pursue careers in cellular and sub cellular biological research, biomedical research, or medicine or allied health fields.

Unit I   Cell structure

Introduction to cell: Prokaryotic, akaryotic and eukaryotic cell. Biosis, viroid, mycoplasmas and cyanobacteria (gene organization only). Difference between plant and animal cell at different level.

Plasma Membrane: The lipid layer, membrane proteins, membrane carbohydrate, membrane transport of small molecules, cell adhesion, cell junction and extra cellular matrix.

Cell Wall: Chemical composition, cross linkage, porosity, tensile strength, turgor modifications in special types of cells. Plasmadesmeta and fluid transport between cells.

Unit II   Cell Organelles

Endoplasmic Reticulum: Types – rough & smooth. Ultra structure. Role in compartmentalization, intracellular transport & lipid biosynthesis.

Ribosomes: Ultra structure, general chemistry, assembly and function.
Golgi Apparatus: Structure and functions.

Mitochondria: Ultra structure and membrane organization. Role of mitochondria in cellular energies & biogenesis.

Chloroplast: Structure and function. Photosynthesis. Photosynthetic units and reaction centers. Photophosphorylation. CO_2 fixation and synthesis of carbohydrates. Importing proteins in chloroplast and biogenesis.

Lysosomes: General organization, polymorphism, enzyme systems and their functions. Vacuoles and ergastic substances.

Peroxisomes: Formation, enzyme content and role.

Unit III   Nuclear Material

Cytoskeleton: Microtubules, microfilaments & associated proteins – actin, myosin and intermediate filaments. 3 dimensional organization of cytoskeleton.

Nucleus: Nucleus, nuclear envelops, nucleoplasam, chromatin and chromosomes. Nuclear division.

Unit IV   Organization of Chromosomes, Cell Division & Cell Cycle

Specialized chromosomes, chromosomal abnormalities and qualitative inheritance. Population genetics and developmental genetics using *Drosophila melanogaster* as model system. Somatic cell genetics.

C**ell Division**: Mitosis, meiosis and binary fission. Cell cycle, cell cycle clock & check points.

Cell Cycle and Cell Growth Control: Overview of cell cycle; molecular mechanisms for regulating mitotic events; check points in cell cycle regulation; meiosis; cell birth, lineage and death; Cancer – genetic basis of cancer; Oncogenes and tumour suppressor genes.

Unit V   Microbial Cell Biology

Structural organization of prokaryotic cell. Cell appendages – cilia, pili, fimbriae & flagella. Cell wall structure and bacterial surface layers. Cytoplasm. Bacteria as example for prokaryote. Eukaryotic cell organization – filamentous fungus and yeast as example.

Text Books

1. Freifelder D. 1985. Molecular Biology, Narosa Publishing House. New Delhi.
2. Lewin B. 2007. Genes IX. Oxford University Press, London.
3. Ajoy Paul. 2011. Textbook of Cell and Molecular Biology. Books and Allied Ltd.
4. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. 2008. Molecular Biology of Cell. 6th Edition. Garland Science, Taylor & Francis group Publishers.
5. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. 1995. Molecular Cell Biology. 3rd Edition. W.H. Freeman Publishers.

Reference Books

1. Watson JD, Gilman M, Witkowski J and Zoller M. 1992. Recombinant DNA. Scientific American Books. 2nd Edition. New York.
2. Blackburn GM and Gait MJ. 1996. Nucleic Acids in Chemistry and Biology. Oxford University Press.
3. Lodish H, Baltimore D, Beck A, Zipursky SL, Matsudaria P and Darnell J. 1995. Molecular Cell Biology. Scientific American Books.
4. Cooper M 1995. The Cell Molecular Approach. 2nd Edition. ASM Press.
5. Lewis J Kleinsmith and Valerie M Kish. 1980. Principle of Cell and Molecular Biology 2nd Edition. Benjamin-Cummings Publishing Company.
6. De Robertis, EDP and E.M.F Robertis. 1980. Cell and Molecular Biology. 7th Edition. Saunders Company.
7. T.A. Brown. 2011. Introduction to genetics: A molecular approach. 1st Edition. Garland Science.
8. J.D.Watson, Tania A. Baker, Stephen P. Bell, Michael Levine and Richard Losick. 2013. Molecular Biology of the Gene. 7th Edition. Benjamin/Cummings Publ. Co., Inc., California.
9. Benjamin Lewin. 2008. Genes XI. 9th Edition. Jones & Bartlett Learning.
10. R.A. Meyers. 1995. Molecular Biology and Biotechnology. A comprehensive desk reference. (Ed) Wiley-Blackwell Publishers.

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MICROBIOLOGY

Scope: This paper deals with various types of classification of microbes. The paper also throws light on multifarious habitats of microbes and provides information about all the microbial cellular functions and various metabolic pathways in microbes.

Objective: To impart knowledge on classification of microbes. This paper is also designed to provide knowledge on metabolic function and biochemical reaction going on inside the microbial cell

Goal: This paper enables the students to identify any microorganisms. The students will be able to understand and predict the intermediate metabolism of any microbe used in industrial production processes

Unit I   Introduction to Microbiology

Discovery of microbial world, the experiment of Pasteur, the era of discovery of antibiotics and anaerobic life. Types and classification of microbes. Isolation, identification, characteristics and ultra structure of microbes – Viruses, Bacteria, Fungi and Algae. Various associations of microbes.

Unit I1   Microbial Biodiversity, Growth and Molecular Systematic

Origin and evolution of microorganisms. Concepts of species and hierarchical taxa. Bergy's system of classification – Viruses, Bacteria, Fungi. Biological nomenclature - Measurement of species richness and evenness. Simpson's diversity index – Multivariate analysis.

Microbial Nutrition and Growth: Principles of microbial nutrition – carbon, nitrogen, sulphur, growth factors, nutritional requirements of Bacteria. Nutritional uptake and transport. Nutritional classification of Bacteria. Culture media preparation. Types of media - Selective media, Enrichment media and Differential media.

Molecular Systematic: Polyphasic approach –16S rRNA gene sequencing, Phylogenetic grouping. Mol % G+C analysis, DNA-DNA hybridization, Fatty Acid Methyl Ester (FAME) analysis, peptidoglycan, Isoprenoid and quinines. Microbial Community analysis: DGGE, TGGE, SSCP, T-RFLP, FISH.

Unit III   Microbial Metabolism

Influence of environment on microbial physiology. Physical factors – radiations, temperature, pH and pressure. Chemical factors – nutrients, water, C, H, O, N, P, S. Growth factors - amino acids, purines, pyrimidines, nucleosides, nucleotides, vitamins, lipids, inorganic nutrients. Antimicrobial compounds, metabolic inhibitors. Response to environment – growth and reproduction; growth inhibition and death, movement, differentiation. Modification to the environment – changes in chemical composition, changes in physical properties. Quantitative measurement of bacterial growth by cell mass, cell number and cell activity. Maintenance and preservation of cultures.

Unit - IV   Methods in Microbiology

Isolation of microbes from various sources - serial dilution, pure culture and culture préservation techniques. Microbial culture collection centers. **Staining techniques** – Simple & differential - Gram, endospore, negative, flagellar staining. **Sterilization**

techniques: 1. Concept of sterilization, disinfection, asepsis and sanitation. Moist heat; dry heat, pasteurization, Richards' rapid method - HTST (high temperature/short time) treatments; filter sterilization. 2. Sterilization methods - batch sterilization, continuous sterilization of medium and air. Physical methods of control - temperature, radiation, desiccation, osmotic pressure and filtration. Chemical methods of control - phenol, alcohol, halogens, heavy metals, dyes, detergents, quaternary ammonium compounds, aldehydes and gaseous chemosterilizers. Evaluation of antimicrobial potency of disinfectants and antiseptics - tube dilution, agar diffusion. phenol coefficient.

Unit V   Microbial Genetics

Genetic system of bacteria – transformation, transduction, recombination. Extra cellular genetic material - plasmids and transposons. Genetic systems of viruses – Phage I, RNA viruses and retroviruses. Genetic system of fungi – Yeast and Neurospora. Genetic system of protozoa and mycoplasma. Gene regulation - prokaryotic gene regulation. Operon concept -lac operon and tryptophan operon.

Metagenomics - Culture Independent Studies: Exploring and exploiting the microbial gene pool. Methods to detect and quantify bacteria in various ecological niches. Analysis of microbial communities in microhabitats using FISH. Functional characterization of microbial communities by mRNA analysis. Detection of active bacterial populations in soil.

Text Books

1. Prescott, Harley, Klein. 2003. Microbiology. 5th Edition. McGraw Hill Publ.
2. Bernard R. Glick & Jack J. Pasternak. 2002. Molecular Biotechnology. Indian edition. Panima Publishing Corporation.
3. Pelzer, Chan and Kreig. 1986. Microbiology. 5th Edition. McGraw-Hill.

Reference Books.

1. Tortora, G.J., Funke, B.R. and Case, C.L. 2012. Microbiology - An Introduction. 11th *Edition.* Pearson Education.
2. Stainer, Ingharam, Wheelis and Painter. 1987. General Microbiology. 5th Edition. Macmillan Education, London.
3. A.J. Salle. 1974. Fundamental Principles of Bacteriology. Tata McGraw – Hill Edition.
4. AH Rose. 1977. Chemical Microbiology – An introduction to microbial physiology. Butterworth, London.
5. S. Meenakumari. 2006. Microbial Physiology. MJP Publishers.
6. MT Madigan, JM Martinko and Jack Parker. Brock Biology of Microorganisms. 10th Edition. Pearson and Education Inc., New Jersey.
7. David Freifelder, David M. Freifelder and John E. Cronan. 1994. Microbial genetics. 2nd Edition. Jones & Bartlett Publishers.
8. R.W. Old and S.B. Primrose. 1985. Principles of gene manipulation. Blackwell Scientific Publications.
9. Benjamin Lewin. 2006. Genes IX. 9th Edition. Jones and Bartlett publishers.
10. R.A. Atlas. 1998. Microbiology, Fundamental and Applications. 2nd Edition. McMillan Publishers.
11. Powar and Daginawala. 2010. General Microbiology. Volume – I. Himalaya Publishing House.

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CORE COURSE III

BIOCHEMISTRY

Objectives

This paper aims to study the structure, properties and metabolism of different biomolecules and to know the interrelationships between different metabolisms.

Unit I   Introduction

Chemical basis of life and composition of living matter. Biomolecules - chemical composition and bonding. Properties of water, acids, gases and buffer. pH, ionization and hydrophobicity. Emergent properties of biomolecules in water and bimolecular hierarchy. Macromolecules and molecular assemblies – relationship between structure and function. Structure and biochemical organization of amino acids, proteins, carbohydrate, fatty acids nucleic acids and vitamins.

Unit II   Amino Acids, Proteins and Enzymes

Amino acids - Structure and functional group, properties. Biosynthesis, types, properties and metabolism of amino acids.

Proteins - Peptides and covalent structure of proteins. Elucidation of primary and higher order structures. Ramachandran plot, structural characteristics of protein. Structure - function relationship in model proteins like ribonuclease A, myoglobin, hemoglobin and chymotrypsin. Tools to characterize the expressed proteins.

Enzymes - Nomenclature, classification, properties, structure and functional relationship. Enzyme catalysis and general principles of catalysis. Quantification of enzyme activity and efficiency. Enzyme characterization and Michaelis-Menten kinetics. Relevance of enzymes in metabolic regulation, activation, inhibition and covalent modification. Single substrate and multi-substrate enzymes. Mechanism of action.

Unit III   Carbohydrates and Lipids

Carbohydrates - Structure and classification. Sugars - mono, di, and polysaccharides, chemical composition and bonding. Cellular structure, energy storage and signaling. Glycosylation of biomolecules – glycoproteins and glycolipids. Glycolysis, Kreb's cycle, Gluconeogenesis and HMP pathway.

Lipids - Structure, classification and properties. Lipid metabolism. Oxidation - Fatty acids and cholesterol. Biosynthesis of lipids. Lipid storage and membrane lipids. Lipoproteins. Biomembrane organization - sidedness and

function. Membrane bound proteins - structure, properties and function. Transport phenomena of nucleosides and nucleotides.

Unit IV   Nucleic Acids and vitamins

Nucleic acids - Structure, diversity and function. Sequencing of nucleic acids. Brief overview of central dogma.

Vitamins - Classification and derivatives. Secondary metabolites from plants.

Unit V   Law of Thermodynamics

Bioenergetics - basic principles, equilibrium and concept of free energy, redox potential and their applications. Coupled processes - process of photosynthesis. Logic and integration of central metabolism – entry and exit of various biomolecules from central pathways. Principles of metabolic regulation. Regulatory steps, signals and secondary messengers.

Texts Books

1. L. Lehninger. 2004. Principles of Biochemistry, 4th Edition. W.H Freeman and Company.
2. Stryer. 2002. Biochemistry. 5th Edition. W.H. Freeman and Company.
3. M.N. Chattergea Rana Shinde. 2011. Text book of Medical Biochemistry. 8th Edition.J.P. Medical Ltd.

References Books

1. Donald Voet and Judith G.Voet. 2004. Biochemistry. 3rd Edition. John Wiley, New York.
2. Allan Fershi. 1984. Enzyme structure and mechanism. 2nd Edition. W.H.Freeman & Co. Ltd., USA.
3. Trevor Palmer. 1985. Understanding Enzymes. 2nd Edition. Ellis, Horwood Limited.
4. Victor W. Rodwell, David A Bender, Kathleen M. Botham, Peter J. Kennelly and Anthony P. Weli. 2015. Harper's Illustrated Biochemistry. 30th Edition. Mc Graw Hill Lange Medical Books.

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CORE COURSE IV

MOLECULAR BIOLOGY

Objectives

This paper is aimed to understand the basic structure and functioning of the genetic materials – DNA, RNA and to understand the changes in the genetic material and the consequences.

Unit I   Introduction

Nucleic Acid, Bases, Nucleoside, Nucleotide Types: Overview of Molecular biology, discovery of DNA as genetic material and structure of DNA - Watson and Crick model. DNA & its types. RNA & its types, structure and function. Chromosomes, chromatin and their function. Prokaryotic replication of DNA/RNA and enzymes involved. DNA repair mechanisms and recombination.

DNA Replication: Prokaryotic and Eukaryotic DNA replication. Mechanism of DNA replication. Enzymes & proteins involved in DNA replication. Models of replication - Semi-conservative, unidirectional, bidirectional, rolling circle mechanism. Inhibitors of DNA replication.

Unit II   Central Dogma - Transcription & Translation.

Transcription: Prokaryotic transcription, transcription unit, promoters - constitutive and inducible, operators and regulatory elements. Initiation, elagation, termination, Rho-dependent and independent and   anti - termination. Post transcriptional modifications. Processing of hnRNA, tRNA, rRNA, 5' cap formation, 3' end processing and polyadenylation. Splicing, RNA editing, nuclear export of mRNA, mRNA stability and catalytic RNA.

Translation : Translation machinery, ribosomes, composition and assembly. Universal genetic code, degeneracy of codons and termination codons, isoaccepting tRNA and Wobble hypothesis. Mechanism of initiation, elongation and termination. Co and post translational modifications. Transport of proteins and molecular chaperones. Protein stability, protein turnover and degradation.

Unit III   Mutation

Mutation. Types - Non sense mutation, missense mutation and point mutations, intragenic and intergenic suppression and frame shift mutations. Physical, chemical and biological mutagens. Transposition, mechanisms of transposition and role of transposons in mutation. Gene as unit of mutation and recombination. Molecular nature of mutation, mutagen and origin of spontaneous mutations. Gene transfer mechanisms - transformation, transduction, conjugation, transfection and their applications. **Regulation in eukaryotes:** gene loss, gene amplification, gene rearrangement. Regulation of synthesis of primary transcripts, transcriptional control by hormones.

Unit IV   Extra-chromosomal hereditary materials & transposable genetic elements

Extra-chromosomal hereditary material
Plasmids: Biology of plasmids, discovery, types and structure of R, Rif, Col factors & Ti plasmids. Replication, incompatibility and copy number. Natural & artificial plasmids. Plasmid curing, plasmid transfer and their applications.

Transposable genetic elements: Discovery, early experiments of McClintock in maize. Insertion sequence in prokaryotes. Complex transposons (Tn10, Tn3 & Tn9 as examples). Mechanisms, control, consequences and applications of transposition by simple & complex elements. transposable genetic elements in prokaryotes and eukaryotes and their uses in genetic analysis.

Unit - V   Genetic analysis of microbes

Genetic analysis of microbes - bacteria and yeast. Bacteriophages, Lyticphages - T 7and T4. Lysogeneic phages - I and P1, M13 and f X174. Life cycle and their uses of microbial genetics. Microbial genetics and design of vaccines for BCG, TB and leprosy. DNA vaccine, designing and advantages.

Text Books

1. Ajoy Paul. 2011. Textbook of Cell and Molecular Biology. Books and Allied Ltd.
2. Benjamin Lewin. 2007. Gene IX. 9th Edition, Jones and Barlett Publishers.
3. J.D.Watson, N.H. Hopkins, J.W Roberts, J. A. Seitz & A.M. Weiner. 2007. Molecular Biology of the Gene. 6th Edition. Benjamin Cummings Publishing Company Inc.
4. Watson JD, Gilman M, Witkowski J, Zoller M. 1992. Recombinant DNA. Scientific American Books.

References

1. Bruce Alberts, Alexander Johnson. Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter. 2014. Molecular Biology of Cell. Garland Science publication.
2. Burton E. Tropp. 2012. Molecular Biology – Genes to Proteins. Jones and Bartlett Publishers.
3. George M. Malacinski. 2013. Freifeder's Essentials of Molecular Biology. Norosa Publishing House.
4. Stanely R. Maloy, Jhon E Cornan Jr, David Freifelder. 1994.Microbial genetics. 2nd Edition. Jones and Bartlett publisher.
5. Uldis N. Streips and Ronalad E. Yasbin. 2002. Modern Microbial Genetics. 2nd Edition. Wiley-Blackwell.
6. Sandy B. Primrose, Richard M. Twyman and Robert W. Old. 2008. Principles of Gene Manipulation. 6th Edition. Blackwell Science.

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CORE PRACTICAL I

CELL BIOLOGY, MICROBIOLOGY, BIOCHEMISTRY & MOLECULAR BIOLOGY (P)

Objectives

In this course the students will get hands on experience in Cell Biology, Microbiology, Biochemistry & Molecular Biology Techniques.

Cell Biology

1. Microtomy – (Demo).
2. Prokaryotic & eukaryotic cell - structure observation.
3. Cell count - prokaryotic & eukaryotic.
4. Types of cells - parenchyma, collenchyma, sclerenchyma, columnar epithelium, squamous epithelium.
5. Leishman staining
6. Giemsa staining
7. Total (WBC, RBC) & differential count of human blood cells.
8. Separation of Peripheral Blood Mononuclear Cells from blood.
9. Osmosis and Tonicity.
10. Cell Division - Cytological preparations of tissues (onion) for mitosis.
11. Cell Division - Cytological preparations of tissues (Tradescantia) for meiosis.
12. Cell Division - Binary fission of yeast
13. Polytene and diplotene chromosomes.
14. Temporary and permanent slide preparation.
15. Sub-cellular fractionation.

Microbiology

1. Microscopy - Observation of different microbes.
2. Sterilization techniques – physical, chemical, filtration and irradiation techniques.
3. Preparation of media - simple media and complex media.
4. Isolation of microorganisms from air, soil & water - spread plate, pour plate, streak plate techniques
5. Staining methods – simple, differential, acid - fast & negative
6. Identification - Macroscopic, microscopic, biochemical, serological & generic level.
7. Bacterial growth curve - colony counting, cell counting, spectrophotometric method.
8. Preservation & maintenance.
9. Antibiotic sensitivity test – Kirby - Bauer method.

Biochemistry

1. Preparation of solutions – Molar, Normal, Percentage, Stock, Working etc.
2. Preparation of buffers – PBS, Tris and Acetate buffer.
3. Identification of sugars - reducing & non-reducing sugars.

4. Estimation of mono saccharine (glucose) by Nelson, Somogi method & polysaccharide (starch) by iodine method.
5. Estimation of amino acid by Ninhydrin method.
6. Estimation of protein by Lowry's method and Barford Method
7. Estimation of nucleic acids by absorbance at 260 nm and hyperchromic effect.
8. Enzyme assay: Estimation of salivary amylase from saliva & phosphatase from potato
9. Estimation of DNA by diphenylamine and RNA by orcinol method.
10. Estimation of lipids - cholesterol, PUFA & steroid.
11. Estimation of vitamins – ascorbic acid, α-tocopherol & β – carotenoids.

Molecular Biology

1. Isolation and purification of genomic DNA from prokaryotes.
2. Isolation and purification of genomic DNA from eukaryotes.
3. Isolation and purification of plasmid DNA.
4. Observation of DNA - Agarose gel electrophoresis.
5. Quantification of nucleic acids – DNA & RNA – Chemical and UV method.
6. Separation of protein by SDS PAGE
7. Protein staining techniques. Amido black, coomosic brilliant blue & $AgNO_3$.
8. Transfer of protein - Western blot.
9. Observation of transferred protein – staining (Indian ink), immunoblot.
10. Bacterial mutagenesis – physical & chemical.
11. Preparation of *E. coli* competent cells.
12. Transformation of bacteria – $CaCl_2$ method.
13. Bacterial conjugation.
14. Transduction.

Reference Books

1. S.Sadasivam., A. Manickam. 1996. Biochemical Methods. 2nd Edition. New Age International (p) Ltd, Publishers.
2. Dr. G.Rajagobal., Dr. B.D.Toora. 2001. Practical Biochemistry. 1st Edition. Ahuja Book Company Pvt.Ltd.
3. J.Jayaraman. 2000. Laboratory Manual in Biochemistry. New Age International Publishers.
4. Plummer Mu, David T. Plummer. 1988. Introduction to Practical Biochemistry. Tata McGraw-Hill Education.
5. Gunasekaran, P. 2009. Laboratory Manual in Microbiology. 1st Edition. New Age International Publishers. Reprint 2009.
6. Dr. T. Sundararaj. Microbiology Laboratory Manual. Dr.A.L. MPGIBMS, University of Madras, Taramani, Chennai – 600 113.
7. Arnold L. Demain & Julian E. Davies. 1999. Manual of Industrial Microbiology and Biotechnology. 2nd Edition. ASM press.
8. M. Mooyoung. 1985. Comprehensive Biotechnology. Vol. 2, 3 & 4. Pergamon press.
9. Dr. David A Thompson. 2011. Cell and Molecular Biology Lab Manual.

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CORE COURSE V

rDNA TECHNOLOGY

Objectives

This paper is aimed to study the various principles underlying genetic engineering that forms the basis of rDNA technology and to study the methodologies, and in brief the applications and related issues of rDNA technology.

Unit I   Basics Concepts

DNA structure and properties. Restriction enzymes, DNA ligase, klenow enzyme, T4 DNA polymerase, polynucleotide kinase, alkaline phosphatase, cohesive and blunt end ligation, linkers, adaptors and homopolymeric tailing. Labeling of DNA - nick translation, random priming, radioactive and non radioactive probes, hybridization techniques - northern, southern and colony hybridization, fluorescence *in- situ* hybridization, chromatin immuno-precipitation, DNA - protein interactions, electromobility shift assay, DNeI foot printing and methyl interference assay.

Unit II   Cloning Vectors

Plasmids, bacteriophages, M13 mp vectors, PUC19 and blue script vectors. Phagemids, lambda phage vectors, insertion and replacement vectors, EMBL, cosmids, artificial chromosome vectors (YAC, BAC), animal virus derived vectors - SV40, vaccinia/bacculo & retroviral vectors. Expression vectors – pMal, GST and pET based vectors. Protein purification. his-tag, GST-tag, MBP-tag etc., intein-based vectors, inclusion bodies, methodologies to reduce formation of inclusion bodies, baculovirus and pichia vectors system, plant based vectors, Ti and Ri as vectors, yeast vectors and shuttle vectors.

Unit III   Cloning Methodologies

Insertion of foreign DNA into host cells, transformation, construction of libraries, isolation of mRNA and total RNA. cDNA and genomic libraries, cDNA and genomic cloning, expression cloning and protein-protein interactive cloning. Yeast two hybrid system, phage display and principles in maximizing gene expression.

Unit IV   PCR and its Applications

Primer design, fidelity of thermostable enzymes, DNA polymerases, types of PCR - multiplex, nested, reverse transcriptase, real time, touchdown, hot start, and colony. Cloning of PCR products, T-vectors, proof reading enzymes, PCR in gene recombination, deletion, addition, overlap extension, and site specific mutagenesis. PCR in molecular diagnostics, viral and bacterial detection, PCR

based mutagenesis, mutation detection - SSCP, DGGE, RFLP, oligo ligation assay (OLA), Mismatch Chemical Cleavage (MCC), Allele-Specific Amplification (ASA) and Protein Truncation Test (PTT).

Unit V   Sequencing Methods

DNA sequencing - Enzymatic, chemical & automated DNA sequencing and RNA sequencing. Chemical synthesis of oligonucleotides, introduction of DNA into mammalian cells, and transfection techniques. Gene silencing techniques, introduction to siRNA, siRNA technology, micro RNA, construction of siRNA vectors, principle and application of gene silencing. Gene knockouts and gene therapy, creation of knockout mice, disease model, somatic and germ line therapy – *in-vivo* and *ex-vivo*, suicide gene therapy, gene replacement and gene targeting.   Transgenics, cDNA and intragenic arrays, differential gene expression and protein array.

Text Books

1. S.B. Primrose, R.M. Twyman and R.W.Old. 2001. Principles of Gene Manipulation. 6th Edition. S.B.University Press.
2. J.D. Watson, N.H. Hopkins, J.W Roberts, J. A. Seitz & A.M. Weiner. 2007. Molecular Biology of the Gene. 6th Edition. Benjamin Cummings Publishing Company Inc.
3. Watson JD, Gilman M, Witkowski J, Zoller M. 1992. Recombinant DNA. Scientific American Books.

Reference Books

1. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. 2002. Molecular Biology of the Cell, 4th Edition. Garland Sciences.
2. Stanley Maloy 1994. Microbial genetics. 2nd Edition. Jones and Bartlett publisher.
3. Uldis N. Streips and Ronalad E. Yasbin. 2002. Modern Microbial Genetics. 2nd Edition. Wiley-Blackwell.
4. Sandy B. Primrose, Richard M. Twyman, Robert W. Old. 2008. Principles of Gene Manipulation. 6th Edition. Blackwell Science.
5. *Brown TA. 2008. Genomes. 3rd Edition.* New York: Garland Publishing Co. New York: *Garland Science.*

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CORE COURSE VI

IMMUNOLOGY

Objectives

This paper is aimed to understand the basic concepts of immune system, elucidate the immune response of humans to foreign substances and to study the modern techniques of immunology that help determine human protection.

Unit I   Fundamental Concepts and Anatomy of the Immune System

Terminology – Antigen, immunogen, hapten, allergen, tolarogen, super antigens, antibody, immunoglobulin, antigenigity, immunogenicity. Self & nonself, innate & acquired immunity. Haematopoesis. Organs, tissues, cells and mediators of immune system - primary lymphoid organs, secondary lymphoid tissues, lymphocytes, cytokines and lymphokines. Lymphatic system, lymphocyte circulation and lymphocyte homing. Mucosal and Gut associated lymphoid tissue (MALT&GALT) and mucosal immunity. Principles of cell signaling.

Unit - II   Immune Responses Generated by B and T lymphocytes

B cell: B cell development, maturation, activation and differentiation. B cell receptor and determinants. B cell subsets. Immunoglobulins - basic structure, classes & subclasses of immunoglobulins, antigenic determinants, multigene organization of immunoglobulin genes and immunoglobulin super gene family. Generation of antibody diversity.

T cell: T cell development, maturation, activation and differentiation. T cell receptor and determinant. T cell subsets. TCR complex. Antigen processing and presentation - endogenous antigens, exogenous antigens, non-peptide bacterial antigens Cell to cell co-operation and hapten-carrier system.

Unit - III   Immune Response

Recognition & response: Non specific and Specific. **Nonspecific**: Natural built-in barrier, phagocytosis. Complements, natural killing, inflammatory response. **Specific:** HI & CMI. Antigen recognition and response. Major Histocompatibility Complex - MHC genes, MHC in immune responsiveness and disease susceptibility. HLA typing. Kinetics of immune response and memory. **Unresponsiveness:** tolerance, suppression and potentiation.

Unit - IV   Vaccinology

Active, passive and combined immunization. Live, killed, attenuated, plasma derived, sub unit, recombinant DNA, protein based, plant-based, peptide, anti-idiotypic and conjugate vaccines – production & applications. Role and

properties of adjuvants & ISCOMS. Antibody genes and antibody engineering - chimeric and hybrid monoclonal antibodies, catalytic antibodies and generation of immunoglobulin gene libraries.

Unit - V   Clinical Immunology

Immunity to infection, bacteria, viral, fungal and parasitic infections (with examples from each group). Hypersensitivity – Type I, II, III and IV. Autoimmunity and types of autoimmune diseases. Mechanism and role of CD4$^+$ T cells, MHC and TCR in autoimmunity. Treatment of autoimmune diseases. Transplantation – immunological basis of graft rejection, clinical transplantation and immunosuppressive therapy. Tumor immunology, tumor antigens, immune response to tumors and tumor evasion of the immune system. Cancer immunology and immunotherapy. Immunodeficiency - primary immuno - deficiencies, acquired or secondary immuno - deficiencies.

Text Books

1. Peter J. Delves, Seamus J. Martin, Dennis R. Burton and Ivan M. Roitt. 2011. Essential Immunology 12th Edition. Wiley - Blackwell. 2. Charles A Janeway, Jr. Paul Travers, Mark Walport, and Mark J Shlomchik. 1999. Immunobiology. 4th Edition. Journal of Current Biology publications.
2. D. M. Weir and John Stewart. 1997. Immunology. 8th Edition. Churchill Livingstone.
3. P.J.Delves, I S.J.Artin, I D.R.Burton and I.M.Roitt. 2006. Essential Immunology. 11th Edition. Wiley - Blackwell.
4. Richard M. Hyde. 2012. Microbiology and Immunology. 3rd Edition. Springer Science & Business Media.

Reference Books

1. Brostoff J, Seaddin JK, Male D and Roitt IM., 2002. Clinical Immunology. 6th Edition. Gower Medical Publishing.
2. Paul William E. 1999. Fundamental of Immunology. 4th Edition. Lippencott Raven.
3. E Roitt. 2011. Essential Immunology. 12th Edition. Blackwell Publication.

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CORE PRACTICAL II

rDNA TECHNOLOGY & IMMUNOLOGY (P)

Objectives

By studying this paper the students will get trained in immological techniques and basic molecular biology techniques which are essential for them to know about rDNA technology.

rDNA Technology

Unit V Molecular Biology Techniques

1. Isolation of plasmids – small & large scale.
2. Size analysis of plasmids by agarose gel electrophoresis.
3. Restriction digestion, ligation.
4. Preparation of competent *E.coli* cells & transformation of *E.coli* with recombinant DNA.
5. Selection methods (Blue white selection, insertional inactivation).
6. Primer design and PCR amplification of β(beta)- galactosidase.
7. Cloning of PCR product into pBR322.
8. Introduction of cloned genes and analysis by SDS – PAGE.
9. Southern blotting.
10. RFLP Analysis of 18s rRNA of the genome.
11. Genetic diversity of Pseudomonas by RAPD.
12. Reporter gene assay (GUS/ β(beta)- galactosidase).
13. Northen blotting.

Immunology

Basics - Bleeding, separation of serum, plasma. (Hands on).

Precipitation techniques – Agar gel diffusion, counter immuno-eletrophoresis, single radial immuno-diffusion, rocket immuno-electrophoresis (Hands on).

Agglutination techniques
Blood grouping and Rh factor; Latex agglutination – RF, ASLO, HBsAg and CRP (Hands on); Heme agglutination - RPHA / IHA (Hands on)

Labeled Assays

1. Enzyme Linked Immunosorbent Assay (ELISA) (Hands on).
2. Immunoflouresence (IF) (Hands on).
3. Immunohistochemistry (IH) (Demonstration).
4. Immunoperoxidase (PAP) staining.
5. Radioimmunoassays (RIA) (Theory).

Animal Tissue Culture (Demonstration).

1. Preparation of tissue culture media.
2. Separation of Human PBMC & analysis.
3. Types of culture.
4. Maintenance of culture

In-vivo Testing (Theory)

1. Breeding and maintenance of experimental animals.
2. Surgical and experimental techniques – thymectomy, spleenectomy and harvesting of lymphnodes.
3. Isolation and enumeration of immune reactive cells.
4. Immunization techniques and use of adjuvants.
5. Choice of animals, form and dose of antigen, route of immunization, immunization schedule, bleeding schedule.
6. Collection of blood, separation and preservation of serum / plasma.

Text Books

1. Richard A. Goldsby, Thomas J. Kindt. Barbara, A. Osborne, Janis Kuby. 2003. Immunology. 5th Edition, W. H. Freeman & Company.
2. J. Sambrook and D.W. Russel, CSHL. 2001. Molecular Cloning: A Laboratory Manual, Vols 1-3.Cold spring Harbor Laboratory press.

Reference Books

1. J. W. Goding, Academic Press, 1983. Monoclonal Antibodies: Principles and Practice
2. T.A. Springer. 1985. Hybridoma Technology in the Biosciences and Medicine. Plenum Press New York.
3. F.Brown, R.M.Chanock, KA Lerner. 1986. Vaccines, New Approaches to immunization, Cold Spring Harbor Lab.
4. Topley and Wilson. G. Wilson, A.Miles, M.T.Paker. Arnold, Heineman, 1984. Principles of Bacteriology, Virology and immunology. Willy – Blackwell.
5. J.H.Miller. 1999. A short core courses in bacterial genetics. Cold spring Harbor Laboratory.
6. Brenda D. Spangler. 2002. Methods in Molecular Biology and protein chemistry. John Wiley & sons, Ltd.
7. Bruce Rirren/Eric. D. Green. 1997. Genome Analysis – A laboratory manual – vol I Analyzing DNA. Cold spring Harbor Laboratory press.
8. Sambrook et al., 1989. Molecular cloning: A Laboratory manual vol.I – III Cold Spring Harbor Laboratory.
9. Stanley R.Maloy, Valley.J.Stewart. 1996. Genetic analysis of Bacteria. Cold spring Harbor Laboratory press.
10. John M.S.Barlett, David Stirling. 2003. PCR protocols. Humana press Inc.
11. Robert E.Farrel Jr. 1996. RNA Methodologies. 2nd Edition. Academic press Inc.
12. Frederick M. Ausbel, Roger Breut. 2002. Short protocols in Molecular Biology. Vol I & II, 5th Edition. John Wiley & Sons Inc
13. Micheal,A. Immis, David.H.Gelfand. 1995. PCR Strategies. Academic Press, Inc.

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ELECTIVE COURSE I

BIO INSTRUMENTATION

Objectives

This course will give an understanding about the working principles, construction and applications of the instruments often used in the studies related to various disciplines of Biological Sciences.

Unit I   Basic Instrumentation (Theory & Demo)

Principles, operation protocol & applications of the following instruments: Weighing balance, pH meter, Polarography, Radioactivity, ECG, FTIR.

Unit II   Microscopy (Hands on)

Observation of different microbes. Light – Bright & Dark field; Phase contrast, Inverted Phase contrast; Fluorescent, Electron – TEM & SEM; Confocal

Unit III   Spectroscopy (Theory & Demo)

Colorimeter, Spectrometer, UV visible spectrometer, X – ray spectrometer, ELISA reader, Atomic absorption spectrometer, Flame photometer, Flourimeter & Spectro flourimeter.

Unit IV   Separation Techniques (Theory & Demo)

Centrifugation - Principle, operation, types & applications.

Chromatography - Principle, operation & applications - Paper – ascending, descending & Circular, TLC, HPTLC, GC, HPLC, Column Chromatography, Ion Exchange & Affinity Chromatography, LC – MS.

Unit V   Electrophoresis (Theory & Demo)

Native & denatured - zone, iso-electrofocusing & isotachophoresis, 1D & 2D. PCR, MoldiTof

Reference Books

1. S.SadasivamA. Manickam. 2004. Biochemical Methods. 2nd Edition. New Age International (p) Ltd, Publishers.
2. Dr. G.Rajagopal, Dr. B.D.Toora. 2005. Practical Biochemistry. 2nd Edition. Ahuja Book Company Pvt.Ltd.
3. J.Jayaraman. 2000. Laboratory Manual in Biochemistry. New Age International Publishers.
4. Plummer Mu, David T. Plummer. 1988. Introduction to Practical Biochemistry. Tata McGraw-Hill Education.
5. M. Mooyoung. 1985. Comprehensive Biotechnology. Vol. 2, 3 & 4. 2nd Edition. Pergamon press.

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ELECTIVE COURSE II

BIO INFORMATICS

Objectives

By studying this course the students will get an idea about the basic understanding about Bioinformatics, tools, sequences, algorithms and the analysis of phylogenetic tree.

Unit I   Basic Bioinformatics

Aim and branches of Bioinformatics. Application of Bioinformatics. Role of internet and www in bioinformatics. Basic biomolecular concepts: Protein and amino acids. DNA & RNA - Sequence, structure and function. NCBI, EBI, ExPASy, RCSB, DDBJ: The knowledge of databases and bioinformatics tools available at these resources. Organization of databases: data contents, purpose and utility. Algorithms; asymptotic analysis of algorithms; NP complete problems; Algorithm types; Brute force; divide and conquer; sorting algorithms.

Unit II   Methods of Sequences

Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues. Introduction to PAM and BLOSUM matrices; basic concept of a scoring matrix, matrices for nucleic acid and proteins sequences, PAM and BLOSUM series; principles based on which these matrices are derived; differences between distance & similarity matrices.

Unit III   Tools

Collecting and storing sequences. Various file formats for bio-molecular sequences: GenBank, FASTA, GCG, MSF, NBRF-PIR etc. Database searching: Using BLAST, FASTA and other sequence analysis tools to assign homology; BLAST algorithms, various versions of basic BLAST, application of methods for sequence analysis including the on-line use of the tools and interpretation of results.

Unit IV   Dynamic Programming Algorithm

Pairwise alignment methods such as Smith-Waterman and Needleman-Wunsch. Concepts behind multiple sequence alignment; ClustalW, TCoffee. Sequence patterns and profiles: Basic concept and definition of sequence patterns, motifs and profiles, various types of pattern representations viz. consensus, regular expression (prosite-type) and profiles.

Unit V   Phylogenetic Analysis

Phylogenetic tree, Neighbour joining, UPGMA. Use of Hidden Markov model (HMM) in assigning homology. Advantages and disadvantages of various sequence analysis methods.

Text Books

1. J. M.Keith. 2008. Bioinformatics. Vol. 1: Data, sequence analysis & evolution. Humana Press.
2. R. Durbin. 1998. Biological sequence analysis. Cambridge University Press.
3. M. Holmes. 2007. A Cell Biologists' guide to modeling and Bioinformatics. Wiley Interscience.
4. R.C. Elston, W.D. Johnson. 2008. Basic biostatistics for geneticists & epidemiologists – A practical approach. Jhon Wiley & Sons Pvt. Ltd.
5. P. R. Bevington. 1969. Data reduction and error analysis for the physical sciences. McGraw Hill.

Reference Books

1. Teresa K. Attwood, David J. Parry –Smith. 1999. Introduction to bioinformatics. 4th Edition. Pearson Education.

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CORE COURSE VII

PLANT BIOTECHNOLOGY

Objectives

This course will give an idea about the basic principles and techniques involved in plant cell culture and to understand the concepts of transformation and achievements of biotechnology in Plant systems.

Unit I   Basics of Plant Tissue culture
Plant tissue culture techniques. *In-vitro* pollination and fertilization. Embryo culture and its applications. Embryogenesis and organogenesis. Micropropagation, haploids and their applications. Somaclonal variations and applications. Endosperm culture and production of triploids.

Unit II   Protoplast – Culture & Genetic Manipulation

Introduction to protoplast isolation, culture and regeneration, methods of fusing protoplasts, somatic hybridization. Protoplast and tissue culture manipulation for genetic manipulation of plants.

Unit III   Plant Transgenesis

Agrobacterium mediated gene transfer, *Agrobacterium* based vectors (Ti plasmids and Ri plasmids), viral vectors and their applications. Direct gene transfer methods - electroporation, microinjection and particle bombardment. Characterization of transgenics, screenable and selectable markers. Marker free methodologies and gene targeting.

Unit IV   Transgenic plants

Transgenic rice with Vitamin A, transgenic plants with stress tolerance for drought and salinity, crop improvement, herbicide resistance, insect resistance, virus resistance, plants as bioreactors. Genetically modified foods - application, future applications, ecological impact of transgenic plants. Organic food, types of organic food, identifying organic food, organic food & preservatives. Genetic modification in food industry – background, history, controversies over risks, application, future applications.

Unit V   Plant Molecular Biology Techniques

Quantitative Real time PCR, Southern blotting, Northern blotting, Western blotting, DNA sequencing methods and their applications. DNA finger printing in plants. Marker assisted selection (MAS) for crop improvement.

Text Books

1. Gamborg O.L and Philips, G.C. 1995. Plant Cell, Tissue and organ culture - Fundamental methods. Narosa Publishing House, New Delhi.
2. Slater A., Scott N.W. and Fowler, M.R. 2008. Plant Biotechnology - the genetic manipulation of plants. 2nd Edition. Oxford University press, USA.
3. H.S. Chawla, 2002. Introduction to Plant Biotechnology. Oxford and IBH P Publishing Co. Pvt. Ltd. New Delhi.
4. Monica. A. Hughes. 1999. Plant Molecular Genetics. Pearson Education limited, England.

Reference Books

1. Phundan Singh. 2013. Principles of Plant Biotechnology. Kalyani Publishers, India.
2. V. Kumaresan. 2015. Applied Plant Biotechnology. Saras Publication, India.
3. Singh. 2014. Plant Biotechnology, 2nd Revised Edition, Kalyani Publishers, India.
4. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. 2000. Molecular cell Biology. 4th Edition, W.H. Freeman & Company.

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CORE COURSE VIII

ANIMAL BIOTECHNOLOGY

Objectives

This course is designed to have an understanding about the basics of Animal cell culture, transgenic animals, pest & animal management, Molecular markers and regulations about the use of Biotechnology.

Unit - I   Animal Cell, Tissue and Organ Culture

History – Definitions – steps for preparation of cell culture room, culture Environment (Substrate and Media) – Techniques for establishing of cell lines – insect cell culture – organ and embryo culture – cryo
preservation – valuable products. Artificial insemination (IUI, ICSI) – Embryo transfer – cloning (DOLLY, MOLLY and POLLY). Nuclear transplantation, *in-vitro* fertilization technology. Genetic Engineering in animals: Transformation of animal cells – Cloning vectors – Restriction Endonucleases, expression vectors – RTPCR - animal viral vectors and yeast vectors.

Unit – II   Transgenic Animals

Development and uses - mice, cattle, goat, fish and sheep and transgenic pets. Tendered meat production. Transgenic breeding strategies – Molecular farming (products with strategic importance). Insulin production using GMO. Embryonic stem cell preservation and its uses in endangered animals.

Unit - III   Pest and Animal Management

Juvenile hormone analogues – pheromones and genetic manipulation. Biotechnology of silkworms. Transgenic silk production – Baculo viruses vector and foreign gene expression. Biotechnological approach to the production of live feed. Animal management: cat, dog, pig, horse using appeasing pheromones and their products.

Unit – IV   Molecular Markers

Use of nucleic acid probes and antibodies in clinical diagnosis and tissue typing. Mapping of human genome – HGP (Human genome project), RFLP, RAPD and its applications. Genetic engineering approaches for the correction of genetic disorders. Human cloning, Gene silencing. Animal right activities Blue cross in India – Society for prevention of cruelty against animals. Ethical limits of Animal use –Human Rights and Responsibilities. Proteomics in disease biomarkers indentification.

Unit – V Regulating the use of Biotechnology

Regulating DNA technology – DNA barcoding. Regulating food and food ingredients. Human gene therapy. Initial public concerns – accumulation of defective genes in future generation. Future of gene therapy. Patenting Biotechnology inventions – patenting multi-cellular organisms – patenting of fundamental research. Indian and USA patents.

Text Books

1. B Singh, SK Gautam and MS Chauhan. 2015. Textbook of Animal biotechnology. Teri Publication.
2. M.K. Sateesh. 2010. Biotechnology: V: (Including Animal Cell Biotechnology, Immunology and Plant Biotechnology). 2nd Edition. New Age International Pvt. Ltd. Publishers.

Reference Books

1. Harrison, M.S. and Bal, I.R. 1997. General techniques of all culture Cambridge University press.
2. Prasash M. and Arora. C.K.. 1998. Plant tissue culture, Ammol publication Pvt. Ltd.
3. Darling D.C. and Morgan S.J. 1994. Animal cells, culture Media. Wiley, New York.
4. *In-vitro* cultivation of animal cells. 1994. I. ed., Butter worth – Heinemann Ltd.
5. R. Ian Freshney. 2010. Culture of Animal cells & Manual of basic technique. 6th Edition. Wiley – Blakwell publication.
6. Bernard B. Glick, Jack J. Pastunak. 2009. Molecular Biotechnology principles and application of Recombinant – DNA
7. R. Sasidhara. 2006. Animal Biotechnology. MJP publishers
8. Duhcy R.C. 2007. Text book of biotechnology. S.Chand & Company Ltd.
9. Bobert C. Tait. 1997. An Introduction to Molecular Biology. 1st Edition. Horizon Scientific Press.
10. Bobert Matheson. 1994. Entomology- an introductory course. 2nd Edition. Comstock Publishing Company.

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PLANT AND ANIMAL BIOTECHNOLOGY (P)

Objectives

This course is planned to give hands on training on plant & animal tissue culture and biotechnology

Plant Biotechnology

1. Introduction to the laboratory and general Safety Practices for plant cell, Plant growth and development. Laboratory Report Guidelines (Theory & Demo).
2. Aseptic culture techniques for establishment and maintenance of cultures (Hands on).
3. Tissue culture media preparation: Preparation of stock solutions of Murashige Skoog basal medium and plant growth regulator stocks (Hands on).
4. Mechanical isolation of protoplast. Enzymatic isolation of protoplast and culture (Hands on).
5. Isolation of plant genomic DNA by modified CTAB method (Hands on).
6. Size analysis of DNA by Agarose Electrophoresis (Hands on).
7. The cell cycle, plant vascular system & Photoperiodism.
8. Transformation of leaf discs with Agrobacterium (Hands on).
9. Expression of foreign genes into plant cells: use of *Agrobacterium tumefaciens* (Theory).
10. Morphogenesis in tobacco leaf tissue (Hands on).
11. Regeneration abilities of the Shoot Apical Meristem (SAM).
12. Preparation of chloroplast from pea (Hands on).
13. Effect of different light wavelengths on germinating corn embryos (Hands on)..
14. Measurement of photosynthesis (Hands on).
15. Stomata conductance & transpiration (Hands on).
16. Separation of thylakoid and stromal proteins by SDS-Gel electrophoresis.
17. Isolation of DNA & RNA from light and dark –grown seedlings.

Animal Biotechnology

1. Isolation of DNA from Animal liver
2. Isolation of DNA from human cheek cells
3. Isolation of DNA from blood
4. Quantification of DNA by spectrophotometeric method
5. Size analysis of DNA by Agarose gell electrophoresis
6. Isolation & identification of stem cells

Reference Books

1. M. S. Clark. 1997. *Plant Molecular Biology:* A *Laboratory Manual.* Springer-Verlag.
2. Slater A., Scott N.W. and Fowler, M.R. 2008. Plant Biotechnology - the genetic manipulation of plants. 2nd Edition. Oxford University press, USA.
3. H.S. Chawla, 2002. Introduction to Plant Biotechnology. Oxford and IBH P Publishing Co. Pvt. Ltd. New Delhi.
4. Monica. A. Hughes. 1999. Plant Molecular Genetics. Pearson Education limited, England.
5. Harrison, M.S. and Bal, I.R. 1997. General techniques of all culture Cambridge University press.
6. Prasash M. and Arora. C.K.. 1998. Plant tissue culture, Ammol publication Pvt. Ltd.
7. Darling D.C. and Morgan S.J. 1994. Animal cells, culture Media. Wiley, New York.

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ELECTIVE COURSE III

BIOSTATISTICS, BIOETHICS AND IPR

Objectives

This course is planned to give an understanding about Biostatistics, Bioethics, IPR & Legal Protection, Patent Filing and Infringement and Biosafety.

Unit I   Biostatistics

Introduction to Biostatistics – sample, population and statistical inference.
Interval data: construction of histogram; interpretation of histogram, the normal distribution, mean, median, mode and standard deviation. Representing normal curve, uncertainties in estimation of mean, comparison of mean and variance.

Proportion data: examples of proportion data (MPN, sterility testing of medicines, animal toxicity, therapeutic trial of drugs and vaccines, infection and immunization studies) statistical treatment to proportion data. Chi – square data and goodness of fit.

Count data: examples of count data (bacterial cell count, radio activity count, colony and plaque counts) statistical treatment to count data, Poisson distribution, standard error, confidence limits of count.

Unit II   Bioethics

Concept, philosophical considerations, epistemology of science, ethical terms, principles and theories and relevance to biotechnology. Ethics and the law issues - genetic engineering, stem cells, cloning, medical techniques, transhumanism and bioweapons. Research concerns - animal rights, ethics of human cloning, reproduction and stem cell research. Emerging issues - biotechnology's impact on society, DNA on the witness stand and use of genetic evidence in civil and criminal court cases. Challenges to public policy, regulations, improving public understanding of biotechnology products to correct misconceptions.

Unit III   Introduction to IPR & Legal Protection

Basics of patents, types of patents, Indian Patent Act 1970, recent amendments, filing patent application, precautions before patenting – disclosure and non-disclosure. WIPO treaties, Budapest treaty, PCT and implications, role of a country patent office and procedure for filing a PCT application. Types of IP - patents, trademarks, copyright & related rights, industrial design, traditional knowledge, geographical indications and international framework for the protection of IP. Introduction to history of GATT, WTO, WIPO and TRIPS. Global scenario of patents and Indian position,

patenting of biological materials. IP as a factor in R&D and IP relevance to Biotechnology.

Unit IV   Patent Filing and Infringement

Patent application - forms and guidelines, fee structure and time frames. Types of patent applications, provisional and complete specifications, PCT and convention patent applications. International patenting - requirement, procedures and costs. Financial assistance for patenting and introduction to existing schemes. Publication of patents -gazette of India, status in Europe and US. Patenting by research students, lecturers and scientists. University/organizational rules in India and abroad, credit sharing by workers and financial incentives. Patent infringement - meaning, scope, litigation, case studies and examples.

Unit V   Biosafety

Introduction and historical background. Introduction to biological safety cabinets, primary containment for biohazards, biosafety levels, biosafety levels of specific microorganisms, recommended biosafety levels for infectious agents and infected animals. Biosafety guidelines by Government of India. Definition of GMOs and LMOs. Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO's applications in food and agriculture. Environmental release of GMOs, risk assessment; risk management and communication. Overview of national regulations and relevant international agreements including Cartagena protocol.

Important Links

1. Bioethics - by Ellen Frankel Paul, Fred D. Miller, Jeffrey Paul, Fred Dycus Miller Cambridge University Press, 2002.
2. Bioethics & Science, John A. Bryant, Linda Baggott la Velle, John F. Searle – 2002.
3. http://www.w3.org/IPR/
4. http://www.wipo.int/portal/index.html.en
5. http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html
6. www.patentoffice.nic.in
7. www.iprlawindia.org/ - 31k - Cached - Similar page
8. http://www.cbd.int/biosafety/background.shtml
9. http://www.cdc.gov/OD/ohs/symp5/jyrtext.htm
10. http://web.princeton.edu/sites/ehs/biosafety/biosafetypage/section3.html
11. http://www.accessexcellence.org/RC/AB/IE/#Anchor-Bioethics-6296 ww.bioethics.net
12. http://www.americanprogress.org/issues/domestic/science?_kk=bioethics
13. http://www.billmuehlenberg.com/2005/09/02/the-stem-cell-debate/

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BIOTECHNOLOGY FOR ENTREPRENEURS

Objectives

This purpose of this course is to give an understanding about biotechnology based entrepreneurship among students.

Unit I   Introduction to Entrepreneurship

Entrepreneurship definition, factors necessary for entrepreneurship, desirables in a startup, mistakes to be avoided, pillars of bio-entrepreneurship, promoting bio-entrepreneurship, biotech company roadmap, legal, regulatory and other business factors.

Unit II   Identification of a Project

Project management: Search for a business idea, concept of project and classification, project identification, project formulation, project design and network analysis, project report, project appraisal.

Unit III   Assessment of a Project

Financial analysis: Ratio analysis, Investment process, Break even analysis, Profitability analysis, Budget and planning process. Sources of finance: Source of development finance, Project financing, Institutional financing to Entrepreneurs, Financial institutions, Role of consultancy organizations. Marketing channels: Methods of marketing, marketing channels, Marketing institutions and assistance.

Unit IV   Generation of Fund

Funding of biotech business (Financing alternatives, VC funding, funding for biotech in India, Exit strategy, licensing strategies, valuation), support mechanisms for entrepreneurship (Bio-entrepreneurship efforts in India, difficulties in India experienced, organizations supporting biotech growth, areas of scope, funding agencies in India, biotech policy initiatives), Role of knowledge centers and R&D (knowledge centers like universities and research institutions, role of technology and upgradation).

Unit V   Biotech enterprises

Setting up Small, Medium & Large scale industry, Quality control in Biotech industries, Location of an enterprise, steps for starting a small industry, incentives and subsidies, exploring export possibilities.

Text Books

1. D. Hyne & John Kapeleris. 2006. Innovation and entrepreneurship in biotechnology: Concepts, theories & cases.
2. Richard Dana Ono. 1991. The Buisiness of Biotechnology: From the Bench of the Street. Butterworth- Heinemann.
3. Martin Grossmann. 2003. Entrepreneurship in Biotechnology: Managing for growth from start-up to Initial Public Offering

Reference Books

1. Yali Friedman. 2008. Best Practices in Biotechnology Education. Logos Press.
2. Robert Nicholas Trigiano and Dennis John Gray. 2004. Plant Development and Biotechnology CRC Press. 358 pages.
3. Vasant Desai. 2005. Dynamics of Entrepreneurial Development and Management. 6th Edition. Himalaya Publishing House, 2005.
4. Prasannan. Projects: Planning Analysis, Selection, Implemantation & Review. 7th Edition.

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CORE COURSE IX

BIOPROCESS TECHNOLOGY

Objectives

This course is designed to give an idea about the avenues of exploiting microbes and to study the downstream processes for product recovery in fermentation.

Unit I   Basic principle of Biochemical engineering

Isolation, screening and maintenance of industrially important microbes. Microbial growth and death kinetics (an example from each group, particularly with reference to industrially useful microorganisms). Strain improvement for increased yield and other desirable characteristics.

Microbial Growth and Preservation

Mathematical expression of bacterial growth, generation time and growth rate. Different phases of growth & growth curve and. Batch, continuous and synchronous cultures. Diauxic growth and factors affecting microbial growth. Stress response. Microbial death curve under adverse conditions.

Unit II   Concepts of basic mode of fermentation processes

Bioreactor designs and types of fermentation and fermentors. Concepts & basic modes of fermentation - Batch, fed batch and continuous fermentation. Conventional fermentation versus biotransformation. Solid substrate, surface and submerged fermentation. Fermentation economics and fermentation media. Fermenter design - mechanically agitated, pneumatic and hydrodynamic fermenters. Large scale animal and plant cell cultivation and air sterilization. Upstream processing - media formulation, sterilization, aeration and agitation. Measurement and control of bioprocess parameters, scale up and scale down process.

Unit III   Downstream processing

Bioseparation - filtration, centrifugation, sedimentation, flocculation, microfiltration, sonication. Cell disruption – enzymatic lysis and liquid-liquid extraction. Purification by precipitation (ammonium sulfate, solvent), electrophoresis and crystallization. Extraction (solvent, aqueous two phase, super critical) and chromatographic techniques. Reverse osmosis and ultra filtration. Drying, crystallization, storage and packaging. Treatment of effluent and its disposal.

Unit IV   Applications of enzymes in food processing

Mechanism of enzyme function and reactions in food processing. Enzymic bioconversions e.g. starch and sugar conversion processes. High fructose corn syrup, hydrolyzed protein and their downstream processing. Baking by amylases, deoxygenation and de-sugaring by glucose oxidase, beer mashing and chill proofing; cheese making by proteases and various other enzyme catalytic actions in food processing.

Unit V   Applications of Microbes in food processing and production

Fermented foods and beverages, food ingredients and additives used in fermentation and their purification. Fermentation as a method of preparing and preserving foods. Microbes and their use in pickling, producing colours and flavours, alcoholic beverages and other products. Process wastes - whey, molasses, starch substrates and other food wastes for bioconversion to useful products. Bacteriocins from lactic acid bacteria – production and applications in food preservation.

Text Books

1. Jackson AT. 1991. Bioprocess Engineering in Biotechnology. Prentice Hall, Engelwood Cliffs.
2. Shuler ML and Kargi F. 2002. Bioprocess Engineering: Basic concepts, 2nd Edition, Prentice Hall, Engelwood Cliffs.

Reference Books

1. Young M.M. and Reed. 2004. Comprehensive Biotechnology: The Principles, Applications and Regulations of Biotechnology in Industry, Agriculture and Medicine. Vol 1, 2, 3 and 4. Elsevier India Private Ltd, India.
2. Mansi EMTEL and Bryle CFA. 2007. Fermentation Microbiology and Biotechnology. 2nd Edition, Taylor & Francis Ltd, UK.

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CORE COURSE X

FOOD TECHNOLOGY

Objectives

This course is designed to understand the chemical nature and associated microbes of food and to understand the principles of food processing, preservation and manufacture.

Unit I   Basics of Food Technology

Food chemistry: constituents of food - contribution to texture, flavour and organoleptic properties of food. Food additives - intentional and nonintentional and their functions. Enzymes in food processing.

Unit II   Microbiology of Food

Sources and activity of microorganisms associated with food. Food fermentation & food chemicals. Food borne diseases - infections and intoxications. Food spoilage - causes.

Unit III   Food Processing

Raw material characteristics; cleaning, sorting and grading of foods; physical conversion operations - mixing, emulsification, extraction, filtration, centrifugation, membrane separation, crystallization, heat processing.

Unit IV   Food Preservation

Use of high temperatures - sterilization, pasteurization, blanching, canning - concept, procedure & application; Low temperature storage - freezing curve characteristics. Factors affecting quality of frozen foods. Irradiation preservation of foods.

Unit V   Manufacture of Food Products

Bread and baked foods. Dairy products - milk processing, cheese, butter, ice-cream. Vegetable and fruit products. Edible oils and fats. Meat, poultry and fish products. Confectionery, beverages.

Text Books

1. Crosby, N.T. 1981. Food packaging Materials Applied Science Publishers, London.
2. David, S. Robinson. 1997. Food Chemistry and nutritive value. Longman group, UK.
3. Frazier, W.C. and Westhoff, D.C. 1988. Food Microbiology, 4th Edition. McGram-Hill, New York.
4. Pyke, M. 1981. Food Science and Technology, 4th Edition. John Murray, London.
5. Sivasankar, B. 2002. Food processing and preservation. Prentice Hall, New Delhi.

Reference Books

1. Brenner, J.G., Butters, J.R., Cowell, N.D. and Lilly, A.E.V. 1979. Food engineering operations, 2nd Edition. Applied Sciences Pub. Ltd., London.
2. Desrosier, N.W. and Desrosier, J.N. 1987. The Technology of Food Preservation, CBS Publishers and Distributors, New Delhi.
3. Fennema, O.R. 1976. Principles of food science: Part I, Food chemistry, Marcel Dekker, New York.
4. Lindsay, W. 1988. Biotechnology, Challenges for the flavor and food Industries, Elsevier Applied Science.
5. Shakuntala, N. and Shadaksharaswamy, M. 1997. Foods; Facts and principles. 2nd Edition. New Age International Publishers, New Delhi.

CORE PRACTICAL IV

BIOPROCESS AND FOOD TECHNOLOGY (P)

Objectives

By doing this course the students will get hand on exposure & understand the chemical nature and associated microbes of food and the principles of food processing, preservation and manufacture.

1. Isolation of industrially important microorganisms.
2. Selective isolation of actinomycetes – study their growth characteristics.
3. Isolation and enumeration of lactic acid bacteria.
4. Ethanol production by yeast.
5. Wine production by yeast – setting up a lab experiment.
6. Estimation of alcohol content by colorimetric method and GLC.
7. Enzyme production – amylase production.
8. Production of organic acids – citric acid production by solid state fermentation.
9. Antibiotic production by different strains of microbes (Theory).
10. Test for sensitivity of microorganisms.
11. Down stream processes of enzymes – dialysis.
12. Ion exchange chromatography – drying – cellulose column chromatography.
13. Immobilization of yeast cell by alginate beads
14. Bioassay techniques for antibiotics.
16. Large scale production of organic acids, large scale production of solvents using fermentor (Demo).
17. Visit to Distillery unit; alcohol production and pharmacological industries. Pasteur Institute (Field visit).
18. Isolation & identification microbes from spoiled food.
19. Production of yogurt, butter.

Reference Books

1. E Mans, E.M.T. and C.F.A. Bryce, Taylor and Francis, UK. 2002. Fermentation technology and Biotechnology.
2. Ghose, T.K and P.Ghose. 2003. Biotechnology in India. Springer Publishers, India.
3. Glazer, A.N and H. Nikaido. 1995. Microbial Biotechnology. W.H. Freeman and Co., New York.
4. Stanbury, P.F., A. Whitaker ans S.J. Hall. 1995. Principles of fermentation Technology, Pergamon, UK.
5. Wolf. Cruzer and Annalise Cruzer. 2000. Biotechnology Text Book of Industrial Microbiology. Panima Publishing House, New Delhi.
6. Patel, A.H. 2001. Industrial Microbiology, Mac-Millan India Ltd.

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ELECTIVE COURSE V

ENVIRONMENT BIOTECHNOLOGY AND NANOTECHNOLOGY

Objectives

This course to planned to give an idea about Pollution, types of pollution, management to waste. Synthesis of nanomaterials, charecterisation and their application is also planned.

UNIT I   Introduction to Pollution

Introduction - Types of pollution – Air, water, sound pollution. Measurement of pollution. Global environmental problems - ozone depletion, green house effect and acid rain. Control of pollution through Biotechnology.

UNIT II   Water Pollution

Water management, measurement and sources of water pollution. Waste water treatment - physical, chemical and biological treatment processes. Biotechnological approaches for industrial waste water treatment - dairy, distillery, tannery, sugar, and pharmaceutical industries. Biodegradation of inorganic and organic wastes, lignin, tannin. Bioremediation of oil spills. Biomonitoring of water pollution using algae, bacteria, plankton, macrophytes, invertebrates, fishes (Bioindicators). Management for effluent toxicity, heavy metal pollution, thermal and radioactive pollution.

UNIT III   Solid waste management

Types of solid wastes. Solid waste characteristics and its impact on environment. Solid waste disposal - land filling, incineration, composting, mushroom farming, vermiculture and biogas production. Processing of sugar factory wastes, residential and municipal wastes, coir wastes and mycostraw wastes. Biodegradation of xenobiotics compounds. Biotechnological methods for hazardous waste management.

Conservation Biotechnology: Biodiversity - types, uses and values. Loss of Biodiversity. Conservation and sustainable management of Biodiversity - In *situ* and *Ex-situ* ecorestoration. Environmental and biodiversity laws, environmental education.

UNIT IV   Synthesis of Nano Materials & Characterisation

Definition of a nano system - dimensionality and size dependent phenomena, Quantum dots, Nanowires and Nanotubes, 2D films. Methods for synthesis of Nanoscale Materials. Aspects of Nanofluidics. Basic concepts and properties of nanostructured materials. Gold Nanoparticles. Nanopores.
Characterisation of Nanomaterials: Scanning electron microscopes, transmission electron microscopes, scanning probe microscopy, atomic force microscopy, scanning tunneling microscope, Scanning Non-linear Dielectric microscopy, Nuclear Magnetic Resonance Spectroscopy, Nuclear Quadrupole Resonance Spectroscopy Mossbauer & Microwave Spectroscopy and Electron Spin Resonance Spectroscopy, IR & Raman Spectroscopy.

UNIT V   Applications of nanotechnology

Nanosensors **-** types and its applications. Nanocarriers for Drug Delivery **-** Polymeric Nanoparticles as Drug Carriers. Micelles for Drug Delivery. Micro-array and Genome Chips. Polymer Micelles as Drug Carriers. Microemulsions as Drug Delivery Vehicles. Lipoproteins as Pharmaceutical Carriers. Solid Lipid Nanoparticles as Drug Carriers. Nanocapsules **–** preparation, characterization and therapeutic Applications. Nanomedicine - Bio-Pharmaceuticals, Implantable Materials, Implantable Devices, Surgical Aids, Diagnostic Tools, Genetic Testing, Imaging, Nanoparticles Probe. Nanotechnology for Cancer Research and Therapy. Nanotechnology for Imaging and Detection. Environmental Nano Remediation Technology - Thermal, Physico-Chemical, and Biological Methods. Nano Filtration for the Treatment of Wastes, Removal of Organics, Inorganics and Pathogens. Nanotechnology for Water Purification.

Text Books

1. Jogdand, S.N. 1995. Environmental Biotechnology. 1st Edition. Himalaya Publishing House, Bombay.
2. Technoglous, G., Burton, F.L. and Stensel, H.D. 1995. Wastewater Engineering – Treatment, Disposal and Reuse. 3rd Edition. Metcalf and Eddy, Inc., Tata Mc Graw Hill, New Delhi.
3. Jain, K.K. 2006.   Nanobio-Technology in Molecular Diagnostics: Current Techniques and Applications. Horizon Biosciences, India.
4. Parag Diwan and Ashish Bharadwaj. 2006. Nano Medicines Pentagon Press. ISBN 81-8274-139-4.

Référence Books

1. Alan Scragg. 1999. Environmental Biotechnology. Pearson Education Limited, England.
2. De, A.K. 2004. Environmental Chemistry. Wiley Eastern Ltd. New Delhi.
3. Allsopp, D. and K.J. Seal. 1986. Introduction to Biodeterioration. ELBS/Edward Arnold, London.
4. Ratner, M. and Ratner, D. 2005. Nanotechnology: A Gentle Introduction to the Next Big idea. Pearson Education, Inc. NJ, USA.
5. Christef M. Niemeyer, C. A. Mirkin. 2004. Nanobiotechnology: Concepts, Application and Properties. Wiley – VCH Publishers, New York.
6. Tuan Vo-Dinh. 2007. Nanotechnology in Biology and Medicine: Methods, Devices and Applications. Taylor and Francis Inc., London.
7. Pradeep, T. 2006. NANO. Tata McGraw Publishers, New Delhi, India
8. Challa S.S.R. Kumar (Ed). 2006. Biological pharmaceutical Nanomaterial, Wiley-VCH Verlag Gmbh & Co, KgaA. Weinham, Germany.
9. Vladimir P.Torchilin (Ed.). 2006. Nanoparticulates as Drug Carriers. Imperial College Press, North Eastern University, USA. ISBN 1-86094.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.
M.Sc. Botany   Course Structure under CBCS
(For the candidates admitted from the academic year 2016-2017 onwards)

Sem-ester	Course	Course Title	Ins. hr/ week	Cre-dit	Exam hr	Marks Int.	Marks Ext.	Total
I	Core Course I (CC)	Plant Biodiversity I (Algae, Fungi, Lichens and Bryophytes)	6	5	3	25	75	100
	Core Course II (CC)	Plant Biodiversity II (Pteridophytes, Gymnosperms and Paleobotany)	6	5	3	25	75	100
	Core Course III (CC)	Microbiology, Plant Pathology and Immunology	6	4	3	25	75	100
	Core Course IV (CC)	Biofertilizers and Mushroom Technology	6	4	3	25	75	100
	Core Practical I (CP)	Plant Biodiversity I & II, Microbiology, Plant Pathology and Immunology & Biofertilizers and Mushroom Technology (P)	6	4	3	40	60	100
	Total		**30**	**22**				**500**
II	Core Course V (CC)	Anatomy, Embryology and Morphogenesis	6	5	3	25	75	100
	Core Course VI (CC)	Angiosperm Taxonomy, Ecology and Conservation	6	5	3	25	75	100
	Core Practical II (CP)	Anatomy, Embryology and Morphogenesis & Angiosperm Taxonomy, Ecology and Conservation (P)	6	4	3	40	60	100
	Elective Course I (EC)	Forestry and Wood Science	6	4	3	25	75	100
	Elective Course II (EC)	Industrial Microbiology	6	4	3	25	75	100
	Total		**30**	**22**				**500**
III	Core Course VII (CC)	Cell Biology, Genetics and Plant Breeding	6	5	3	25	75	100
	Core Course VIII (CC)	Plant Physiology, Biochemistry and Biophysics	6	5	3	25	75	100
	Core Practical III (CP)	Cell Biology, Genetics and Plant Breeding & Plant Physiology, Biochemistry and Biophysics (P)	6	4	3	40	60	100
	Elective Course III (EC)	Genetic Engineering and Biotechnology	6	4	3	25	75	100
	Elective Course IV (EC)	Horticulture and Landscaping	6	4	3	25	75	100
	Total		**30**	**22**				**500**
IV	Core Course IX (CC)	Plant Tissue Culture	6	5	3	25	75	100
	Core Course X (CC)	Research Methodology	6	5	3	25	75	100
	Core Practical IV (CP)	Plant Tissue Culture & Research Methodology (P)	6	4	3	40	60	100
	Elective Course V (EC)	Food Preservation and Processing	6	4	3	25	75	100
	Project Work	Project Work	6	6	–	-	-	100
	Total		**30**	**24**				**500**
	Grand Total		**120**	**90**				**2000**

ELECTIVE COURSES

The Botany Department offers the following Elective Courses for P.G. Botany students:

- EC-I : Forestry and Wood Science (Semester II)
- EC-II : Industrial Microbiology (Semester II)
- EC-III: Genetic Engineering and Biotechnology (Semester III)
- EC-IV: Horticulture and Landscaping (Semester III)
- EC-V : Food Preservation and Processing (Semester IV)

Core Paper	-	10
Core Practical	-	4
Elective	-	5
Project	-	1

Note:

1. Theory   Internal   25 marks   External   75 marks

2. Practical   ”   40 marks   ”   60 marks

3. Separate passing minimum is prescribed for Internal and External

   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The passing minimum not less than 50% in the aggregate.

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PLANT BIODIVERSITY I
(ALGAE, FUNGI, LICHENS AND BRYOPHYTES)

Objectives:

This paper provides information pertaining to classification, structure, function and economic importance of Algae, Fungi, Lichens and Bryophytes.

Unit I: ALGAE

General trends and criteria for Algal classification (Bold and Wynne, 1978). Salient features of major classes: Prochlorophyta, Chlorophyta, Charophyta, Xanthophyta, Phaeophyta and Rhodophyta. Ultrastructure of Prokaryotic and Eukaryotic algal cells and their components - cell wall, protoplasm, flagella, eye spots, chloroplast, pyrenoid, nucleus, pigments and reserve foods. Economic importance of algae - Food and feed - Single cell protein - Industrial products (Agar-Agar, Carrageenan, Iodine, Vitamins) - in Medicine and Diatomaceous earth.

Unit II: ALGAE

Range of thallus structure, origin and evolution of sex in algae, phylogeny and interrelationships of algae. Lifecycle patterns in algae and alternation of generations, Fossil algae.

Ecology of Algae: Freshwater algae, marine algae, soil algae, symbiotic algae and parasitic algae. Algae as pollution indicators, algal blooms, algicides culture and cultivation of fresh water and marine algae - Knop's solution and Chu-10 medium (1972).

Unit III: FUNGI

General features, occurrence and distribution. Mode of nutrition in fungi, culture of fungi. Classification of fungi (Alexopoulos and Mims, 1979), recent trends in the classification of fungi. General characters of major classes: Mastigomycotina, Zysomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina. Thallus organization, cell structure and fruit bodies. Phylogeny and interrelationships of major groups of fungi. Economic importance of fungi, in medicine and in industries.

Unit IV: FUNGI

Homothallism and Heterothallism in fungi. Homokaryon and Heterokaryon, Hormonal control in sex organ development in fungi. Physiological specialization and physiological races in fungi. Reproduction, life cycle types, parasexual cycles, reduction in sexuality in fungi. Spore dispersal mechanisms and fungal genetics, Fossil fungi.

LICHENS: General features, classification (Miller, 1984), Distribution, thallus organisation, vegetative and sexual reproduction, lichens as indicators of pollution and economic importance.

Unit V: BRYOPHYTES

General features, distribution, classification (Watson, 1955), General characters of major groups. Marchantiales, Jungermaniales, Anthoceratales, Sphagnales, Funariales and Polytrichales. Range of vegetative structure, Evolution of gametophytes and sporophytes. Reproduction - Vegetative and sexual, spore dispersal mechanisms in bryophytes, spore germination patterns in bryophytes. Ecological and economic importance of bryophytes. Origin and interrelationships, Fossil bryophytes.

REFERENCES

ALGAE

1. Bold, H.C. and Wyne, M.J. (1978). *Introduction of Algae - Structure and Reproduction.* Prentice Hall, New Jersey.
2. Chapman, C.J. and Chapman, D.J. (1981). *The Algae* (2nd ed.). Macmillan, London.
3. Darley, W.M. (1982). *Algal Biology: A Physiological Approach.* Blackwell Scientific Publications. Oxford, London.
4. Fritsch, F.E. (1976). *Structure and Reproduction of the Algae Vols. I & II.* Cambridge University Press, London.
5. Ian Morris (1967). *An Introduction to the Algae.* Hutchinson University Library, London.
6. Kumar, H.D. (1989). *Introductory Phycology.* East-West Press, Madras.
7. Kumar, H.D. and Singh, H.N. (1982). *A Textbook of Algae.* East-West Press, Madras.
8. Lee, R.E. (2008). *Phycology* (4th Edition). Cambridge University Press, New Delhi.
9. Round, F.E. (1981). *The Ecology of Algae.* Cambridge University Press, London.
10. Sharma, O.P. (1986). *Textbook of Algae.* Tata McGraw Hill Co., New Delhi.
11. Smith, G.M. (1976). *Cryptogamic Botany Vol. I. Algae and Fungi.* Tata McGraw Hill, New Delhi.
12. Van Den Hoek, C., Mann, D.G. and Jahns, H.M. (1995). *Algae* (An Introduction to Phycology). Cambridge University Press India Pvt. Ltd., New Delhi.
13. Vashishta, B.R. *et al.* (2008). *Botany for Degree Students – Algae.* S. Chand and Co. Ltd., New Delhi.
14. Venkataraman *et al.* (1974). *Algal Form and Function.* Today and Tomorrow Publishers, New Delhi.

FUNGI

1. Alexopoulus, C.J. and Mims, C.W. (1979). *Introductory Mycology.* Wiley Eastern Ltd., New York.

2. Bessey, E.A. (1979). *Morphology and Taxonomy of Fungi*. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Bold, H.C. *et al.* (1980). *Morphology of Plants and Fungi*. Harper and Row Publishing Inc., New York.
4. Burnet, J.H. (1971). *The Fundamentals of Mycology*. ELBS Publications, London.
5. Mehrotra, R.S and Aneja, K.R. (1990). *An Introduction of Mycology*. Wiley Eastern Ltd., New Delhi.
6. Ringo, J. (2004). *Fundamental Genetics*. Cambridge University Press, United Kingdom.
7. Sharma, P.D. (1987). *The Fungi*. Rastogi and Co., Meerut.
8. Vashishta, B.R. and Sinha, A.K. (2007). *Botany for Degree Students – Fungi*. S. Chand and Co. Ltd., New Delhi.

LICHENS

Hale, M.E.Jr. (1983). *Biology of Lichens*. Edward Arnold, Maryland.

BRYOPHYTES

1. Cavers, F. (1911) *The Interrelationship of Bryophytes*. Cambridge, UK.
2. Ingold, C.T. (1939). *Spore Discharge in Land Plants*. Oxford, UK.
3. Kashyap, S.R. (1972). *The Liverworts of Western Himalayas and Punjab Plains I & II*. Research Company Publications, New Delhi.
4. Parihar, N.S. (1972). *An Introduction to Embryophyta – I: Bryophyta*. Central Book Depot, Allahabad.
5. Prem Puri (1973). *Bryophytes: A Broad Perspective*. Atma Ram and Sons, New Delhi.
6. Smith, G.M. (1971). *Cryptogamic Botany Vol. II. Bryophytes and Pteridophytes*. Tata McGraw Hill, New Delhi.
7. Vashishta, B.R. *et al.* (2008). *Botany for Degree Students: Bryophyta*. S. Chand and Co. Ltd., New Delhi.
8. Watson, E.V. (1971). *The Structure and Life of Bryophytes*. B.I. Publications, New Delhi.

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CORE COURSE II

PLANT BIODIVERSITY II
(PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY)

Objectives:

This paper provides information pertaining to classification, structure, function and economic importance of Pteridophytes, Gymnosperms and Paleobotany.

Unit I   : PTERIDOPHYTES

General features and origin of Pteridophytes. Classification of Pteridophytes (Reimer, 1954). Range of morphology, structure, reproduction and evolution of gametophytes and sporophytes of the following orders: Rhyniales, Psilotales, Lycopodiales, Selaginellales, Isoetales, Calamitales and Equisetales.

Unit II   : PTERIDOPHYTES

Range of morphology, structure, reproduction and evolution of gametophytes and sporophytes of the following orders: Ophioglossales, Marattiales, Osmnndales, Filicales and Salviniales. Stelar evolution in pteridophytes, Heterospory and origin of seed habit. Structure, development and evolution of sorus in Filicales. Phyletic slide, spore germination patterns. Economic importance of Pteridophytes.

Unit III   : GYMNOSPERMS

A general account of the characteristic features of Gymnosperms. Origin of Gymnosperms. Classification of Gymnosperms (Sporne, 1965). General structure and interrelationships of Pteridospermales, Bennetittales, Pentoxylales and Cordaitales.

Unit IV   : GYMNOSPERMS

A general account on the distribution, morphology, anatomy, reproduction and phylogeny of Cycadales, Coniferales, Ginkgoales, Ephedrales, Welwitchiales and Gnetales. Economic importance of Gymnosperms.

Unit V   : PALEOBOTANY

Concepts of Paleobotany, A general account on Geological Time Scale. Techniques for paleobotanical study.
Fossil types: Compressions, incrustation, casts, molds, petrifactions, coalballs and compactions. Age determination and methods of study of fossils. Systematic and Nomenclature of fossil plants. Paloclimates and fossil plants. Role of fossil in oil exploration and coal excavation, Paleopalynology.

REFERENCES

PTERIDOPHYTES

1. Bower, F.O. (1939). *The Ferns Vols. I – III*. Today and Tomorrow's Printers, New Delhi.
2. Eames, A.J. (1936). *Morphology of Vascular Plants - Lower Groups*. Tata McGraw Hill, New Delhi.
3. Ingold, C.T. (1939). *Spore Discharge in Land Plants*. Oxford University Press, Oxford, UK.
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8. Sporne, K.R. (1972). *The Morphology of Pteridophytes*. B. I. Publications, Madras.
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10. Vashishta, P.C. *et al.* (2008). *Botany for Degree Students: Pteridophyta*. S. Chand & Co. Ltd., New Delhi.

GYMNOSPERMS

1. Chamberlain, C.J. (1957). *Gymnosperms: Structure and Evolution*. University Chicago Press, New York.
2. Coultar, J.M. and Chamberlin, C.J. (1967). *Morphology of Gymnosperms*. Central Book Depot, Allahabad.
3. Foster, A.S. and Gifford, E.M. (1965). *Morphology and Evolution of Vascular Plants*. W. H. Freeman & Co., California.
4. Maheswari, P. and Vasil, V. 1960. *Gnetum: A Monograph*. CSIR Publications, New Delhi.
5. Sporne, K.R. (1974). *The Morphology of Gymnosperms*. B.I. Publications, New Delhi.
6. Vasishta, P.C. *et al.* (2006). *Botany for Degree Students: Gymnosperms*. S. Chand & Co. Ltd., New Delhi.

PALEOBOTANY

1. Nikias, K.J. (1981). *Paleobotany, Paleoecology and Evolution*. Praeger Publishers, USA.
2. Seward, A.C. (1919). *Fossil Plants Vols. I – IV*. Cambridge University Press, London.
3. Seward, A.C. (1931). *Plant Life through the Ages*. Cambridge University Press, London.
4. Shukla, A.C. and Mishra, S.P. (1982). *Essentials of Paleobotany* (2nd ed.). Vikas Publishing House Pvt. Ltd., New Delhi.

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CORE COURSE III

MICROBIOLOGY, PLANT PATHOLOGY AND IMMUNOLOGY

Objectives:

This paper helps

1. To understand the structure, biology, nutrition and reproduction of virus and bacteria
2. Give information on pathogen causing diseases in plants and then mode of action
3. To provide information on immunology.

MICROBIOLOGY

Unit I

Scope, branches of Microbiology. Whittaker's five kingdom concept (1969). Prokaryotic and Eukaryotic microbes. General features of virus, classification, ultrastructure, replication, economic importance, Virions and Prions, Phytoplasma (including Mycoplasma).

Unit II

Bergey's system of Bacterial classification (1984-1991) – Eubacteria, Archaebacteria, Cyanobacteria and Actinomycetes - General account, ultrastructure, nutrition, growth and reproduction. Bacterial culture techniques and Economic importance.

PLANT PATHOLOGY

Unit III

Organisms and causal factors responsible for plant diseases – Methods of studying plant diseases. Koch's postulates. Plant-microbe interactions – mutualism, Mycoparasitism, Antagonism, Commensalism. Defense mechanism in plants. Integrated disease management.

Unit IV

Common Plant Diseases – Tobacco mosaic, Cucumber mosaic, Little leaf disease of Brinjal, Citrus canker, Rice blight, Tikka disease of groundnut, Wilt of cotton, White rust of Mustard, Rust of Wheat, Root Knot of tomato, Red rot of sugarcane.

IMMUNOLOGY

Unit V

General account of immune systems – innate and acquired immunity – Antigen and antibody (types, structure and interactions). Detection of antibody (immuno electrophoresis, ELISA and RIA). Immunohistochemistry – Major and minor Blood groups – ABO and Rh incompatibility.

REFERENCES:

1. Annadurai, B. (2008). *A Textbook of Immunology and Immunotechnology*. S. Chand & Co. Ltd., New Delhi.
2. Bilgrami, K.S. and Dube, H.C. (1990). *A Textbook of Modern Plant Pathology*.
   Vikas Publishing House Pvt. Ltd., New Delhi.
3. Carpenter, P.L. (1987). *Microbiology*. Saunders Co., Philadelphia, USA.
4. Dubey, R.C. and Maheshwari, D.K. (2007). *A Textbook of Microbiology*. S. Chand & Co. Ltd., New Delhi.
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7. Nandini Shetty (2008). *Immunology - Introductory Textbook*. New Age International Publishers, New Delhi.
8. Pandey, B.P. (1982). *A Textbook of Plant pathology, Pathogen and Plant Diseases*. S. Chand and Co. Ltd., New Delhi.
9. Pelczar, M.J., Chan, E.C.S. and Krieg, N.R. (1993). *Microbiology*. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
10. Power and Daginwala (1994). *General Microbiology*. Himalayan Publishing House Bombay.
11. Rangaswamy, G. (1972). *Diseases of Crop Plants in India*. Prentice Hall of India Pvt. Ltd., New Jersey.
12. Schlegel, H.G. (1993). *General Microbiology* (7th Edition). Cambridge University Press, United Kingdom.
13. Singh, R.S. (1990). *Plant diseases* (6th ed.). Oxford & IBH, New Delhi.
14. Staley, J.T. *et al.*, (1991). *Bergey's manual of Systematic Bacteriology Vols. I – IV*. Williams & Wilkins, London.

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CORE COURSE IV

BIOFERTILIZERS AND MUSHROOM TECHNOLOGY

Objectives:

This paper helps
1. To understand the structure, biology, nutrition and reproduction of virus and bacteria
2. To give information on pathogen causing diseases in plants and then mode of action
3. To provide information on immunology.

BIOFERTILIZERS

Unit I

Biofertilizers: Introduction, scope and general account. Cyanobacterial biofertilizers –organism, medium (BG11), isolation (nitrogen fixing), mass cultivation, career material, field inoculation. Mass cultivation of *Azolla*. Symbiotic association of Cyanobacteria.

Unit II

Bacterial Biofertilizers: Isolation – *Azotobacter* – Ashby's mannitol agar, *Azospirillum* – Semisolid medium – (Bulow and Dobereiner, 1975). *Rhizobium* – Yeast Extract Mannitol Agar medium – Culture characteristics. Mass production of *Azospirillum, Azotobacter* and *Phosphobacteria.* Phosphate solubilization and mobilization – *Azospirillum, Azotobacter, Frankia, Phosphobacteria* and *Rhizobium.*

Unit III

Mycorrhiza: Scope and general account of Ecto, Endo and Arbuscular mycorrhizae (AM). Isolation and inoculation techniques. Legume-AM interaction – National and Regional Biofertilizers production and Development Centres. Methods of collection, wet sieving, and decanting method and inoculums production. Culture of mycorrhizae in Modified Melin – Norkrans (MMN) agar medium.

Mushroom Technology

Unit IV

Mushroom Technology: Introduction and Scope. Edible and Poisonous mushrooms. Structure, Formation and Development of Basidiocarp – *Agaricus.* Importance and nutritive value of edible mushrooms. Isolation and culture of spores, culture media preparation. Production of mother spawn, Multiplication of spawn – Inoculation Technique – Cultivation technology – Substrates, composting technology, bed, polythene bag preparation,

spawning – casing – cropping – mushroom production – Harvest – Storage methods and Marketing.

Unit V

Cultivation of Button mushroom (*Agaricus bisporus*), Milky mushroom (*Calocybe indica*), Oyster mushroom (*Pleurotus sajor-caju*) and Paddy straw mushroom (*Volvariella volvacea*). Food Preparation – Soup, cutlet, vegetable curry, samosa, omlette and pickle. Mushroom Research Centres in India.

REFERENCES:

1. Alice, D., Muthusamy and Yesuraja, M. (1999). *Mushroom Culture.* Agricultural College, Research Institute Publications, Madurai.
2. Dubey, R.C. (2008*). A Textbook of Biotechnology.* S. Chand & Co. Ltd., New Delhi.
3. Marimuthu, T. *et al.* (1991). *Oyster Mushroom, Development of Plant Pathology.* Tamil Nadu Agricultural University, Coimbatore.
4. Newton, W.E. *et al.* (1977). *Recent Developments in Nitrogen Fixation.* Academic Press, New York.
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8. Subba Rao, N.S. (1982). *Advances in Agricultural Microbiology.* Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
9. Subba Rao, N.S. (2002). *Soil Microbiology* (4th ed.) *Soil Microorganisms and Plant Growth.* Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
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11. Tripathi, D.P. (2005). *Mushroom Cultivation.* Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
12. Verma, A. (1999). *Mycorrhiza.* Springer Verlag, Berlin.

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CORE PRACTICAL I

PLANT BIODIVERSITY – I & II,
MICROBIOLOGY, PLANT PATHOLOGY AND IMMUNOLOGY &
BIOFERTILIZERS AND MUSHROOM TECHNOLOGY (P)

ALGAE

Gleocapsa, Spirulina, Anabaena, Volvox, Spirogyra, Ulothrix, Acetabularia, Nitella, Vaucheria, Cyclotella and *Navicula (Diatoms), Padina, Sargassum, Gelidium* and *Gracilaria*

FUNGI

Pythium, Pilobolus, Taphrina, Xylaria, Pluerotus, Lycoperdon, Cercospora, Fusarium and *Colletotrichum*

LICHENS

Parmelia and *Usnea*

BRYOPHYTES

Morphological and anatomical study of representative members of the following genera: *Marchantia, Lunularia, Targionia, Reboulia, Porella* and *Polytrichum*

PTERIDOPHYTES

Study of morphology and anatomy of the vegetative and reproductive parts of the following genera: *Isoetes, Lycopodium, Angiopteris, Osmunda, Gleichenia, Pteris, Nephrolepis* and *Azolla*

GYMNOSPERMS

Study of morphology and anatomy of the vegetative and reproductive parts of the following genera: *Araucaria, Podocarpus, Ginkgo* and *Ephedra*

PALEOBOTANY

Lepidodendron, Stigmaria, Calamostachys, Lyginopteris, Lagenostoma and *Cordaites*

MICROBIOLOGY

Isolation of microbes from soil – Serial dilution and Plating – Gram's staining of bacteria found in milk, curd, root – nodule – Effect of different antibodies on bacterial growth (antibiotic sensitivity)

PLANT PATHOLOGY

Study of the following diseases:
Rust of wheat, Wilt of cotton, White rust of mustanrd – Citrus canker, Rice blight – Tobacco mosaic, Cucumber mosaic, Little leaf of brinjal, Tikka diseases of   ground nut, Root knot of tomato.

IMMUNOLOGY

Blood group determination (Demonstration)

BIOFERTILIZERS

Isolation, identification of *Rhizobium*, VAM, *Azospirillum*

MUSHROOM TECHNOLOGY

Preparation of culture, Spawn production, Cultivation Techniques.

Note:

Duly certified record notebooks should be submitted for all the practical examinations and those who do not submit, need not be permitted to the concerned practical examination.

EVALUATION FOR CORE COURSE – V

➢ **Internal** (40 marks)
- Practical skill   : 10
- Submission of observation note books   : 10
- Practical assessment by test   : 10
- Submission of 10 permanent slide of
   hand/microtome section   : 10
   Total   **: 40**

➢ **External** (60 marks)

- Practical Examination   : 50
- Record   : 10
   Total   **: 60**

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CORE COURSE V

ANATOMY, EMBRYOLOGY AND MORPHOGENESIS

Objectives:

1. To inculcate the basics of tissues and anatomical features of plants.
2. To impart the knowledge about the various aspects of morphogenesis.
3. To understand the key aspects of embryology of angiosperms

Unit I: ANATOMY

General account and theories of organization of apical meristems of shoot apex and root apex, quiescent centre. Structural diversity and phylogenetic trends of specialization of xylem and phloem. Cambium - origin - cellular structure, cell division, storied and non-storied types. Cambium in budding and grafting - wound healing role. Trichomes, periderm and lenticels.

Unit II: ANATOMY

Anatomical characteristics and vascular differentiation in primary and secondary structure of root and stem in Dicot and Monocot. Origin of lateral roots – Root - stem transition - Anatomy of Dicot and Monocot leaves. Anatomy of nodes and petioles. Leaf abscission, stomatal types, vascularization of flower and seedling.

Unit III: EMBRYOLOGY

Microsporangium - Microsporogenesis, Microspores - arrangement - morphology - ultrastructure - Microgametogenesis - Nemec phenomenon – pollen - stigma - Incompatibility - Methods to overcome incompatibility - Megasporangium - Megagametogenesis - Female gametophyte – Monosporic, Bisporic, Tetrasporic and special types - Nutrition of embryo sac and fertilization

Unit IV: EMBRYOLOGY

Endosperm - Types - Endosperm haustoria - Cytology and physiology of endosperms, functions of endosperms - Embryo development in Dicot and Monocot, Nutrition of embryo - Polyembryony - Causes, Apomixis - Causes, Apospory - Their role in plant improvement programmes and seed development.

Unit V: MORPHOGENESIS

Definition - Morphogenesis and its relation to morphology - Turing's diffusion reaction theory - Morphogenetic factors - growth regulators - genetic and environment - polarity.
Molecular basis of morphogenesis - Cytosol and cytoskeleton, microtubules and microfilaments - Cellular level morphogenesis - Nuclear transplantation experiments with *Acetabularia* - Sach's and Errer's laws - Asymmetric

divisions and their significance. Morphogenesis at tissue level - Differentiation, dedifferentiation and redifferentiation of vascular tissue *in vivo, in vitro* and in wounds.

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ANATOMY

1. Clowers, F.A.L. (1961). *Apical Meristems*. Blackwell Scientific Publications, Oxford.
2. Cutter, E.G. (1978). *Plant Anatomy*. Edward Arnold Publishers Ltd., London.
3. Easu, K. (1953). *Plant Anatomy*. John Wiley & Sons Inc., New York.
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EMBRYOLOGY

1. Agarwal, S.B. (1990). *Embryology of Angiosperms – a fundamental approach*. Sahitya Bhawan, Agra.
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5. Raghavan, V. (1976). *Experimental Embryogenesis in Vascular Plants*. Academic Press, London.

MORPHOGENESIS

1. Bard, J. (1990). *Morphogenesis*. Cambridge University Press, London.
2. Bonner, J.T. (1965). *Morphogenesis*. Oxford & IBH Publications, Bombay.
3. Brouder, L.W. (1986). *Development Order: A Comprehensive Treatise Vol.2. The Cellular Basis of Morphogenesis*. Plenum Press, New York.
4. Bryant, J.A. and Francis, D. (1985). *The Cell Division Cycle in Plants*. Cambridge University Press, London.
5. Burgess, J. (1985). *An Introduction to Plant Cell Development*. Cambridge University Press, London.
6. Ebert, J.D. *et al.* (1970). *Interacting Systems in Development*. Holt, Reinhart & Win Inc., New York.
7. Murphy, T. M. and Thompson, W. F. (1988). *Molecular Plant Development*. Prentice Hall of India Pvt. Ltd., New Jersey.

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CORE COURSE VI

ANGIOSPERM TAXONOMY, ECOLOGY AND CONSERVATION

Objectives:

This paper covers all the aspects pertaining to

1. Different systems of classification of Angiosperms, taxonomic literature, botanical nomenclature
2. Preparation of description of plant species, herbarium techniques and interpretation of allied disciplines and molecular taxonomy to resolve the disputes in modern taxonomy
3. Systematic treatment, diagnostic features, characters and economic importance of selected families in Angiosperms
4. Components, dynamics, trophic level and biogeochemical cycles in different ecosystems and their conservation by *in situ* and *ex situ* methods

Unit I

Plant Taxonomy: Objectives, types of botanical classifications; Linnaeus, Bentham and Hooker, Engler & Prantl and Hutchinson, Takhtajan system, Cronquist system, Dahlgrens system, APG III classification. Floras, revisions and monographs. Construction of taxonomic keys --indented and bracketed. International Code of Botanical Nomenclature: type concept, principle of priority, valid publication and starting points of nomenclature.

Unit II

Phytography. Field and Herbarium Techniques; Important herbaria and botanic gardens in India. Modern trends in taxonomy. Anatomy, palynology and embryology in relation to taxonomy. Cytotaxonomy, Biosystematics, Taxometrics, Cladistics, Chemotaxonomy, Serotaxonomy, Numerical Taxonomy, Biosystematics, Molecular Taxonomy applications of RAPD, RFLP, ISSR, SSR, ITS, and QTL, DNA barcoding.

Unit III

Menispermaceae, Polygalaceae, Caryophyllaceae, Portulacaceae, Rhamnaceae, Sapindaceae, Fabaceae (Papilionoideae, Caesalpinioideae, Mimosoideae), Lythraceae, Passifloraceae, Aizoaceae

Unit IV

Sapotaceae, Oleaceae, Gentianaceae, Boraginaceae, Scrophulariaceae, Pedaliaceae, Aristolochiaceae, Loranthaceae, Casuarinaceae, Orchidaceae, Commelinaceae, Cyperaceae

Unit V

Concept and dynamics of ecosystem: Types of ecosystem, components, Food chain, Food web and energy flow - Trophic level, ecological pyramids. Productivity and biogeochemical cycles (N, P, C, S). *In situ*- Protected Areas; Biosphere Reserves, National Parks, Tiger Reserves, Wildlife Sanctuaries. *Ex situ* – selection of superior germplasms. Field gene bank, botanic garden, experimental garden, introduction, reintroduction and *in vitro* conservation of threatened plants.

References

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4. Bilgrami, K.S. and Dogra, J.V. (1990). *Phytochemistry and Plant Taxonomy.* CBS Publishers, New Delhi.
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CORE PRACTICAL II

ANATOMY, EMBRYOLOGY AND MORPHOGENESIS & ANGIOSPERM TAXONOMY, ECOLOGY AND CONSERVATION (P)

ANATOMY AND EMBRYOLOGY

ANATOMY: Preparation of Transverse sections of the following plant parts to observe and record the internal structure. Monocot and Dicot stem, and leaf (Primary structure), normal secondary thickening in dicot stem and root. Anomalous secondary thickening in *Dracaena*, *Nyctanthes* and *Boerhaavia* stems. Nodal anatomy–uni–& trilacunar.

EMBRYOLOGY: T.S. of anther (young and nature) at various stages of development. Pollen types L.S. of ovule, Types of ovules – orthotropous and Anatropous. Embryogenesis, Embryo Dissection.

TAXONOMY

Study of the plants belonging to the following families:
Menispermaceae, Polygalaceae, Caryophyllaceae, Portulacaceae, Rhamnaceae, Sapindaceae, Fabaceae (Papilionoideae, Caesalpinioideae, Mimosoideae), Lythraceae, Passifloraceae, Aizoaceae, Sapotaceae, Oleaceae, Gentianaceae, Boraginaceae, Scrophulariaceae, Pedaliaceae, Aristolochiaceae, Loranthaceae, Casuarinaceae, Orchidaceae, Commelinaceae, Cyperaceae.

➢ Identification of binomial of the plants with the help of Gamble Flora.
➢ ICBN problems to be worked out.
➢ Submission of 30 herbarium specimens with field note book and tour report.
➢ The students should undertake as part of their course a tour and field study of vegetation under the guidance of the staff for three to five days within the state and neighbouring states. Students who have not undertaken the above activities shall forfeit the appropriate marks allotted for this purpose (10 marks) for practical examination.

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FORESTRY AND WOOD SCIENCE

Objectives:

1. To prepare students for careers in the forest services and wood products industry.
2. To educate students to provide technical expertise to the wood industries.

Unit I

World and Indian forest scenario; Forest types of India; Forest influences and protection; Rare and endangered species; Conservation strategies; Exotics and its significance; Silvicultural principles and practices; Genetic Engineering and its application in forestry; Remote sensing and GIS in forestry.

Unit II

Forest Resources and utilization; Forest products; Forest laws and policies, people and Forest; Social and community forestry; Forest industries; Role of social forestry in cottage industry; Role of forestry in Indian economy. Biomass conversion strategies - energy plantations.

Unit III

Nature and properties of wood: physical, chemical, mechanical and anatomy of wood. Durability of wood. Monocot and dicot wood; pycnoxylic and manoxylic wood; dendrochronology; Wood seasoning and preservation; Defects and abnormalities of wood; types of commercial wood species of India.

Unit IV

Wood deterioration- fungi, insects and other agents; Wood protection- Practical methods for preserving and protection, Chemical processing of wood.

Unit V

Composite wood: adhesives-manufacture, properties, uses, manufacture and uses of plywood, fiber boards and particle boards. Present status of composite wood, paper and rayon industries. Present position of supply of raw material to industries and wood substitution.

BOOKS

1. Bowyer, J.L., Shmulsky, R. and Haygreen, J.G. (2007). *Forest Products and Wood Science: An Introduction.* Wiley-Blackwell, Oxford.
2. De Vere Burton L. (2000). *Introduction to Forestry Science.* Delmar Publishers, New York.
3. Franz F.P. Kollmann and Wilfred A. Jr. Cote. (2012). *Principles of Wood Science and Technology: I Solid Wood.* Springer–verlag, Berlin.

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1. Jha, L.K. (1996). *Forestry for Rural Development.* APH Publishing Corporation, New Delhi.
2. Negi, S.S. (1994). *India's Forests, Forestry and Wildlife.* Indus Publishing Co., New Delhi.

*Note***:** No Practical for this paper.

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ELECTIVE COURSE II

INDUSTRIAL MICROBIOLOGY

Objectives:

1. Understand the importance of microbes, basics of a sterilization, fermenter design and types
2. Study the avenues of exploiting microbes in bioconversion technology
3. Study the industrial production and product recovery in fermentation

Unit I

Introduction, history and development of industrial microbiology, scope of industrial microbiology. Microorganisms in industry - sterilization - preparation of media - isolation methods for microorganisms - culture and preservation and stability. Principles of storage of microbes at low temperature in liquid nitrogen, preparation of inoculum.

Unit II

Principal types of fermentation: factors involved in fermenter design, differences between biochemical and chemical processes; biochemical reactions, operational consideration. Fermenter configuration and various types of fermentors; principle of operation characteristics of fermentors.

Unit III

Methylotrophs: methanogens and methylotrophs, mechanism of methane production - Economic importance of methylotrophs. Hydrogen fuel. Microbial leaching. Sulphur utilizing bacteria, sulphate reduction pathway - use of nucleotides as nitrogen source for growth of certain microorganisms (pathway of nucleic acid breakdown).

Unit IV

Microbial production of food; microbial single cell protein (SCP). Fermented dairy products, fermented meats, leavening of breads, alcoholic beverages - beer, distilled liquors and wines, vinegar; fermented vegetables, pickles, olives and soy sauce.

Unit V

Production of pharmaceuticals: antibiotics, steroids, human proteins, vaccines and vitamins, enzymes. antibiotics and their mode of action with reference to penicillin, streptomycin, erythromycin, cephalosporin and griseofulvin.

BOOKS

1. Davis, B.D., Dulbecco, R., Eiser, H.N. and Grinsberh, H.S. (1980). *Microbiology*. Harber Row, New York.
2. Davis, R.W., Bostein, D. and Roth, J.R. (1980). *Advanced Bacterial Genetics*. Cold Spring, Henbor, New York.
3. Ketchum, P.A. (1988). *Microbiology: Concepts and Application*. John Wiley & Sons Inc., New York.
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6. Pelczar, M.H. and Cahn, E.C.S. (1993). *Microbiology*. Tata-McGraw Hill Publishing Co. Ltd., New Delhi.
7. Power and Daginawala (1994). *General Microbiology*. Himalayan Publishing House, New Delhi.
8. Ringo, J. (2004). *Fundamental Genetics*. Cambridge University Press, United Kingdom.
9. Salle, A.J. (1974). *Fundamental Principles of Bacteriology*. Tata-McGraw Hill Publishing Co. Ltd., New Delhi.
10. Schlegel, H.G. (1993). *General Microbiology* (7th Edition). Cambridge University Press, United Kingdom.
11. Starr, M.P. (1981). *The Prokaryotes: A Handbook on Habitat, Isolation and Identification of Bacteria, Vols. I & II*. Springer Verlag, Berlin.
12. Trevan, M.D. (1987). *Biotechnology: The Biological Principles*. Tata-McGraw Hill Publishing Co. Ltd., New Delhi.
13. Trevan, K. (1991). *Biotechnology*. Wiley Eastern Ltd., New Delhi.

Note: No Practical for this paper.

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CORE COURSE VII

CELL BIOLOGY, GENETICS AND PLANT BREEDING

Objectives:

This paper imparts knowledge on

1. Structure, organization, function, interrelationships of cell membrane and cell organelles and cell communication systems
2. Cell growth and cell division
3. Mendelian and non-Mendelian genetics and linkage and crossing over
4. Genes and genetic variations
5. Plant breeding methods and role of molecular markers in plant breeding

Unit I   : CELL BIOLOGY

Structural organization and composition of cell membrane carbohydrates, proteins and lipids. Membrane functions. Structure, function and interrelationships of mitochondria, chloroplast, peroxisomes and glyoxysomes. Genetic systems in mitochondria and chloroplast. Cell communication: general principles, Signaling molecules. Receptors: Cell surface receptors – ion-channel linked receptors, G-protein coupled receptors.

Unit II   : CELL BIOLOGY

Cell growth and division - Phases of cell cycle, cell cycle control and regulation systems; extracellular and intracellular signals. Cyclins and Cyclin-dependent kinases. Regulation of plant cell cycle. Programmed cell death – molecular mechanism and control. Cytoskeleton; structure, assembly, disassembly and regulation of filaments involved – actin filaments (microfilaments), microtubules, and intermediate filaments.

Unit III   : GENETICS

Mendelism – basic principles (brief study). Non-Mendelian inheritance: cytoplasmic inheritance - cytoplasmic and genetic male sterilities and applications. Sex determination in animals and plants.
Linkage and Crossing over - Stern's hypothesis, Creighton and McClintock's experiments, single cross over, multiple cross over, two-point cross, three-point cross, map distances, gene order, interference and co-efficient of coincidence.

Unit IV   : GENETICS

Gene pool, allele and genotype frequency. Hardy-Weinberg law and its applications, estimation of allele and genotype frequency of dominant genes, codominant genes, sex-linked genes and multiple alleles. Genetic equilibrium, genetic polymorphism. Factors altering allelic frequencies

(mutation, genetic drift - bottle neck effect and founder effect, migration, selection, non-random mating and inbreeding coefficient).

Unit V   : PLANT BREEDING

Genetic variability and its role in plant breeding - Breeding methods in self-pollinated, cross pollinated, vegetatively propagated and apomictic plants. Inbreeding depression - Role of heterosis in plant breeding. Somaclonal variations in crop improvement. RFLP and SNP in plant breeding.

REFERENCES:

1. Ajay Paul (2007). *Text book of Cell and Molecular biology.* Books and Allied (P) Ltd., Kolkata
2. Allard, R.W. (1995). *Principles of Plant Breeding.* John Wiley and Sons, Inc., India.
3. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2002). *Molecular biology of the cell* (IV Edn). Garland Science, Taylor and Francis group, New York.
4. Gardner, E.J., Simmons, M.J. and Snustad, D.P. (1991). *Principles of Genetics* (III Edn). John Wiley and Sons Inc., India.
5. Gerald Karp (2008). *Cell and Molecular biology: Concepts and experiments* (V Edn). John Wiley & Sons, India.
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11. Snustad, D.P. and Simmons M.J. (2010). *Principles of genetics* (V Edn). John Wiley and Sons, India.
12. Strickberger (2005). *Genetics* (III Edn). Prentice Hall of India Pvt. Ltd., New Jersey.
13. Wayne M Becker, Lewis J Kleinsmith, Jeff Hardin (2007). *The world of the cell* (VI Edn). Pearson.

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CORE COURSE VIII

PLANT PHYSIOLOGY, BIOCHEMISTRY AND BIOPHYSICS

Objectives:

Students can understand

1. Plant-water relationship, translocation of water and minerals, photosynthesis, respiration and transfer of energy
2. Nitrogen metabolism, plant growth hormones, flowering, dormancy and senescence, stress
3. Chemistry of carbohydrates, proteins, enzymes and lipids
4. Nucleic acids, vitamins and secondary metabolites
5. Bioenergetics, laws of Thermodynamics and photobiology

PLANT PHYSIOLOGY

Unit I

Water relations of plants – Structure and Physicochemical properties of water, chemical potential and water potential in the plant, bulk movement of water, soil-plant atmosphere continuum, stomatal physiology and regulation.

Modern concepts of mineral salt absorption and translocation. Photosynthesis: Photophysical and photochemical phase; Light reactions; sequence of photosynthetic pathway - Electron Transport Chain, Photophosphorylation. Pathways of CO_2 fixation. Respiration: Photorespiration and dark respiration. Cycles of respiration, Oxidative Phosphorylation, Gluconeogenesis.

Unit II

Mechanism of nitrogen fixation, Nitrogen uptake and assimilation. Biosynthesis, storage, breakdown, transport, physiological effects, and mechanism of action of plant growth hormones, elicitors. Phytochrome and hormones in movements and flowering. Physiology of Dormancy break. Senescence and aging. Effect of water and salt stress on crop production.

Unit III

Structure of atoms, molecules and chemical bonds. pH and buffers. Chemistry of biological molecule: Carbohydrates: Classification, structure of mono, di, oligo and polysaccharides. Protein: Classification, structure and composition of amino acids. Enzymes: Classification, mode of action, km value, coenzymes, isoenzymes. Lipids: Classification, structure and properties of acyl lipids and phosphates.

Unit IV

Nucleic acids: DNA and RNA structure - Watson and Crick model; A, B and Z forms of DNA - RNA secondary structure. Vitamins – general characters – classification – structure and properties – fat soluble and water soluble vitamins. Secondary metabolites: Classification, biosynthesis, and functions of terpenoids, alkaloids, phenolics, flavonoids, coumarins.

Unit V

Bioenergetics, Energy and work. Laws of Thermodynamics. Energy transductions in biological systems. Redox potential, Redox couples, ATP bioenergetics, Order of reactions. Photobiology: Dual nature of light, characteristics of solar radiation, solar energy - Efficiency of atoms - Absorption spectra in molecules, energy states, De-excitation.

REFERENCES:

PLANT PHYSIOLOGY AND BIOCHEMISTRY:

1. Haynie, D.T. (2008). *Biological Thermodynamics* (2nd Edition). Cambridge University Press India Pvt. Ltd., New Delhi.
2. Hess, D. (2012). *Plant Physiology: Molecular, Biochemical, and Physiological Fundamentals of Metabolism and development.* Springer Science & Business Media, New York.
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5. Michael M Cox, David L Nelson (2008). *Lehninger Principles of Biochemistry* (V Edn). W H. Freeman and company, New York.
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8. Taiz, L. and Zeiger, E. (2010). *Plant Physiology.* Sinauer Associates, India.
9. Verma, S.K. (1999). *Plant Physiology.* S. Chand & Co., New Delhi.

BIOPHYSICS:

1. Casey, E.J. (1962). *Biophysics: Concepts and Mechanics.* Van Nostrand Reinhold Co. and East-West Press, New Delhi.
2. Lehninger, A.L. (1971). *Bioenergetics: The Molecular Basis of Biological Energy Transformation.* Addison Wiley.
3. Salil Bose, S. (1982). *Elementary Biophysics.* Vijaya Printers, Madurai.

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CORE PRACTICAL III

CELL BIOLOGY, GENETICS AND PLANT BREEDING & PLANT PHYSIOLOGY, BIOCHEMISTRY AND BIOPHYSICS (P)

CELL BIOLOGY, GENETICS AND PLANT BREEDING

1. Workout problems related to linkage, crossing over and gene mapping, human pedigree analysis.
2. Workout problems in population genetics - gene and genotype frequency, Hardy Weinberg equilibrium.
3. Hybridization techniques in self and cross pollinated plants
4. Visit a plant breeding station to familiarize with breeding programmes. Submit a report of the visit.

PLANT PHYSIOLOGY

1. Measurement of water potential by gravimetric method.
2. Measurement of Photosynthesis - Hill Reaction.
3. Estimation of total chlorophyll and study of absorption pattern of chlorophyll solution.
4. Survey of C4 plants and CAM plants.
5. Separation of photosynthetic pigments by TLC/paper chromatography and calculating the Rf value
6. Determination of nitrate reductase activity.
7. Extraction and estimation of leghaemoglobin from root nodules.
8. Estimation of proline in plant tissues under various abiotic stresses.
9. Estimation of phenol in plant tissues affected by biotic stress.
10. Determination of peroxidase activity in plant tissues affected by biotic/abiotic stresses.
11. Estimation of free amino acids in senescing leaves to understand the source to sink transformation phenomenon.

BIOCHEMISTRY AND BIOPHYSICS

1. Preparation of molal, molar, normal and percentage solutions and their dilutions.
2. Estimation of proteins by Lowry's method
3. Protein profile (SDS-PAGE).in plants under stress.
4. Extraction and estimation of lipid
5. Determination of reducing sugars in (grapes) fruit
6. Separation and identification of amino acids by chromatography
7. Extraction of amylase and determination of its activity
8. Determination of km-value, V-max, Michael's constant for amylase

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ELECTIVE COURSE III

GENETIC ENGINEERING AND BIOTECHNOLOGY

Objectives:

This paper provides an understanding of basic techniques of genetic manipulation, plasmids and phase vectors, cloning, screening and sequencing strategies of genomic DNA,

Unit I: BASIC TECHNIQUES OF GENETIC MANIPULATION

Basic techniques: Agarose gel electrophoresis, nucleic acid blotting, transformation of *E. coli*, polymerase chain reaction. Cutting and joining DNA molecules: Restriction enzymes, joining DNA molecules with DNA ligases, adaptors, homopolymer tailing, joining DNA molecules without DNA ligases.

Unit II: PLASMIDS AND PHASE VECTORS

pBR322, Ti-plasmid Bacteriophage λ, single standard DNA vectors – phage M_{13}, cosmids, Phagemids BAC, YAC, Expression vectors, Shuttle vectors.

Unit III: CLONING

Cloning strategies: Cloning genomic DNA – Genomic DNA libraries, PCR as an alternative to genomic cloning. Cloning – Properties cDNA libraries, preparation of cDNA for library construction, full-length cDNA cloning.

Unit IV: SCREENING STRATEGIES

Sequence – dependent screening, screening by hybridization, probe design, chromosome walking, screening expression libraries – immunological, south-western, north-western blotting, RAPD, RFLP, DNA foot printing.

Unit V: SEQUENCING STRATEGIES

Basic DNA sequencing – Chain terminator sequencing, automated sequencing, Whole genome sequencing – Analysis of sequence data, DNA sequence databases and data base searches, site–directed mutagenesis. Gene transfer to plants: *Agrobacterium* mediated transformation, direct DNA transformation – Protoplast transformation, particle bombardment, electroporation and microinjection.

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Note: No Practical for this paper.

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ELECTIVE COURSE IV

HORTICULTURE AND LANDSCAPING

Objectives:

To enable the students

1. To understand the main principles and importance of horticulture
2. To develop skill in horticulture techniques
3. To know the various methods of plant propagation
4. To develop potential for self-employment

Unit I

Importance of scope of horticulture – Divisions of horticulture – Climate, soil and nutritional needs – Water irrigation – Plant propagation method – Cutting, layering, grafting, budding. Stock – scion relationship, micropropagation by induction of rooting. Glass houses and green houses

Unit II

Principles and methods of designing outdoor garden – hedges, edges, fences, trees, climbers, rockeries, arches, terrace garden – Lawn making and maintenance – Water garden – cultivation of water plants-common water plants. Layout for a model college garden.

Unit III

Indoor gardening – Foliage plants, flowering plants, hanging basket, Bonsai plants – Training, watering and pruning. Floriculture – Cultivation of commercial flower crops – Rose, Jasmine and Chrysanthemum, Flower decoration – Dry and wet decoration.

Unit IV

Classification of vegetables, cultivation of important vegetable – Tomato, potato, brinjal, onion, cabbage and snake guard. Layout for a model kitchen garden.

Unit V

Fruit crops – Induction of flowering, flower thinning, fruit setting, fruit development. Cultivation of important fruit crops - Mango, Grapes, Sapota and Guava. Cultivation of tree species – Eucalyptus and Teak.

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7. *Note:* No Practical for this paper

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CORE COURSE IX

PLANT TISSUE CULTURE

Objectives:

1. To inculcate the basics of plant tissue culture
2. To impart the knowledge about the various aspects of tissue culture and their applications

Unit I

Introduction - history, scope and concepts of basic techniques in plant tissue culture. Laboratory requirements and organisation. Sterilization-filter, heat and chemical. Media preparation - inorganic nutrients, organic supplements, carbon source, gelling agents, growth regulators and composition of important culture media (MS, White,s and Gamborg's media).

Unit II

Cell, tissue and organ culture - Isolation of single cells, selection and types of cells, tissue explants and organs for culture - paper, raft nurse technique, plating method, microchamber techniques, cell suspension cultures - batch, continuous, chemostat culture - synchronization of suspension culture, cellular totipotency, cytological, cytochemical and vascular differentiations - totipotency of epidermal and crown – gall cells.

Unit III

Micropropagation - clonal propagation of elite germplasm, factors affecting morphogenesis and proliferation rate, technical problems in micropropagation. Organogenesis - formation of shoots and roots - role of growth regulators and other factors, somaclonal and gametoclonal variations. Somatic embryogenesis - Process of somatic embryogenesis, structure, stages of embryo development, factors affecting embryogenesis, synthetic seeds.

Unit IV

Haploid production - androgenesis, gynogenesis - techniques of anther culture – segmentation pattern in microspore - isolated pollen culture - plantlets from haploids - diploidisation - factors influencing androgenesis, haploidy through gynogenesis, haploid mutants, utilization of haploids in plant breeding. *In vitro* pollination - ovule and ovary culture, importance, techniques overcoming incompatibility barriers, embryo rescue. Protoplast culture: Isolation of protoplasts - mechanical and enzymatic sources, culture of protoplasts, viability. Protoplastfusion - spontaneous, mechanical, induced electrofusion, selection of somatic hybrids, cybrids, importance.

Unit V

In vitro production of secondary metabolities - classification of secondary metabolites, biosynthetic pathways, cell suspension cultures, immobilized cell cultures and biotransformation, elicitors and hairy root culture. Cryopreservation and gene bank - Modes of preservation, preparation of materials for deep freezing, cryopotectors, storage strategies, assessment of successful cryopreservation, application and limitations. Application of tissue culture in forestry, horticulture, agriculture and pharmaceutical industry, transgenic plants.

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1. Bhojwani, S.S. and Razdan, M.K. (1983). *Plant Tissue Culture: Theory and Practice.* Elsevier Science Publishers, Netherlands.
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10. Vasil, I.K. (1986). *Cell Culture and somatic Cell Genetics of Plants* (3 Volumes). Academic Press Inc.

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CORE COURSE X

RESEARCH METHODOLOGY

Objectives:

To enable the students

1. To know principles involved in microscopy, chromatography, spectroscopy and electrophoresis method
2. To make the students apply statistical principles to biological studies
3. To make the students understand the problem selection, project design and thesis writing

Unit I

Microscopy – Principles and applications of light, dark field, phase contrast, fluorescence, polarization, scanning and transmission microscopy – Fixation and staining of materials for electron microscopy.

Unit II

Chromatography – Principles and applications of partition-adsorption – Ion Exchange – Affinity – Gel filtration – TLC–GLC, HPLC, GCMS-Spectroscopy – Colorimeter, UV-Visible Spectrophotometer – Flame photometer – Atomic absorption spectrophotometer, NMR.

Unit III

Electrophoresis – Native PAGE, SDS PAGE, Two dimensional Electrophoresis and Agarose – Radio isotopes – Half-life Tracer techniques, autoradiography – scintillation and GM counter.

Unit IV

Scope of biostatistics – Classification of data-graphical and diagrammatical representation – mean, median, mode-Standard Deviation – Standard Error – Test of significance – 't'–Test – Chi-square test – ANOVA – Simple Correlation – Regression.

Unit V

Thesis writing – Research design-choosing the problem for research – Review of literature – Primary, secondary and tertiary sources, Bibliography – Indexing and abstracting – Reporting the results of research in conference – Oral presentation – Poster presentation – Planning and preparing a thesis, Preparing article for publication, Proof correction, citation index and impact factor

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CORE PRACTICAL IV

PLANT TISSUE CULTURE & RESEARCH METHODOLOGY (P)

RESEARCH METHODOLOGY

1. Sampling by Random Number Table
2. Data Collection
3. Classification of Data: Discrete, continuous and cumulative.
4. Statistical diagrams: Histogram, Frequency curve, Bar chart and Ogive curve
5. Measures of Central Values: Mean, Median and Mode
6. Measures of Dispersion: Range, Mean Deviation and Standard Deviation.
7. Exercises with Tests of Significance
8. Preparation of Index cards
9. Preparation of Bibliography
10. Proof correction
11. Exercises in the calculation of Citation Index.
12. Determination of Impact Factor of Author, Article and Journal.
13. Identification of instruments/their parts and their applications

PLANT TISSUE CULTURE

1. Media preparation-MS, Whites and Gamborg's
2. Sterilization of Ex-plant and inoculation (shoot tip, nodal, leaf)
3. Callus induction
4. Micropropagation
5. Protoplast isolation (Mechanical and enzymatic)
6. Synthetic seed production

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ELECTIVE COURSE V

FOOD PRESERVATION AND PROCESSING

Objectives:

1. To understand the salient features of food preservation and processing.
2. To study the preservation and processing of day to day products by using food additives

Unit I

Food Preservation: principles and methods – perishable, semi–perishable and non-perishable foods – methods of preservation – temporary preservation – asepsis, low temperature, antiseptics, pasteurization, electromagnetic radiation – permanent preservation – sterilization processing by heat, effect of acidification and antiseptics.

Unit II

Preservation by salting, preservation by sugar syrup – preservation by concentration – preparation of jam jelly – role of pectin in jam – preservation by chemicals: benzoic acid, parabenzene, sulphur-di-oxide, sulphites, nitrites diethylpyrocarbonates (DEPC), hydrogen peroxide, chlorine and CO_2.

Unit III

Processing methods: wet heating method by cookers. Microwave heating; processing of fruits and fruit products – canning fruits; preparation of fruit juices: squashes and cordials. Preservation by antibiotics and irradiation.

Unit IV

Vegetable and vegetable products –Canning of vegetables and pickles. Baked products: Classification of wheat – hard wheat, soft wheat, durum wheat, flour preparation, baking formulation, processing. Milk and milk products: butter, ghee, lassi, unfermented milk products, condensed milk, cheese, ice-cream and milk powder.

Unit V

Food additives: definitions, preservatives, antioxidants – colouring agents, emulsifier, stabilizers and thickening, bleaching and maturing agents, clarifying agents, anti– foaming agents, function of additives. Food adulteration – adulterants and simple detection techniques; food grades – standards, laws and regulations.

References

1. Adams, M.R. and Moss, M.O. (1996). *Food Microbiology*. New Age International Pvt. Ltd. Publishers, New Delhi.

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Note: No Practical for this paper.

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BHARATHIDASAN UNIVERSITY   **TIRUCHIRAPPALLI – 620 024**
M.Sc. Chemistry   **Course Structure under CBCS**
(For the candidates admitted from the academic year 2016-2017 onwards)

Semester	Course	Title	Instruction Hours/ Week	Credit	Exam Hours	Marks Internal	Marks External	Total
I	Core Course – I (CC)	Organic Chemistry –I	6	5	3	25	75	100
	Core Course – II (CC)	Inorganic Chemistry –I	6	5	3	25	75	100
	Core Course – III (CC)	Physical Chemistry –I	6	5	3	25	75	100
	Core Practical – I (CP)	Organic Chemistry Practical –I	6	3	6	40	60	100
	Core Practical – II (CP)	Inorganic Chemistry Practical –I	6	3	6	40	60	100
		TOTAL	**30**	**21**				**500**
II	Core Course – IV (CC)	Inorganic Chemistry –II	6	5	3	25	75	100
	Core Course – V (CC)	Physical Methods in Chemistry –I	6	5	3	25	75	100
	Core Practical – III (CP)	Organic Chemistry Practical – II	6	3	6	40	60	100
	Core Practical – IV (CP)	Inorganic Chemistry Practical –II	6	3	6	40	60	100
	Elective Course – IA (EC) / Elective Course – IB (EC)	(A) Solid State Chemistry / (B) Supramolecular Chemistry	6	5	3	25	75	100
		TOTAL	**30**	**21**				**500**
III	Core Course – VI (CC)	Organic Chemistry – II	6	5	3	25	75	100
	Core Course – VII (CC)	Physical Chemistry – II	6	6	3	25	75	100
	Core Practical – V (CP)	Physical Chemistry Practical – I	6	3	6	40	60	100
	Elective Course – IIA (EC) / Elective Course – IIB (EC)	(A) Pharmaceutical Chemistry / (B) Bio-organic Chemistry	6	5	3	25	75	100
	Elective Course – III (EC)	Analytical Chemistry	6	5	3	25	75	100
		TOTAL	**30**	**24**				**500**
IV	Core Course – VIII (CC)	Physical Methods in Chemistry – II	6	5	3	25	75	100
	Core Practical – VI (CP)	Physical Chemistry Practical – II	6	3	6	40	60	100
	Elective Course – IVA (EC) / Elective Course – IVB (EC)	(A) Green Chemistry / (B) Industrial Chemistry	6	5	3	25	75	100
	Elective Course – VA (EC) / Elective Course – VB (EC)	(A) Selected Topics in Chemistry/(B) Chemistry of Nanoscience and Nanotechnology	6	5	3	25	75	100
	Project	Dissertation = 80 Marks Viva = 20 Marks	6	6	-	-	-	100
		TOTAL	**30**	**24**				**500**
		GRAND TOTAL	**120**	**90**				**2000**

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Project            :100 Marks
(Dissertation      :  80 Marks
Viva Voice         :  20 Marks)
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Note:

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Core Papers       -      8
Core Practical    -      6
Elective Papers   -      5
Project           -      1
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Note:

1. Theory	Internal	25 marks	External	75 marks
2. Practical	Internal	40 marks	External	60 marks

Note:

1. Theory	Internal	25 marks	External	75 marks
2. Practical	”	40 marks	”	60 marks

3. Separate passing minimum is prescribed for Internal and External

   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The passing minimum not less than 50% in the aggregate.

ORGANIC CHEMISTRY I

OBJECTIVES

1. To understand the basic concepts of aromaticity.
2. To learn the oxidation and reducing reagents for organic synthesis.
3. To learn stereochemistry of organic compounds.
4. To know the effect of light in organic reactions.
5. To study the concerted pericyclic reactions.

UNIT I: Aromaticity

Aromatic character: Five-, six-, seven-, and eight-membered rings – other systems with aromatic sextets – Huckel's theory of aromaticity, concept of homoaromaticity and antiaromaticity.

Electron occupancy in MO's and aromaticity – NMR concept of aromaticity and antiaromaticity, systems with 2,4,8 and 10 electrons, systems of more than 10 electrons (annulenes), Mobius aromaticity.

Bonding properties of systems with $(4n+2)\pi$-electrons and $4n\pi$-electrons, alternant and non-alternant hydrocarbons (azulene type) – aromaticity in heteroaromatic molecules, sydnones and fullerenes.

UNIT II: Reagents in Organic Synthesis

Oxidation: Baeyer-Villiger, Jacobsen epoxidation, Shi epoxidation, Jones reagent, PCC, PDC, IBX, DMP, CAN, TPAP, NOCl, $Mn(OAc)_3$, $Cu(OAC)_2$, Bi_2O_3, Swern oxidation, Sommelet reaction, Elbs reaction, Oxidative coupling of phenols, Prevost reaction and Woodward modification.

Reduction: palladium / platinum / rhodium / nickel based heterogeneous catalysts for hydrogenation, Wilkinson's catalyst, Noyori asymmetric hydrogenation – reductions using Li/Na/Ca in liquid ammonia.

Hydride transfer reagents from group III and group IV in reductions. (i) triacetoxyborohydride, L-selectride, K-selectride, Luche reduction, Red-Al, $NaBH_4$ and $NaCNBH_3$, trialkylsilanes and trialkylstannane, (ii) stereo/enantioselectivity reductions (Chiral Boranes, Corey-Bakshi-Shibata).

UNIT III: Stereochemistry and Conformational Analysis

Stereoisomerism – symmetry – enantiomers and diastereomers – *R* and *S* nomenclature – optical activity and chirality – types of molecules exhibiting optical activity – absolute configuration – chirality in molecules with non-

carbon stereocenters (N, S and P) – molecules with more than one chiral centre – atropisomerism.

Molecular chirality – allenes, spiranes, biphenyls, helicenes and cyclophanes – methods of determining configuration – *E* and *Z* nomenclature – determination of configuration of geometrical isomers – stereochemistry of addition and elimination reactions – stereospecific and stereoselective synthesis [elementary examples].

Basic concepts of conformational analysis – conformations of cyclopentane, cyclohexane, cyclohexene and fused (decalin) and bridged (norbornane type) ring systems – anomeric effect in cyclic compounds.

UNIT IV: Organic Photochemistry

Organic photochemistry – fundamental concepts – energy transfer – characteristics of photoreactions – photoreduction and photooxidation, photosensitization.

Photoreactions of ketones and enones – Norrish Type I and II reactions – Paterno-Büchi reaction – photo-Fries rearrangement – photochemistry of alkenes, dienes and aromatic compounds – di-π-methane rearrangement.

Reactions of unactivated centres – photochemistry of α,β-unsaturated carbonyl compounds – photolytic cycloadditions and photolytic rearrangements – photo additions – Barton reaction.

UNIT V: Pericyclic Reactions

Concerted reactions – orbital symmetry and concerted symmetry – Woodward and Hoffmann rules – selection rules for electrocyclic reactions – frontier molecular orbital approach – correlation diagram – examples.

Selection rules for cycloaddition reactions – frontier molecular orbital approach – correlation diagram – examples – chelotropic and ene reactions.

Sigmatropic rearrangements – 1,3, 1,5 and 1,7-hydrogen shifts – examples – Cope and Claisen rearrangements – 1,3-dipolar cycloaddition reactions: types of dipoles, selectivity, scope and applications.

REFERENCES

UNIT I and II

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2. I. L. Finar, Organic Chemistry; Vol.II, 7th Ed., Pearson education Ltd, New Delhi, 2009.

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5. F. A. Carey and R. J. Sundberg, <u>Advanced Organic Chemistry</u>; Parts A and B, 5th Ed., Springer, Germany, 2007.
6. T. H. E. Lowry and K. S. Richardson, <u>Mechanism and Theory in Organic Chemistry;</u> Addison-Wesley, USA, 1998.

UNIT III

7. P. S. Kalsi, <u>Stereochemistry;</u> Wiley eastern limited; New Delhi, 1993.
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9. E. L. Eliel, and S. H. Wilen, <u>Stereochemistry of Organic Compounds</u>; John Wiley, New York, 1994.
10. J. Clayden, N. Greeves, S. Warren, and P. Wothers, <u>Organic Chemistry;</u> 1st Ed., Oxford University Press, UK, 2000.

UNIT IV and V

11. J. D. Coyle, <u>Organic Photochemistry;</u> Wiley, New York, 1998.
12. J. M. Coxon, and B. Halton, <u>Organic Photochemistry</u>; 2nd Ed., Cambridge, University Press, UK, 1987.
13. G. R. Chatwal, <u>Organic Phtochemistry;</u> 1st Ed., Himalaya Publications house, Bangalore, 1998.
14. S. Sankararaman, <u>Pericyclic Reactions - A Textbook: Reactions, Applications and Theory;</u> Wiley-VCH, New York, 2005.

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INORGANIC CHEMISTRY I

OBJECTIVES

1. To understand the basic concepts of main group elements.
2. To learn the theories and mechanism of reactions of metal complexes.
3. To study the concepts of photochemistry and its applications.

UNIT I: Main Group Chemistry

Chemistry of boron – borane, higher boranes, carboranes, borazines and boron nitrides – chemistry of silicon – silanes, higher silanes, multiple bonded systems, disilanes, silicon nitrides.

P-N compounds, cyclophosphazanes and cyclophosphazenes – S-N compounds – S_2N_2, S_4N_4, (SN)x, polythiazyl S_xN_4 compounds – S-N cations and anions, S-P compounds – molecular sulphides such as P_4S_3, P_4S_7, P_4S_9 and P_4S_{10} – homocyclic inorganic systems – oxocarbon anion.

Ionic model – lattice energy – Born-Lande equation – Kapustinskii equation – high T_c superconductors – solid state reactions – tarnish reaction decomposition, solid-soild reaction and photographic process – factors affecting reaction rate.

UNIT II: Principles of Coordination Chemistry

Studies of coordination compounds in solution – detection of complex formation in solution – stability constants – stepwise and overall formation constants.

Simple methods (potentiometric, pH metric and photometric methods) of determining the formation constants.

Factors affecting stability – statistical and chelate effects – forced configurations.

UNIT III: Theories of Metal-Ligand Bond

Crystal field theory – splitting of d-orbitals under various geometries – factors affecting splitting – CFSE and evidences for CFSE (structural and thermodynamic effects).

Spectrochemical series – Jahn-Teller distortion – spectral and magnetic properties of complexes – site preferences.

Limitations of CFT – ligand field theory – MO theory – sigma- and pi-bonding in complexes – Nephelauxetic effect – the angular overlap model.

UNIT IV: Reaction Mechanism in Coordination Complexes

Kinetics and mechanism of reactions in solution – labile and inert complexes – ligand displacement reactions in octahedral and square planar complexes – acid hydrolysis, base hydrolysis and anation reactions.

Trans effect – theory and applications – electron transfer reactions – electron exchange reactions – complementary and non-complementary types – inner sphere and outer sphere processes – application of electron transfer reactions in inorganic complexes – isomerisation and racemisation reactions of complexes.

Molecular rearrangements of four- and six-coordinate complexes – interconversion of stereoisomers – reactions of coordinated ligands – template effect and its applications for the synthesis of macrocyclic ligands – unique properties.

UNIT V: Inorganic Photochemistry

Electronic transitions in metal complexes, metal-centered and charge-transfer transitions – various photophysical and photochemical processes of coordination compounds.

Unimolecular charge-transfer photochemistry of cobalt(III) complexes – mechanism of CTTM, photoreduction – ligand-field photochemistry of chromium(III) complexes – Adamson's rules, photoactive excited states, V-C model – photophysics and photochemistry of ruthenium – polypyridine complexes, emission and redox properties.

Photochemistry of organometallic compounds – metal carbonyl compounds – compounds with metal-metal bonding – Reinecke's salt chemical actinometer.

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2. F. A. Cotton and G. Wilkinson, C. A. Murillo and M. Bochmann, <u>Advanced Inorganic Chemistry;</u> 6th Ed., A Wiley - Interscience Publications, John Wiley and Sons, USA, 1999.
3. J. E. Huheey, <u>Inorganic Chemistry;</u> 4th Ed., Harper and Row publisher, Singapore, 2006.
4. A. W. Adamson, <u>Concept of Inorganic Photochemistry</u>; John Wiley and Sons, New York, 1975.
5. S. F. A. Kettle, <u>Physical Inorganic Chemistry – A Coordination Chemistry Approach, Spectrum</u>; Academic Publishers, Oxford University Press, New York, 1996.
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7. J. Ferraudi, <u>Elements of Inorganic Photochemistry;</u> Wiley, New York, 1988.
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PHYSICAL CHEMISTRY I

OBJECTIVES

1. To understand the concepts of group theory and quantum chemistry.
2. To learn the chemical kinetics and statistical thermodynamics.
3. To study the theories of kinetics, photochemistry and radiation chemistry.

UNIT I: Concepts of Group Theory

Symmetry elements and operations – point groups – assignment of point groups to molecules – group postulates and types of groups – group multiplication tables, sub groups, similarity transformations – conjugate elements and classes.

Matrix representation of symmetry operations and point groups – reducible and irreducible representations – properties of irreducible representation.

The great orthogonality theorem – construction of character table – direct product – projection operators – symmetry of hybrid orbitals.

UNIT II: Quantum Chemistry - I

Inadequacy of classical mechanics – black body radiation – Planck's quantum concept – photoelectric effect – Bohr's theory of hydrogen atom – hydrogen spectra – wave-particle dualism – uncertainty principle – decline of old quantum theory.

Schrödinger equation – postulates of quantum mechanics – operator algebra: linear operator, Hermitian operators, eigenfunctions and eigenvalues, angular momentum operator – commutation relations and related theorems – orthogonality and normalization.

Applications of wave mechanics to simple systems – particle in a box, one and three dimensional, particle with finite potential barrier – the quantum mechanical tunneling.

UNIT III: Chemical Kinetics - I

Theories of reaction rate – absolute reaction rate theory (ARRT) – transmission coefficient, reaction coordinate – potential energy surfaces – kinetic isotope effect – Hinshelwood theory – Kassel, Rice and Ramsperger theory (KRRT) – Slater's treatment.

Principle of microscopic reversibility – steady-state approximation – chain reactions: thermal and photochemical reactions between hydrogen and halogens – explosions and hydrogen-oxygen reactions.

UNIT IV: Statistical Thermodynamics

Thermodynamic probability – probability theorems – relation between entropy and probability (Boltzmann-Planck equation), ensembles, phase space, Ergodic hypothesis, microstates and macrostates, Maxwell-Boltzmann distribution law – partition functions – translational, rotational, vibrational and electronic partition functions.

Relationship between partition functions and thermodynamic properties – calculation of equilibrium constants from partition functions – heat capacities of monatomic crystals – Einstein theory and Debye theory.

Quantum statistics – Bose-Einstein (B.E.) and Fermi-Dirac (F.D.) distribution equations – comparison of B.E. and F.D. statistics with Boltzmann statistics – applications of quantum statistics to liquid helium, electrons in metals and Planck's radiation law – concept of negative Kelvin temperature.

UNIT V: Fast Reaction Techniques, Photochemistry and Radiation Chemistry

Introduction – flow methods (continuous and stopped flow methods) – relaxation methods (T and P jump methods) – pulse techniques (pulse radiolysis, flash photolysis) – shock tube method – molecular beam method – lifetime method.

Photophysical processes of electronically excited molecules – Jablonski diagram – Stern-Volmer equation and its applications – experimental techniques in photochemistry – chemical actinometers – lasers and their applications.

Differences between radiation chemistry and photochemistry – sources of high energy radiation and interaction with matter – radiolysis of water, solvated electrons – definition of G value, Curie, linear energy transfer (LET) and Rad – scavenging techniques – use of dosimetry and dosimeters in radiation chemistry – applications of radiation chemistry.

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ORGANIC CHEMISTRY I (P)

OBJECTIVES

1. To perform the qualitative analysis of a given organic mixture.
2. To carry out the preparation of organic compounds.

1. Qualitative analysis of an organic mixture containing two components

Mixtures containing two components are to be separated (pilot separation) and purified (bulk separation) – The physical constants are to be reported (analysis).

2. Preparation of organic compounds (single stage)

1. Methyl-*m*-nitrobenzoate from methylbenzoate (nitration)
2. Glucose pentaacetate from glucose (acetylation)
3. Resacetophenone from resorcinol (acetylation)
4. Benzophenone oxime from benzophenone (addition)
5. *o*-Chlorobenzoic acid from anthranilic acid (Sandmayer reaction)
6. *p*-Benzoquinone from hydroquinone (oxidation)
7. Phenylazo-2-naphthol from aniline (diazotization)

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INORGANIC CHEMISTRY I (P)

OBJECTIVES

1. To perform the semi-micro qualitative analysis.
2. To estimate the metal ions using colorimeter.

1. **Semi-micro qualitative analysis** of a mixture containing two common cations (Pb, Bi, Ca, Cd, Fe, Cr, Al, Co, Ni, Mn, Zn, Ba, Sr, Ca, Mg, NH$_4$) and two less common cations (W, Tl, Se, Te, Mo, Ce, Th, Zr, Ti, V, U, Li).

2. **Estimation** of copper, ferric, nickel, chromium and manganese ions using photoelectric colorimeter

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INORGANIC CHEMISTRY II

OBJECTIVES

1. To understand the role of metal ions in biological process.
2. To learn the basic concepts of chemotherapy.
3. To learn the principle of catalysis and reaction mechanisms of organometallics.

UNIT I: General Principles of Bioinorganic Chemistry

Occurrence and availability of inorganic elements in biological systems – biomineralization – control and assembly of advanced materials in biology – nucleation and crystal growth – various biominerals – calcium phosphate – calcium carbonate – amorphous silica, iron biominerals – strontium and barium sulphate.

Function and transport of alkali and alkaline earth metal ions: characterization of K^+, Na^+, Ca^{2+} and Mg^{2+} – complexes of alkali and alkaline earth metal ions with macrocycles – ion channels – ion pumps, catalysis and regulation of bioenergetic processes by the alkaline earth metal ions – Mg^{2+} and Ca^{2+}.

Metals at the center of photosynthesis – primary processes in photosynthesis – photosystems I and II-light absorption (energy acquisition) – exciton transport (direct energy transfer) – charge separation and electron transport – manganese catalyzed oxidation of water to O_2.

UNIT II: Amines, Proteins and Enzymes

Cobalamines: reactions of the alkyl cobalamines – one electron reduction and oxidation – Co-C bond cleavage – coenzyme B_{12} – alkylation reactions of methylcobalamin.

Heme and non-heme proteins – haemoglobin and myoglobin – oxygen transport and storage – electron transfer and oxygen activation – cytochromes, ferredoxins and rubredoxin – model systems, mononuclear non-heme iron enzymes.

Copper containing proteins – classification and examples – electron transfer – oxygen transport-oxygenation – oxidases and reductases – cytochrome oxidase – superoxide dismutase (Cu, Zn) – nickel containing enzyme: urease.

UNIT III: Medicinal Bioinorganic Chemistry

Bioinorganic chemistry of quintessentially toxic metals – lead, cadmium, mercury, aluminium, chromium, copper and plutonium – detoxification by metal chelation – drugs that act by binding at the metal sites of metalloenzymes.

Chemotherapy – chemotherapy with compounds of certain non-essential elements – platinum complexes in cancer therapy – cisplatin and its mode of action – cytotoxic compounds of other metals.

Gold containing drugs as anti-rheumatic agents and their mode of action – lithium in psychopharmacological drugs – radiopharmaceuticals – technetium.

UNIT IV: Organometallics

The 18 electron rule – applications and limitations – isolobal concept and its usefulness – uses of typical organometallics such as metal alloys and organometallic hydrides in organic synthesis.

Nitrosyl complexes – bridging and terminal nitrosyls, bent and linear nitrosyls – dinitrogen complexes – metallocene and arene complexes – metal carbenes, carbenes, carboxylate anions.

Classification based on captivity and polarity of M-C bond, organometallic compounds of lanthanides and actinides – fluxional organometallic compounds – organometallics in medicine, agriculture, horticulture and industry.

UNIT V: Reactions and Catalysis by Organometallics

Organometallic reactions – ligand association and dissociation – oxidative addition and reductive elimination – insertion reactions.

Reactions of coordinated ligands in organometallics – hydrogenation, hydroformylation, epoxidation, metathesis.

Polymerization of olefins, olefin oxidation (Wacker process) and carbonylation of methanol.

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PHYSICAL METHODS IN CHEMISTRY I

OBJECTIVES

1. To understand the principles of molecular spectroscopy.
2. To study UV, NMR and IR spectroscopy of organic compounds.
3. To learn the ESR, ORD and Mass spectroscopy of organic compounds.
4. To know the effect of X-ray, electron, neutron diffractions of compounds.

UNIT I: Principles of Molecular Spectroscopy

Interaction of electromagnetic radiation with molecular systems – time evolution of the systems under radiation – Einstein transition probability for induced absorption and spontaneous and stimulated emission – transition moment and oscillator strength.

Microwave spectroscopy – rotational spectra of diatomic molecules, rigid and non-rigid rotors – intensity of spectral lines – effects of isotopic substitution – microwave spectra of polyatomic molecules – linear and symmetric top molecules – infrared spectra – diatomic molecules, simple harmonic and anharmonic oscillators – diatomic vibrating rotator rotation – vibration spectrum of carbon monoxide – interaction of rotation and vibration (breakdown of Born-Oppenheimer approximation) – influence of the rotation on the spectrum of polyatomic molecules, linear and symmetric top molecules, parallel and perpendicular vibrations – influence of nuclear spin.

Raman spectra – rotational Raman spectra of linear and symmetric top molecules – vibrational Raman spectra – rotational fine structure – electronic spectra of diatomic molecules – vibrational coarse structure – intensity of vibrational lines in electronic spectra – rotational fine structure – fortrat diagram.

UNIT II: Nuclear Magnetic Resonance Spectroscopy

^{1}H NMR Spectroscopy – multiplicity – coupling constant – spin-spin splitting – vicinal and geminal coupling constants – Karplus equation – long range coupling constants, influence of stereochemical factors on chemical shift of protons.

Simplification of complex spectra – double resonance techniques, shifts reagents – chemical spin decoupling of rapidly exchangeable protons (OH, SH, COOH, NH, NH_2) – an elementary treatment of NOE phenomenon.

^{13}C NMR Spectroscopy – broad band decoupling – off resonance decoupling – chemical shifts of common functional groups – FT NMR and its importance–

DEPT spectra – identification of small compounds based on NMR data – 2D techniques: ^1H–^1H COSY, ^1H–^{13}C HETCOSY – NOESY.

UNIT III: UV-Visible and IR Spectroscopy

UV-Visible spectroscopy – introduction – instrumentation, sampling techniques – Woodward-Fieser and Scott's rules for conjugated dienes and polymers, ketones, aldehydes, α,β-unsaturated acids, esters, nitriles, and amides – differentiation of geometrical isomers and positional isomers – disubsituted benzene derivatives – study of steric effect in aromaticity.

Infrared spectroscopy – Introduction – instrumentation, sampling techniques – factors influencing group frequencies – quantitative studies – hydrogen bonding (intermolecular and intramolecular).

UNIT IV: ESR, ORD and Mass Techniques

ESR – basic principles – comparison between ESR and NMR spectra – hyperfine splitting – applications to organic free radicals.

Optical rotatory dispersion and circular dichroism – introduction to theory and terminology – cotton effect – ORD curves – axial haloketone rule and its applications – the octant rule – its applications – applications of ORD to determine absolute configuration of monocyclic ketones – comparison between ORD and CD – their interrelationships.

Mass Spectrometry – instrumentation – resolution – ESI, EI, CI and FAB methods – base peak, isotopic peaks, metastable peaks – importance of metastable peaks, parent peak, recognition of molecular ion peak – fragmentation – general rules – pattern of fragmentation for various classes of compounds, McLafferty rearrangement – nitrogen rule.

Application of UV, IR, NMR and mass spectroscopy – structural elucidation of organic compounds – (minimum 15 problems should be worked out).

UNIT V: X-Ray Diffraction

X-Ray diffraction by single crystal method – space groups – systematic absences in X-ray data and identification of lattice types, glide planes and screw axes – X-ray intensities – structure factor and its relation to intensity and electron density – phase problem – structure solution by heavy atom method and direct method – determination of absolute configuration of molecules – a brief account of Cambridge Structural Database (CSD) and Protein Data Bank (PDB).

Electron diffraction by gases – scattering intensity vs. scattering angle, Wierl equation – measurement techniques.

Neutron diffraction by crystals – magnetic scattering – measurement techniques – elucidation of structure of magnetically ordered unit cell.

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ORGANIC CHEMISTRY II (P)

OBJECTIVES

1. To carry out the qualitative analysis of an organic mixture.
2. To perform the preparation of organic compounds.

1. Quantitative analysis of organic compounds

Estimation of phenol, aniline, ketone, glucose, nitrobenzene, saponification value of an oil and iodine value of oil.

2. Preparation of organic compounds (double stage)

a. *p*-Bromoacetanilide from aniline (acetylation and bromination)
b. Acetylsalicylic acid from methyl salicylate (hydrolysis and acetylation)
c. 1,3,5-Tribromobenzene from aniline (bromination, diazotization and hydrolysis)
d. *p*-Nitroaniline from acetanilide (nitration and hydrolysis)
e. Benzilic acid from benzoin (rearrangement)
f. *p*-Aminobenzoic acid from p-nitrotoluene (oxidation and reduction)
g. Benzanilide from benzophenone (rearrangement)
h. *p*-Bromoaniline from acetanilide (bromination and hydrolysis)
i. *m*-Nitroaniline from nitrobenzene (nitration and reduction)
j. 1,2,4-Triacetoxy benzene from hydroquinone (oxidation and acylation)

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INORGANIC CHEMISTRY II (P)

OBJECTIVES

1. To carry out the titrimetric and gravimetric analyses.
2. To perform the preparation of compounds.

1. Titrimetry and Gravimetry

A mixture of solution(s) should be given for estimation
  Cu (V) and Ni (G)
  Cu (V) and Zn (G)
  Fe (V) and Zn (G)
  Fe (V) and Ni (G)
  Zn (C) and Cu (G)

2. Preparation of complexes

1. Tris(thiourea)copper(I) chloride
2. Tetraamminecopper(II) sulphate
3. Potassium trioxalatoferrate
4. Potassium trioxalatoaluminate(III)
5. Potassium trioxalatochromate(III)
6. Hexamminecobalt(III) chloride

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(A) SOLID STATE CHEMISTRY

OBJECTIVES

1. To learn the crystal structures of few inorganic solids.
2. To study the chemistry of crystallization and vapour phase transport.
3. To learn the applications of magnetic materials.
4. To study the chemistry of organic solids.

UNIT I: Crystal Structure and Crystal Engineering of Organic Solids

Types of close packing – hcp and ccp – packing efficiency – SC, BCC, and FCC, radius ratio rule – applications – polyhedral description of solids – structure types: Na_2O, Cs_2O, rutile, perovskite (ABO_3), ReO_3, K_2NiF_4, spinels and antispinels.

Hydrogen bonded supramolecular patterns involving water / carboxyl / halide motifs – concepts of different types of synthons based on non-covalent interactions – principles of crystal engineering and non-covalent synthesis – polymorphism and pseudopolymorphism – supramolecular isomorphism, polymorphism and crystal engineering of pharmaceutical phases.

UNIT II: Metallo Organic Frameworks

M.O.Fs (Metallo Organic Frameworks) – organometallic systems – combinations of different interactions to design molecular rods, triangles, ladders, networks, etc. Design of nanoporous solids.

Interligand hydrogen bonds in metal complexes – implications for drug design – crystal engineering of NLO and OLED materials.

UNIT III: Preparative Methods in Solid State Chemistry

Experimental procedure, coprecipitation as a precursor to solid state reaction, other precursor methods, kinetics of solid state reactions – crystallizations of solutions, melts, glasses and gels, solutions and gels: zeolite synthesis – precipitation from solution or melt: flux method, epitaxial growth of thin layers, verneuil flame fusion method.

Graphite intercalation compounds, transition metal dichalcogenide and other intercalation compounds, ion exchange reaction, synthesis of new metastable phases by 'Chimie Douce'.

Electrochemical reduction methods – preparation of thin films, chemical and electrochemical methods, physical methods – growth of single crystals, Czochralski method, Bridgman-Stockbarger methods – zone melting.

Vapour phase transport, hydrothermal methods, comparison of different methods – high pressure and hydrothermal methods and dry high pressure methods.

UNIT IV: Magnetic Materials and Optical Properties

Selected examples of magnetic materials and their properties – metals and alloys, transition metal oxides, spinels, garnets, ilmenite and perovskites.

Magnetoplumbites – applications – structure/property relations – transformer, information storage, magnetic bubble memory devices, permanent magnets.

Luminescence, Lasers and phosphors – definitions and general comments, configurational coordinate model, some phosphor materials, anti-Stokes phosphors – lasers – the ruby laser, Neodymium lasers

UNIT V: Organic Solid State Chemistry

Topochemical control of solid state organic reactions – intramolecular reactions – conformational effects – intermolecular reactions – molecular packing effects – photodimerization of 2-ethoxycinnamic acid (α form, β form, γ form) – photopolymerization of 2,5-distyrylpyrazine – photopolymerizations of diacetylenes.

Asymmetric syntheses – dimerization of anthracene – control of molecular packing arrangements.

Organic reactions within inorganic host structures – electrically conductive organic solids – organic metals, conjugated systems, doped polyacetylene, polyparaphenylene, polypyrrole – organic charge transfer complexes – new superconductors

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(B) SUPRAMOLECULAR CHEMISTRY

OBJECTIVES

1. To know the fundamentals of supramolecules.
2. To learn co-receptor molecules and multiple recognition
3. To study the supramolecular reactivity and catalysis.

UNIT I: Concepts of Supramolecular Chemistry

Concepts and languages of supramolecular chemistry – various types of non-covalent interactions – hydrogen bonds, C-H···X interactions, halogen bonds – π-π interactions, non–bonded interactions – various types of molecular recognition.

Crystal engineering of organic solids – hydrogen bonded supramolecular patterns involving water / carboxyl / halide motifs – concepts of different types of synthons based on non-covalent interactions – principles of crystal engineering and non-covalent synthesis – polymorphism and pseudopolymorphism – supramolecular isomorphism / polymorphism – crystal engineering of pharmaceutical phases.

UNIT II: Metallo Organic Frameworks

M.O.F (Metallo Organic Frameworks) – organometallic systems – combinations of different interactions to design molecular rods, triangles, ladders, networks, etc. – design of nanoporous solids – interligand hydrogen bonds in metal complexes – implications for drug design – crystal engineering of NLO materials, OLED.

UNIT III: Co-receptor Molecules and Multiple Recognition

Dinuclear and polynulclear metal ion cryptates – linear recognition of molecular length by ditopic co-receptors – heterotopic co-receptors – cyclophane receptors, amphiphilic receptors and large molecular cages – multiple recognition in metalloreceptors – supramolecular dynamics.

UNIT IV: Supramolecular Reactivity and Catalysis

Catalysis by reactive macrocyclic cation receptor molecules – catalysis by reactive anion receptor molecules – catalysis with cyclophane type receptors – supramolecular metallocatalysis – cocatalysis – catalysis of synthetic reactions – biomolecular and abiotic catalysis.

Supramolecular chemistry in solution – cyclodextrin, micelles, dendrimers, gelators – classification and typical reactions – applications.

UNIT V: Supramolecular Devices

Supramolecular devices and sensors – various types of supramolecular devices – an overview – supramolecular photochemistry – molecular and supramolecular photonic devices – light conversion and energy transfer devices – molecular and supramolecular electronic devices – electronic conducting devices – molecular wires, modified and switchable molecular wires – molecular and supramolecular ionic devices – tubular mesophases, molecular protonics – switching devices – electro-photo switch – ion and molecule sensors – role of supramolecular chemistry in the development of nanoscience and technology.

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ORGANIC CHEMISTRY II

OBJECTIVES

1. To understand the nucleophilic and electrophilic substitution reactions.
2. To learn the addition and elimination reactions.
3. To study a variety of heterocycles.
4. To know the chemistry of terpenoids, steroids and alkaloids.

UNIT I: Nucleophilic Substitution Reactions

Aliphatic nucleophilic substitution – mechanisms – S_N1, S_N2, S_Ni – ion-pair in S_N1 mechanisms – neighbouring group participation, non-classical carbocations – substitutions at allylic and vinylic carbons.

Reactivity – effect of structure, nucleophile, leaving group and stereochemical factors – correlation of structure with reactivity – solvent effects – rearrangements involving carbocations – Wagner-Meerwein and dienone-phenol rearrangements.

Aromatic nucleophilic substitutions – S_N1, S_NAr, Benzyne mechanism – reactivity orientation – Ullmann, Sandmeyer and Chichibabin reaction – rearrangements involving nucleophilic substitution – Stevens – Sommelet-Hauser and von-Richter rearrangements.

UNIT II: Electrophilic Substitution Reactions

Aromatic electrophilic substitution reaction – orientation, reactivity and mechanisms based on transition state theory with suitable reactions – substitutions in thiophene and pyridine – N-oxide – quantitative treatment of the structural effects on reactivity.

Substituent effects – origins of Hammett equation – principles of Hammett correlation – effect of structure on reaction mechanisms Hammett parameters – σ and ρ, modified forms of Hammett equation, Taft Equation.

Aliphatic electrophilic substitution – S_E2, S_Ei and S_E1 mechanisms – diazonium coupling reactions – metals as electrophile in substitution reactions and decomposition of diazonium salts.

UNIT III: Addition and Elimination Reactions

Addition to carbon-carbon multiple bonds – electrophilic, nucleophilic and free radical additions – orientation of the addition – stereochemical factors influencing the addition of bromine and hydrogen bromide, hydroxylation, 1,2-

dihydroxylation – hydroboration leading to formation of alcohols – oxidation and ozonolysis.

Addition to carbonyl and conjugated carbonyl systems – mechanism – Grignard reagents – 1,2- and 1,4-additions (lithium dimethylcuprate) – addition to carbon-oxygen double bond – Benzoin, Knoevenagel, Stobbe, Darzens glycidic ester condensation and Reformatsky reactions.

Elimination reactions – mechanisms; E1, E2, E1cB – stereochemistry of elimination, Hofmann's and Zaitsev's rules – competition between elimination and substitution – pyrolytic *cis*-elimination, Chugaev reaction – examples such as dehydration, dehydrohalogenation, Hofmann degradation, Cope elimination – Bredt's rule with examples.

UNIT IV: Heterocycles

Nomenclature: Trivial, systematic and replacement nomenclature – non-aromatic heterocycles – synthesis of tetrahydrofurans – pyrrolidines – tetrahydropyrans – piperidines.

Synthesis and reactivity of heterocycles: aziridines – oxiranes – thiiranes – azetidines – oxetanes – oxazoles – imidazoles – thiazoles – isooxazoles.

Synthesis and reactivity of aromatic heterocycles: pyrazoles – isothiazoles – triazoles – pyrimidines – purines – triazines – pyridazines – pyrazines.

UNIT V: Natural Products

Terpenoids: introduction – biosynthesis of menthol, camphor – total synthesis: Takasago synthesis of menthol, Corey's synthesis of longifolene, Curran's synthesis of hirsutene.

Steroids: introduction – partial synthesis of androsterone and testosterone (from Cholesterol) – total synthesis: Johnson's synthesis of progesterone and Vollhardt's synthesis of estrone.

Alkaloids: introduction – biosynthesis of nicotine, camptothecin – total synthesis: Corey's synthesis of epibatidine, Comin's asymmetric synthesis of Camptothecin and Woodward's synthesis of reserpine.

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UNIT IV and V

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PHYSICAL CHEMISTRY II

Objectives

1. To study the applications of quantum chemistry and group theory.
2. To understand electrochemistry, adsorption and classical thermodynamics.

UNIT I: Quantum Chemistry - II and Group Theory

Applications of wave mechanics – the harmonic oscillator, rigid rotator – hydrogen and hydrogen like atoms – shapes and nodal properties of orbitals – space quantization – approximation methods – methods of variation, application to hydrogen and helium atoms – perturbation method – non-degenerate systems – helium atom – effective nuclear charge.

Electron spin – many electron atoms – Pauli's principle – Slater determinants – atomic structure calculation – self-consistent field method – Hartree-Fock method for atoms – angular momentum in many electron systems – spin-orbit interaction, L-S and j-j coupling schemes.

Symmetry adapted linear combinations (SALC) – vibrational spectra – symmetry properties of normal molecules – symmetry coordinates – selection rules for fundamental vibrational transition – IR and Raman activity of fundamentals in CO_2, H_2O, N_2F_2 – the rule of mutual exclusion and Fermi resonance.

UNIT II: Electrochemistry – I

Ion transport in solution – migration, convection and diffusion – Fick's laws of diffusion conduction – Debye-Huckel theory – ionic atmosphere – Debye-Huckel-Onsager equation – verification and extension – Debye-Falkenhagen effect and Wien effect, Debye-Huckel limiting law – activity coefficients and ionic strength – Bjerrum model.

The electrode – electrolyte interface – electrical double layer and multi layers – theories – electrocapillary curves – Lipmann equation and Lipmann potential.

Electrokinetic phenomena – classification – Tiselius method of separation of proteins – membrane potential – electrocatalysis.

UNIT III: Electrochemistry – II

Dynamics of electron transfer – Marcus theory – tunneling – the rate of charge transfer – current density – Butler-Volmer equation – Taft equation –

polarization and overvoltage – mechanism of hydrogen evolution and oxygen evolution reactions.

Principles of electrodeposition of metals – corrosion and passivity – Pourbaix and Evans diagrams – methods of protection of metals from corrosion.

Power storage systems – fuel cells – construction and functioning – applications – photovoltaic cells.

UNIT IV: Surface Chemistry and Chemical Kinetics-II

Surface phenomena – Gibbs adsorption isotherm – solid-liquid interfaces – contact angle and wetting – solid-gas interface – physisorption and chemisorption – Langmuir, BET isotherms – surface area determination.

Kinetics of surface reactions involving adsorbed species – Langmuir-Hinshelwood mechanism, Langmuir-Rideal mechanism – Rideal-Eley mechanism – some interfacial aspects on micelles, reverse micelles, microemulsions and membranes.

Application of ARRT to solution kinetics – effect of solvent and ionic strength, influence of pressure on rates in solution – enzyme catalysis – mechanism of single substrate reactions – Michaelis-Menten law – acidity functions – kinetics of processes in micellar and reverse micellar systems.

UNIT V: Classical Thermodynamics

Third law – thermodynamics – significance – Nernst heat theorem and other forms of stating the third law – thermodynamic quantities at absolute zero – apparent exceptions to the third law.

Thermodynamics of systems of variable composition – partial molar properties – chemical potential – relationship between partial molar quantities – Gibbs-Duhem equation and its applications (the experimental determination of partial molar properties not included).

Thermodynamic properties of real gases – fugacity concept – calculation of fugacity of real gas – activity and activity coefficient – concept – definition – standard states and experimental determinations of activity and activity coefficient of electrolytes.

Thermodynamics of irreversible processes: coupled flow – Onsager's reciprocal relations – entropy production.

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SEMESTER-III   **HOURS/WEEK: 6**
CORE PRACTICAL-V (CP-V)   **CREDITS: 3**

PHYSICAL CHEMISTRY I (P)

OBJECTIVES

To perform the various techniques of physical chemistry experiments.

Any **ten** experiments (to be decided by the course teacher) out of the following experiments.

a. Kinetics-acid hydrolysis of ester–comparison of strengths of acids.
b. Kinetics-acid hydrolysis of ester–determination of energy of activation (Ea).
c. Kinetics-saponification of ester–determination of ethyl acetate by conductometry.
d. Kinetics-persulfate-iodine reaction –determination of order, effective of ionic strength on rate constant.
e. Determination of molecular weight of substance by transition temperature method.
f. Determination of molecular weight of substances by Rast method.
g. Determination of Critical Solution Temperature (CST) of phenol-water system and effect of impurity on CST.
h. Study of phase diagram of two components forming a simple eutectic.
i. Study of phase diagram of two compounds forming a compound.
j. Study of phase diagram of three components system.
k. Determination of molecular weight of substances by cryoscopy.
l. Determination of integral and differential heat of solutions by colorimetry.
m. Polymerization-rate of polymerization of acrylamide.
n. Distribution law – study of Iodine-Iodine equilibrium.
o. Distribution law – study of association of benzoic acid in benzene.
p. Adsorption – oxalic acid/acetic acid on charcoal using Freundlich isotherm.

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2. J. N. Gurtu and R. Kapoor, <u>Advanced Experimental Chemistry</u>; Vol. 1-Physical, S. Chand and Co., New Delhi, 1987.

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(A) PHARMACEUTICAL CHEMISTRY

OBJECTIVES

1. To understand the basics of pharmaceutical chemistry.
2. To study the antibiotics and their activity.
3. To learn the analgesic and antipyretic activities.
4. To know the activities of anaesthetics and local anaesthetics.
5. To understand concept of clinical chemistry.

UNIT I: Basics of Pharmaceutical Chemistry

Definitions – the terms – drugs, pharmacology, pharmacy, chemotherapy, therapeutics – pharmacologically active principles in plants – first aid – important rules of first aids, cuts, fractures, bleeding for blood, maintaining breathing burns and first aid box – tuberculosis (T.B.), jaundice, piles, typhoid, malaria, cholera – causes – symptoms, diagnosis – prevention and treatment – medicinally important compounds of iron – ferrous gluconate, ferrous sulphate and ferric ammonium citrate.

UNIT II: Antibiotics

Definition – introduction – classification and biological actions – penicillin, chloramphenicol, streptomycin and tetracycline – structure, properties and therapeutic uses – chemical structure and pharmacological activity – effect of unsaturation, chain length, isomerism, halogens, amino groups, hydroxyl groups and acid groups.

UNIT III: Analgesic and Antipyretics

Narcotic analgesic – analgesic action of morphine – derivatives of morphine – heroin and apomorphine – synthetic analgesics – pethidine, methadone – non-narcotic analgesic – aspirin, paracetamol and phenacetin – analgin – preparation, properties and uses – ibuprofen and ketoprofen – structure and uses.

UNIT IV: Anaesthetics and Local Anaesthetics

Characteristics of anaesthetics – classification of anaesthetics – general anaesthetics – volatile anaesthetics – ether, chloroform and halothane – advantages and disadvantages – non-volatile anaesthetics (intravenous anaesthetics) – methohexitone and propanidid – structure and uses – cocaine and amethocaine – structure and uses – benzocaine and procaine – structure, synthesis and uses.

UNIT V: Clinical Chemistry

Determination of sugar (glucose) in serum – *o*-toluidine method – diagnostic test for sugar in urine – Benedict's test – detection of diabetes – detection of cholesterol in urine – detection of anaemia – estimation of haemoglobin (Hb concentration) – red cell count.

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SEMESTER-III   HOURS/WEEK: 6
ELECTIVE COURSE-IIB (EC-IIB)   CREDITS: 5

(B) BIO-ORGANIC CHEMISTRY

OBJECTIVES

1. To learn the preparation, properties of amino acids and proteins.
2. To study the activity of enzymes and cofactors.
3. To know basics of lipids and nucleic acids.
4. To learn the concept of bioenergetics.
5. To learn the principles of lead and analogue synthesis.

UNIT I: Amino Acids and Proteins

Structure, classification, synthesis and properties of amino acids – biosynthesis of amino acids – peptides – N-terminal and C-terminal residue analysis – solid phase peptide synthesis.

Proteins – classification and properties (denaturation, isoelectric point and electrophoresis), primary, secondary, tertiary and quaternary structures of proteins – biological roles of proteins.

UNIT II: Enzymes and Cofactors

Chemical nature of enzymes – characteristics of enzymes – colloidal nature, catalytic nature.

Mechanism of enzymes – Michaelis-Menten hypothesis – Fischer's lock and key model – regulation of enzyme activity.

Structure and biological functions of coenzyme A, NAD+, FAD and vitamin B12.

UNIT III: Lipids and Nucleic Acids

Lipids – definition – simple lipids – fats and oils – compound lipids – phospholipids, glycolipids – physical properties – solubility, melting point, surface tension, emulsification and geometric isomerism – chemical properties – reaction involving -COOH group, -OH group and double bonds.

Nucleic Acid – definition – nucleosides and nucleotides – deoxyribonucleic acid (DNA) – internucleotides linkages – base composition – double helical structure.

UNIT IV: Bioenergetics

Concept of energy – thermodynamic principles – first law, second law, combining the two laws – relationship between standard free energy change and equilibrium constant.

Standard free energy values of chemical reactions – Adenosine triphosphate (ATP) as universal currency of free energy in biological systems – ATP hydrolysis and equilibria of coupled reactions – inter conversion of adenine nucleotides.

UNIT V: Lead and Analogue Synthesis

Designing organic synthesis – disconnection approach – synthons and synthetic equivalents – one group disconnections: alcohol, acid and ketone – functional group interconversions.

Asymmetric synthesis – basic principles – stereoselective and stereospecific reactions – reagents, catalysts and their applications (wherever applicable) in alkylation and hydrogenation – Jacobsen's catalyst – Evan's catalyst.

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ANALYTICAL CHEMISTRY

OBJECTIVES

1. To learn the instrumental methods
2. To learn the nature of errors and their types.
3. To understand the various techniques in chromatography.
4. To understand the principles and instrumentation of thermoanalytical and fluorescence techniques.
5. To studying detail the electroanalytical techniques.

UNIT I: Instrumental Methods of Analysis

Principles and applications of extended X-ray absorption fine structure (EXAFS) – surface extended X-ray absorption (SEXAFS) – atomic absorption spectroscopy (AAS) – flame emission spectroscopy (FES) – turbidimetry – theory and applications.

UNIT II: Data and Error Analysis

Various types of error – accuracy, precision, significant figures – frequency distributions, the binomial distribution, the Poisson distribution and normal distribution – describing data, population and sample, mean, variance, standard deviation, way of quoting uncertainty, robust estimators, repeatability and reproducibility of measurements.

Hypothesis testing, levels of confidence and significance, test for an outlier, testing variances, means t-Test, paired t-Test – analysis of variance (ANOVA) – correlation and regression.

Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals – general polynomial equation fitting, linearizing transformations, exponential function fit – r and its abuse – multiple linear regression analysis, elementary aspects.

UNIT III: Chromatography

Solvent extraction – principles of ion exchange, paper, thin-layer and column chromatography techniques – columns, adsorbents, methods, R_f values, McReynold's constants and their uses – HPTLC, HPLC techniques – adsorbents, columns, detection methods, estimations, preparative column – GC-MS techniques – methods, principles and uses.

UNIT IV: Thermoanalytical Methods and Fluorescence Spectroscopy

Principles – instrumentations and applications of thermogravimetry analysis (TGA), Differential Thermal Analysis (DTA) and Differential Scanning Calorimetry (DSC) –thermometric titrations – types – advantages.

Basic aspects of synchronous fluorescence spectroscopy – spectral hole burning – flow cytometry – fluorometers (quantization) – instrumentation – applications.

UNIT V: Electroanalytical Techniques

Electrochemical sensors, ion-sensitive electrodes, glass – membrane electrodes, solid-liquid membrane electrodes – ion-selective field effect transistors (ISFETs) – sensors for the analysis of gases in solution.

Polarography – principles and instrumentation – dropping mercury electrode – advantages – Ilkovic equation – applications of polarography – polarographic maxima – oscillographic polarography, AC polarography – cyclic voltammetry – advantages over polarographic techniques – chronopotentiometry – advantages – controlled potential coulometry – amperometric titrations: principles – techniques – applications – estimation of lead.

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PHYSICAL METHODS IN CHEMISTRY II

OBJECTIVES

1. To understand electronic spectroscopy of metal complexes.
2. To study in detail IR, Raman and NMR of inorganic compounds.
3. To learn the EPR, Mossbauer and magnetic properties of metal complexes.

UNIT I: Electronic Spectroscopy

Microstates, terms and energy levels for d1 – d9 ions in cubic and square fields – intensity of bands – group theoretical approach to selection rules – effect of distortion and spin-orbit coupling on spectra – evaluation of 10Dq and β for octahedral complexes of cobalt and nickel – applications to simple coordination compounds – charge transfer spectra – electronic spectra of $[Ru(bipy)_3]^{2+}$.

Optical rotatory dispersion and circular dichroism and magnetic circular dichroism – applications to metal complexes.

UNIT II: Infrared and Raman Spectroscopy

Vibrations in simple molecules (H_2O, CO_2) and their symmetry notation for molecular vibrations – group vibrations and the limitations – combined uses of IR and Raman spectroscopy in the structural elucidation of simple molecules like N_2O, ClF_3, NO_3^-, ClO_4^- effect of coordination on ligand vibrations – uses of groups vibrations in the structural elucidation of metal complexes of urea, thiourea, cyanide, thiocyanate and dimethyl sulfoxide.

Effect of isotopic substitution on the vibrational spectra of molecules – vibrational spectra of metal carbonyls with reference to the nature of bonding – geometry and number of C-O stretching vibrations (group theoretical treatment) – applications of Raman spectroscopy – resonance Raman spectroscopy.

UNIT III: NMR Spectroscopy

Examples for different spin systems – chemical shifts and coupling constants (spin-spin coupling) involving different nuclei (^1H, ^{19}F, ^{31}P, ^{13}C) interpretation and applications to inorganic compounds – Effect of quadrupolar nuclei (^2H, ^{10}B, ^{11}B) on the ^1H NMR spectra.

Systems with chemical exchange – evaluation of thermodynamic parameters in simple systems – study of fluxional behaviour of molecules – NMR of paramagnetic molecules – isotropic shifts contact and pseudo-contact interactions – lanthanide shift reagents.

UNIT IV: EPR Spectroscopy and Magnetic properties

Theory of EPR spectroscopy – spin densities and McConnell relationship – factors affecting the magnitude of g and A tensors in metal species – zero-field splitting and Kramers degeneracy – spectra of V(II), Mn(II), Fe(II), Co(II), Ni(II) and Cu(II) complexes – applications of EPR to a few biological molecules containing Cu(II) and Fe(III) ions.

Magnetic properties – types of magnetism – dia-, para-, ferro- and antiferro-magnetism – magnetic properties of free ions – first-order Zeeman effect – second-order Zeeman effect – states KT – states$<<<$KT – determination of magnetic moments and their applications to the elucidation of structures of inorganic compounds – temperature independent paramagnetism – magnetic properties of lanthanides and actinides – spin crossover in coordination compounds.

UNIT V: Mossbauer Spectroscopy

Isomer shifts – quadrupole splitting – magnetic interactions – applications to iron and tin compounds.

NQR spectroscopy – characteristics of quadrupolar nucleus – effects of field gradient and magnetic field upon quadrupolar energy levels – NQR transitions – applications of NQR spectroscopy.

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PHYSICAL CHEMISTRY II (P)

OBJECTIVES

To perform the various electrical experiments.

Any **ten** experiments (to be decided by the course teacher) out of the following experiments.

   a. Conductometry – acid-alkali titrations.
   b. Conductometry – precipitation titrations.
   c. Conductometry – displacement titrations.
   d. Conductometry – determination of dissociation constant of weak acids.
   e. Conductometry – solubility product of sparingly soluble silver salts.
   f. Verification of Onsager equation - conductivity method.
   g. Determination of degree of hydrolysis and hydrolysis constant of a substance.
   h. Potentiometric titrations – acid alkali titrations.
   i. Potentiometric titrations – precipitation titrations.
   j. Potentiometric titrations – redox titrations.
   k. Potentiometry – determination of dissociation constant of weak acids.
   l. Potentiometry – determination of solubility of silver salts.
   m. Potentiometry – determination of activity and activity coefficient of ions.
   n. pH Titration of *ortho*-phosphoric acid.
   o. To determine the relative strength of two acids by conductance measurements.
   p. To determine the pH of a buffer solution using a quinhydrone electrode.

REFERENCES

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3. J. N. Gurtur and R. Kapoor, <u>Advanced Experimental Chemistry;</u> Vol. 1-Physical, S. Chand and Co. Ltd, New Delhi, 1997.

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(A) GREEN CHEMISTRY

OBJECTIVES

1. To learn the green chemistry and their principles.
2. To learn the importance of greener reactions.
3. To understand the phase-transfer catalyst in green chemistry.

UNIT I: Introduction to Green Chemistry

Introduction to green chemistry – twelve principles of green chemistry – planning a green synthesis in a chemical laboratory – evaluating the type of reaction involved – rearrangement, addition, substitution, elimination and pericyclic reactions.

Selection of appropriate solvent – aqueous phase reaction – reactions in ionic liquids – organic synthesis in solid state – solid supported organic synthesis – selection of starting materials – use of protecting group – use of catalyst – use of microwaves and sonication.

UNIT II: Addition and Condensation Reactions

Addition reactions – Michael addition in [aqueous medium and solid state] – Diels-Alder reactions in aqueous phase.

Condensation reactions – Aldol condensation of aldehydes with nitroalkanes and nitriles – Aldol condensation in solid phase – benzoin condensation under catalytic conditions – applications.

UNIT III: Oxidation and Reduction Reactions

Oxidation reactions – Baeyer-Villiger oxidation in aqueous phase and solid state – enzymatic Baeyer-Villiger oxidation.

Reduction reactions – Clemmensen reduction – mechanism – limitations – applications

UNIT IV: Phase-Transfer Catalyst Reactions

Phase-transfer catalyst reactions – Heck reaction – Michael addition reaction – oxidation of toluene to benzoic acid – Reimer-Tiemann reaction – Baker-Venkataraman synthesis – Williamson ether synthesis – Dozen reaction.

UNIT - V: Sonication Reactions

Sonication reactions – Barbier reaction – Reformatsky reaction – Simmons-Smith reaction – Strecker synthesis – Ullmann coupling reaction – Wurtz reaction – Bouveault reaction.

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3. V. K. Ahluwalia and K. Agarwal, Organic Synthesis, Special Techniques; 2nd Ed., Narosa Publishing House, New Delhi, 2007. [Unit-I]

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SEMESTER-IV   **HOURS/WEEK: 6**
ELECTIVE COURSE-IVB (EC-IVB)   **CREDITS: 5**

(B) INDUSTRIAL CHEMISTRY

OBJECTIVES

1. To know the basic ideas of an industry and industrial wastes.
2. To understand the petroleum and petrochemicals.
3. To understand the functions of portland cement.
4. To study the principles of pulp and paper.
5. To know the preparation of soaps, detergents and perfumes.

UNIT I: Basic Ideas and Industrial Wastes

Basics idea about unit operation – flow chart – chemical conversion – batch versus continuous processing – chemical process selection – design – chemical process control.

Types of industrial wastes – treatment of wastes or effluent with organic impurities – treatment of wastes or effluent with inorganic impurities – treatment of some important chemical wastes.

UNIT II: Petroleum and Petrochemicals

Introduction – saturated hydrocarbons from natural gas – uses of saturated hydrocarbons – unsaturated hydrocarbons – acetylene, ethylene, propylene, butylene – aromatic hydrocarbons – toluene and xylene.

Preparation of rectified spirit from beat – methylated spirit – preparation of absolute alcohol from rectified spirit – petrochemicals in India.

UNIT III: Manufacture of Cement

Introduction – types of cement – high alumina cement, water proof cement, slag cement, acid resisting cement, white cement, coloured cement, Pozzolana cement.

Setting of cement – properties of cement – testing of cement – uses of cement – concrete – cement industries in India.

UNIT IV: Pulp and Paper and Manufacture of Paper

Introduction – manufacture of pulp – types of pulp – sulphate or craft pulp, soda pulp, Rag pulp – beating, refining, filling, sizing and colouring.

Calendaring – uses – paper industries in India.

UNIT V: Soaps, Detergents and Perfumes

Introduction – types of soaps – hard and soft soaps – manufacture of soap (hot and continuous process only) – cleansing action of soap – detergents – surface active agents – biodegradability of surfactants, amphoteric detergents.

Introduction – production of natural perfumes – flower perfumes – jasmine, rose and lily – production of synthetic perfumes – muscone and nitro-musks.

REFERENCES

1. B. K. Sharma, Industrial Chemistry; 8th Ed., Goel Publishing House, New Delhi, 1997. (Unit–I, II, III, IV and V)
2. R. N. Shreve, and J. A. Brink Jr. Chemical Process Industries; 4th Ed., McGraw Hill, Toronto, 1977. (Unit–I, II, III, IV and V)
3. A. C. S. Brain, Production and Properties of Industrial Chemicals; Reinhold, New York, 1989. (Unit–I)

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(A) SELECTED TOPICS IN CHEMISTRY

OBJECTIVES

1. To understand the quantum chemical approach to chemical bonding.
2. To know the named reactions and their applications.
3. To understand the retro-synthetic methods.
4. To study the polymers and their types.
5. To learn the principles of nuclear chemistry.

UNIT I: Quantum Chemical Approach to Chemical Bonding and Molecular Structure

Diatomic molecules: Born-Oppenheimer approximation – MO theory (H_2 and H_2^+), VB theory (H_2 and H_2^+) – comparison.

HMO calculations – evaluation of coefficients and eigenvalues for simple molecules – electron density – bond order and free valence index.

Extended HMO theory – applications to simple systems – hybridization schemes.

UNIT II: Named Reactions and Applications in Organic Synthesis

Bamford-Stevens reaction – Barton-McCombie reaction (Barton Deoxygenation) – Baylis-Hillman reaction – Biginelli reaction – Corey-Chaykovsky reaction – Enamines and selective mono- and dialkylation via enamine reactions

Henry reaction – Hosomi-Sakurai reaction – Hunsdiecker reaction – Julia olefination and its modifications – Mitsunobu reaction – Mukaiyama-Aldol addition – Nazarov cyclization – Peterson olefination – Prevost reaction – Prins reaction – Staudinger reaction

Ugi reaction – Weinreb ketone synthesis – Wittig reaction and its modifications – Yamaguchi macrolactonization – Palladium based reactions: Fukuyama coupling – Heck reaction – Hiyama coupling – Sonogashira coupling – Stille coupling – Suzuki coupling – Tsuji-Trost Reaction.

UNIT III: Synthetic Methodology

Introduction to disconnections – synthons and synthetic equivalents – synthon approach – electron donors (nucleophiles) – electron acceptors (electrophiles)

Introduction of functional groups – umpolung reactions – one group disconnections: alcohols, olefins, ketones, acids – two group disconnections: 1,2-, 1,3-, 1,4- and 1,5-difunctional compounds – convergent syntheses.

Functional group interconversion – functional group addition – carbon-heteroatom bonds – methods for 3- and 4-membered rings - synthesis of mono- and difunctional open chain molecules – mono and bicyclic molecules with substituents.

UNIT IV: Polymer Chemistry

Introduction – structure – classification of polymers – polymerisation methods – importance of polymers.

Molecular weight of polymers – number average and weight average – determination of molecular weight by osmometry – light scattering, viscosity and sedimentation methods.

Kinetics of polymerisation reactions, polycondensation reactions, ionic and free radical polymerisation, copolymerisation – coordination polymers, conducting polymers, Ziegler-Natta catalyst.

UNIT V: Fundamental of Nuclear Chemistry

The nucleus – subatomic particles and their properties – nuclear binding energy – nuclear structure – Liquid-drop model and nuclear-shell model – n/p ratio – nuclear forces – modes of radioactive decay – alpha, beta and gamma particles – orbital electron capture – nuclear isomerism – internal conversion.

Q-Values of nuclear reaction, coloumbic barrier, nuclear cross section, threshold energy and excitation function – different types of nuclear reactions with accelerated particles.

Projectile capture and particles emission, spallation, fragmentation, nuclear fission, nuclear fusion – proportional counter, Geiger-Muller counter, scintillation counter and Cherenkov counter – linear accelerator, cyclotron and synchrotron.

REFERENCES

1. R. K. Prasad, Quantum Chemistry; 4th Ed., New Age International Publishers, New Delhi, 2009.
2. A. K. Chandra, Introductory Quantum Chemistry; 4th Ed., Tata McGraw Hill, New Delhi, 1994.
3. D. A. Mcquarrie, Quantum Chemistry; University Science Books, 2nd Ed., 2007.
4. I. N. Levine, Quantum Chemistry; 7th Ed., Prentice Hall, New Jersey, 2013.
5. L. Kurti and B. Czako, Strategic Applications of Named Reactions in Organic Synthesis; Elsevier, 2005.
6. A. Hassner and C. Stumer, Organic Synthesis Based on Named and Unnamed Reactions; Elsevier Science Ltd., UK, 1994.
7. G. Brahmachari, Organic Name Reactions: A Unified Approach; Alpha Science Intl. Ltd, UK, 2006.
8. S. Warren, Designing Organic Synthesis: The Disconnection Approach; 2nd Ed., Wiley, New York, 2008.
9. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry, Parts A and B, 5th Ed., Springer, Germany, 2007.
10. W. Carruthers and I. Coldham, Modern Methods of Organic Synthesis, 4th Ed., Cambridge University Press, Cambridge, 2004.
11. C. E. Carraher, Polymer chemistry, 6th Ed, Marcel Dekker, New York, 2003.
12. F. W. Billmeyer, Jr., A Text Book of Polymer Science, 3rd Ed., John Wiley, 1994.
13. V. R. Gowariker, N. V. Viswanathan, and J. Sreedhar, Polymer Science; 1st.Ed., New Age Publishers, New Delhi, 1986.
14. G. Friedlander, E. S. Macias, J. W. Kennedy and J. M. Miller, Nuclear and Radiochemistry; 3rd Ed., John Wiley and Sons, London, 1981.
15. S. Glasstone, Source Book on Atomic Energy, Krieger Publishing Company, New Delhi, 2014.
16. H. J. Arnikar, Essentials of Nuclear Chemistry; 4th Ed., New Age International Publishers, New Delhi, 2005.

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(B) CHEMISTRY OF NANOSCIENCE AND NANOTECHNOLOGY

OBJECTIVES

1. To know the synthetic methods of nanomaterials.
2. To understand the characterization of nanomaterials.
3. To understand carbon clusters and nanostructures.
4. To learn nanotechnology and nanodevices.

UNIT I: Synthetic Methods

Definition of nanodimensional materials – historical milestones – unique properties due to nanosize, quantum dots, classification of nanomaterials.

General methods of synthesis of nanomaterials – hydrothermal synthesis, solvothermal synthesis – microwave irradiation– sol-gel and precipitation technologies – combustion flame – chemical vapour condensation process – gas-phase condensation synthesis – reverse micelle synthesis – polymer-mediated synthesis – protein microtubule-mediated synthesis – synthesis of nanomaterials using microorganisms and other biological agents – sonochemical synthesis – hydrodynamic cavitation.

Inorganic nanomaterials – typical examples – nano TiO_2/ZnO/CdO/CdS, organic nanomaterials – examples – rotaxanes and catenanes

UNIT II: Characterisation of Nanoscale Materials

Principles of Atomic Force Microscopy (AFM) – Transmission Electron Microscopy(TEM)

Resolution and Scanning Transmission Electron Microscopy (STEM) – Scanning Tunneling Microscopy (STM) – Scanning Nearfield Optical Microscopy (SNOM).

Scanning ion conductance microscope, scanning thermal microscope, scanning probe microscopes and surface plasmon spectroscopy.

UNIT III: Reactions in Nanoparticles

Reactions in nanospace – nanoconfinement – nanocapsules

Cavitands, cucurbiturils, zeolites, M.O.Fs, porous silicon, nanocatalysis.

UNIT IV: Carbon Clusters and Nanostructures

Nature of carbon bond – new carbon structures – carbon clusters – discovery of C_{60}–alkali doped C_{60}–superconductivity in C_{60}–larger and smaller fullerenes.

Carbon nanotubes – synthesis – single walled carbon nanotubes – structure and characterization – mechanism of formation – chemically modified carbon nanotubes – doping – functionalizing nanotubes – applications of carbon nanotubes.

Nanowires –synthetic strategies – gas phase and solution phase growth – growth control – properties.

UNIT V: Nanotechnology and Nanodevices

DNA as a nanomaterial – DNA – knots and junctions, DNA – nanomechanical device designed by Seeman.

Force measurements in simple protein molecules and polymerase – DNA complexes– molecular recognition and DNA based sensor.

Protein nanoarray, nanopipettes, molecular diodes, self-assembled nanotransistors, nanoparticle mediated transfection.

REFERENCES

1. C. N. R. Rao, A. Muller and A. K. Cheetham (Eds), The Chemistry of Nanomaterials: Vol. 1 and 2; Wiley-VCH;Germany, Weinheim, 2004.
2. C. P. Poole, Jr: and F. J. Owens, Introduction to Nanotechnology; Wiley Interscience, New Jersey, 2003.
3. K. J. Klabunde (Ed), Nanoscale Materials in Chemistry; 2nd Ed., Wiley-Interscience, New York, 2009.
4. T. Pradeep, Nano: The Essentials in Understanding Nanoscience and Nanotechnology; 1st Ed., Tata McGraw Hill, New York, 2007.
5. H. Fujita (Ed.), Micromachines as Tools in Nanotechnology; Springer-Verlag, Berlin, 2003.
6. Bengt Nölting, Methods in Modern Biophysics; 3rd Ed., Springer-Verlarg, Berlin, 2009.
7. H. Gleiter, Nanostructured Materials: Basic Concepts, Microstructure and Properties, Elsevier, Chennai, 2000.
8. W. Kain and B. Schwederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life; 2nd Ed., John-Wiley R Sons, New York, 2013.
9. T. Tang and P. Sheng (Eds), Nanoscience and Technology, Novel Structures and Phenomena; Taylor andFrancis, New York, 2003.
10. A. Nabok, Organic and Inorganic Nanostructures; Artech House, Boston, 2005.
11. E. A. Rietman, Molecular Engineering of Nanosystems; Springer-Verlag, New York, 2001.
12. Home page of Prof. Ned Seeman - http://seemanlab4.chem.nyu.edu/
13. Nanoletters - http://pubs.acs.org/journals/nalefd/index.html
14. Nanotation - http://www.acsnanotation.org/

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.
M.Sc. Computer Science   Course Structure under CBCS

(For the candidates admitted from the academic year 2016-2017 onwards)

Updated on 12.06.2017

Sem	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Int.	Ext.	Total
I	Core Course – I (CC)	Mathematical Foundation for Computer Science	6	4	3	25	75	100
	Core Course – II (CC)	Web Technologies	6	4	3	25	75	100
	Core Course – III (CC)	Design and Analysis of Algorithms	6	4	3	25	75	100
	Core Course – IV (CC)	Distributed Operating Systems	6	4	3	25	75	100
	Core Practical – I (CP)	Web Technologies Lab	6	4	3	40	60	100
	TOTAL		30	20				500
II	Core Course – V (CC)	OOAD & UML	6	5	3	25	75	100
	Core Course – VI (CC)	Distributed Technologies	6	5	3	25	75	100
	Core Practical – II (CP)	Distributed Technologies Lab	6	4	3	40	60	100
	Elective Course – I (EC)	Any one from the list	6	5	3	25	75	100
	Elective Course – II (EC)	Any one from the list	6	5	3	25	75	100
	TOTAL		30	24				500
III	Core Course – VII (CC)	Data Mining and Ware Housing	6	5	3	25	75	100
	Core Course – VIII (CC)	Compiler Design	6	5	3	25	75	100
	Core Practical – III (CP)	Data Mining Lab	6	4	3	40	60	100
	Elective Course – III (EC)	Any one from the list	6	5	3	25	75	100
	Elective Course – IV (EC)	Any one from the list	6	5	3	25	75	100
	TOTAL		30	24				500
IV	Core Course – IX (CC)	Cloud Computing	6	5	3	25	75	100
	Core Course – X (CC)	Wireless Sensor Networks	6	5	3	25	75	100
	Core Practical - IV (CP)	Open Source Lab	6	4	3	40	60	100
	Elective Course – V (EC)	Any one from the list	6	4	3	25	75	100
	Project	Project	6	4	-	-	-	100
	TOTAL		30	22				500
	GRAND TOTAL		120	90				2000

List of Elective Courses (For 2016 – 2017)

Elective I		Elective II	
1	Mobile Communication	1	Embedded Systems
2	Web Services	2	Artificial Intelligence
3	Human Computer Interaction	3	Pattern Recognition
Elective III		**Elective IV**	
1	Parallel Processing	1	Network Security
2	Advanced Computer Architecture	2	Computer Simulation and Modeling
3	Pervasive Computing	3	Soft Computing
Elective V			
1	Big Data Analytics		
2	MANET		
3	Digital Image Processing		

Note:

Project	:	100 Marks
Dissertation	:	80 Marks
Viva Voice	:	20 Marks

Core Papers	-	10
Core Practical	-	4
Elective Papers	-	5
Project	-	1

Sl. No	Subject	Internal	External
1.	Theory	25 Marks	75 Marks
2.	Practical	40 Marks	60 Marks

Note:

1. Theory   Internal   25 marks   External   75 marks

2. Practical   "   40 marks   "   60 marks

3. Separate passing minimum is prescribed for Internal and External

   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The passing minimum not less than 50% in the aggregate.

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CORE COURSE I

MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE

Objective :

To learn the basis of the mathematical applications for developing the program.

Unit I

Propositions - evaluation - precedence rules -tautologies - reasoning using equivalence transformation - laws of equivalence - substitution rules - a natural deduction system. Deductive proofs - inference rules - proofs - sub proofs.

Unit II

Introduction - Cryptography – Ceaser Cyphor Coding - Matrix encoding - scrambled codes - Hamming metric - Hamming distance - Error detecting capability of an encoding.

Unit III

Assignment problem and its solution by Hungarian method. Project Scheduling by PERT - CPM: Phases of project scheduling - Arrow diagram - Critical path method - Probability and Cost Considerations in project scheduling - Crahing of Networks.

Unit IV

Testing of hypothesis : Tests based on normal population - Applications of chi-square, Student's-t, F-distributions - chi-square Test - goodness of fit - Test based on mean, means, variance, correlation and regression of coefficients.

Unit V

Graph - Directed and undirected graphs - Subgraphs - Chains, Circuits, Paths, Cycles - Connectivity - Relations to partial ordering - adjacency and incidence matrices - Minimal paths - Elements of transport network - Trees - Applications.

Text Books

1. "The Science of Programming", David Gries. Narosa Publishing House, New Delhi, 1993.
2. "Application Oriented Algebra", James L. Fisher, Dun Donnelly Publisher, 1977.
3. "Operation Research - An Introduction", Hamdy A.Taha, Macmillan Publishing Co., 4th Edn., 1987.
4. "Fundamentals of Mathematical Statistics", Gupta,S.C. and V.K.Kapoor, Sultan Chand & Sons, New Delhi, 8th Edn., 1983.
5. "Fundamentals of Applied Statistics", Gupta.S.C. and V.K.Kapoor, Sultan Chand & Sons, New Delhi, 2nd Edn., 1978.

References

1. "Discrete Mathematics", Seymour Lipschutz and Marc Laris Lipson, Second edition, Schuam's Outlines by Tata McGraw- Hill publishing Company Limited, New Delhi 1999.
2. "Operations Research", Kanti Swarup, P.K.Gupta and Man Mohan, Sultan Chand & Sons, New Delhi, 1994.
3. "Introductory Mathematical Statistics", Erwin Kryszig, John Wiley & Sons, New York, 1990.
4. "Probability and Statistics Engineering and Computer Science", Milton, J.S. and J.C.Arnold, McGraw Hill, New Delhi, 1986.

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CORE COURSE II

WEB TECHNOLOGIES

Objectives :

To provide fundamental concept of Internet, JavaScript, XML, JSP, ASP with a view to developing professional software development skills.

UNIT I

Internet Basics: Basic Concepts – Internet Domains – IP Address – TCP/IP Protocol – The WWW – The Telnet — Introduction to HTML: Web server - Web client / browser - Tags – Text Formatting – Lists – Tables – Linking Documents - Frames.

UNIT II

JavaScript: JavaScript in Web Pages – The Advantages of JavaScript – Writing JavaScript into HTML – Syntax – Operators and Expressions – Constructs and conditional checking – Functions – Placing text in a browser – Dialog Boxes – Form object's methods – Built in objects – user defined objects.

UNIT III

XML: Comparison with HTML – DTD – XML elements – Content creation – Attributes –Entities – XSL – XLINK – XPATH – XPOINTER – Namespaces – Applications – integrating XML with other applications.

UNIT IV

JSP Fundamentals: Basics – Directive basics – Page directive – The taglib directive – The include directive – JSP Standard Actions – Java Beans – Error Handling.

UNIT V

ASP: Introduction to ASP – Objects – Components – Working with HTML forms – Connecting to Microsoft SQL Server & MS–Access Database – SQL statements with connection object – Working with record sets.

Text Books

1. "Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI", Ivan Bayross, BPB Publication. **UNIT I & II**
2. "XML Bible", Elliotte Rusty Harold, 2nd Edition, Wrox Publication. **UNIT III**
3. "Beginning Java Server Pages", Vivek Chopra, Sing Li, Rupert Jones, Jon Eaves, John T. Bell, Wrox Publications. **UNIT IV**
4. "Practical ASP", Ivan Bayross, BPB Publication. **UNIT V**

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CORE COURSE III

DESIGN AND ANALYSIS OF ALGORITHMS

Objectives :

To study the concepts of algorithms and analysis of algorithms using divide and conquer, greedy method, dynamic programming, backtracking, and branch and bound techniques

UNIT I

Introduction: Algorithm Definition – Algorithm Specification – Performance Analysis. Elementary Data Structures: Stacks and Queues – Trees – Dictionaries – Priority Queues – Sets and Disjoint Set Union – Graphs

UNIT II

Divide and Conquer: The General Method – Defective Chessboard – Binary Search – Finding The Maximum And Minimum – Merge Sort – Quick Sort – Selection - Strassen's Matrix Multiplication.

UNIT III

The Greedy Method: General Method - Container Loading - Knapsack Problem - Tree Vertex Splitting – Job Sequencing With Deadlines - Minimum Cost Spanning Trees - Optimal Storage On Tapes – Optimal Merge Patterns - Single Source Shortest Paths.

UNIT IV

Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source Shortest Paths - Optimal Binary Search Trees - String Editing - 0/1 Knapsack - Reliability Design - The Traveling Salesperson Problem - Flow Shop Scheduling. Basic Traversal and Search Techniques: Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees – Biconnected Components and DFS.

UNIT V

Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: The Method - 0/1 Knapsack Problem.

Text Book

Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint 2009.

References

1. Data Structures Using C - Langsam, Augenstien, Tenenbaum, PHI
2. Data structures and Algorithms, V.Aho, Hopcropft, Ullman , LPE
3. Introduction to design and Analysis of Algorithms - S.E. Goodman, ST. Hedetniem- TMH

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DISTRIBUTED OPERATING SYSTEMS

Objectives :

To study the concepts of distributed computing systems and cryptography.

Unit I

Fundamentals: What is Distributed Operating System – Evolution of Distributed Computing System – Distributed Computing System Models – Why are Distributed Computing Systems gaining popularity – What is a Distributed Computing System – Issues in Designing Distributed Computing System – Introduction to Distributed Computing Environment. Introduction to Computer Networks – Network types – LAN –WAN – Communication protocols – Internetworking – ATM Technology

Unit II

Message Passing: Introduction – Desirable features – Issues in PC Message Passing – Synchronization – Buffering – Multidatagram Messages – Encoding and Decoding – Process Addressing – Failure Handling – Group Communication

Unit III

Distributed Shard Memory: Introduction – General Architecture of DSM system – Design and Implementation Issues of DSM – Granularity – Structure of Shared Memory –Replacement Strategy – Thrasing –Heterogeneous DSM – Advantages Synchronization: Introduction – Clock Synchronization – Event Ordering – Mutual Exclusion – Deadlock – Election Algorithm

Unit IV

Distributed File System: Introduction – Desirable features – File Models – File Accessing Models – File Sharing Semantics – File Caching Schemes – File Replication – Fault Tolerance – Atomic Transactions – Design Principles

Unit V

Security: Introduction – Potential Attacks to Computer System – Cryptography – Authentication – Access Control – Digital Signatures – Design Principles

Text Book :

Distributed Operating Systems – Concepts and Design, Pradeep K Sinha, PHI, 2003.

References:

Distributed Operating Systems 1e, Andrew S Tanenbaum, PHI.

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CORE PRACTICAL I

WEB TECHNOLOGIES LAB

Objectives :

To provide fundamental concept of Internet, JavaScript, XML, JSP, ASP with a view to Developing professional software development skills.

1. Write a XML program for job listing in HTML.
2. Write a JavaScript code block, which checks the contents entered in a form's text element. If the text entered is in the lower case, convert to upper case.
3. Write a JavaScript code block, which validates a username and password.
    a) If either the name or password field is not entered display an error message.
    b) The fields are entered do not match with default values display an error message.
    c) If the fields entered match, display the welcome message.
4. Write a JavaScript code to display the current date and time in a browser.
5. Write a JSP Program for user authentication.
6. Write a JSP Program for a simple shopping cart.
7. Write a JSP Program to prepare a bio data and store it in database.
8. Write an ASP Program using Response and Request Object.
9. Write an ASP Program using AdRotator Component.
10. Write an ASP program using database connectivity for student's record.

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CORE COURSE V

OOAD & UML

Objective :

To give a detailed knowledge on Structured approach to system construction, Various object oriented methodologies, Object oriented analysis, Object oriented design and UML examples.

Unit I

Structured approach to system construction : SSADM/SADT - An overview of object oriented systems development & Life cycle

Unit II

Various object oriented methodologies – Introduction to UML

Unit III

Object oriented analysis – Use cases- Object classification, relationships, attributes, methods

Unit IV

Object oriented design – Design axioms – Designing classes – Layering the software design :- data access layer, User interface layer, Control/business logic layer

Unit V

UML - Examples on :Behavioral models – Structural models – Architectural models from real world problems.

TEXT BOOK:

1. **Bahrami Ali**, Object oriented systems development, Irwin McGrawHill, 2005 (First 4 units covered here).
2. **Booch Grady, Rumbaugh James, Jacobson Ivar**, The Unified modeling language – User Guide, Pearson education, 2006 (ISBN 81-7758-372-7) (Unit: -5 covered here).

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CORE COURSE VI

DISTRIBUTED TECHNOLOGIES

Objectives :

This course aims to build concepts regarding the fundamental principles of distributed systems. The design issues and distributed operating system concepts are covered.

Unit I

Introduction to distributed Computing – Challenges involved in establishing remote connection – Strategies involved in remote computation – Current Distributed computing practices through Dot Net and Java technologies.

Unit II

Advanced ADO, NET – Disconnected Data Access – Gridview, Details View, Form View controls – Crystal Reports – Role of ADO, NET in Distributed Applications.

Unit III

Advanced ASP, NET – AdRotator, Multiview, Wizard and Image Map Controls – Master Pages – Site Navigation – Web Parts – Uses of these controls and features in Website development.

Unit IV

Advanced features of ASP.NET – Security in ASP, NET – State Management in ASP, NET – Mobile Application development in ASP, NET – Critical usage of these features in Website development.

Unit V

Web services – Role of Web services in Distributed Computing – WSDL, UDDI, SOAP concepts involved in Web Services – Connected a Web Service to a Data Base – Accessing a Web Service through n ASP, NET application.

Text Book

1. Walther, ASP, NET 3.5, SAMS Publication, 2005.

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CORE PRACTICAL II

DISTRIBUTED TECHNOLOGIES LAB

Objectives :

To provide fundamental concept of Internet, JavaScript, XML, JSP, ASP with a view to developing professional software development skills

1. Create a table and insert a few records using Disconnected Access.
2. Develop a project to update and delete few records using Disconnected Access.
3. Develop a project to view the records using GridView, DetailsView, FormView Controls.
4. Develop a project to generate a crystal report from an existing database.
5. Design a web page that makes uses of Ad Rotator Control.
6. Design a web page involving Multi View or Wizard Control.
7. Make use of Image Control involving two hot spots in a web page.
8. Design a simple web site that makes use of Master Pages.
9. Establish the security features in a simple web site with five pages.
10. Use state management concepts in a mobile web application.
11. Develop a web service that has an ASP.NET client.
12. Develop a web service to fetch a data from a table and send it across to the client.

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CORE COURSE VII

DATA MINING AND WARE HOUSING

Objective :

On successful completion of the course the students should have: Understood data mining techniques- Concepts and design of data warehousing**.**

UNIT I

Introduction – What is Data mining – Data Warehouses – Data Mining Functionalities – Basic Data mining tasks – Data Mining Issues – Social Implications of Data Mining– Applications and Trends in Data Mining.

UNIT II

Data Preprocessing : Why preprocess the Data ? –Data Cleaning - Data Integration and Transformation – Data Reduction – Data cube Aggregation – Attribute Subset Selection Classification: Introduction – statistical based algorithms – Bayesian Classification. Distance based algorithms – decision tree based algorithms – ID3.

UNIT III

Clustering: Introduction - Hierarchical algorithms – Partitional algorithms – Minimum spanning tree – K-Means Clustering - Nearest Neighbour algorithm. Association Rules: What is an association rule? – Methods to discover an association rule–APRIORI algorithm – Partitioning algorithm .

UNIT IV

Data Warehousing: An introduction – characteristics of a data warehouse – Data marts – other aspects of data mart .Online analytical processing: OLTP & OLAP systems.

UNIT V

Developing a data warehouse : Why and how to build a data warehouse – Data warehouse architectural strategies and organizational issues – Design consideration – Data content – meta data – distribution of data – tools for data warehousing – Performance considerations

TEXT BOOKS

1. Jiawei Han and Miceline Kamber , "Data Mining Concepts and Techniques " , Morgan Kaulmann Publishers, 2006. (Unit I – Chapter 1 -1.2, 1.4 , Chapter 11-11.1) (Unit II – Chapter 2 - 2.1,2.3, 2.4, 2.5.1,2.5.2)
2. Margaret H Dunham , "Data mining Introductory & Advanced Topics", Pearson Education , 2003.(Unit I – Chapter 1 -1.1 , 1.3, 1.5) , (UNIT II – Chapter 4 – 4.1, 4.2, 4.3, 4.4) (UNIT III – Chapter 5 – 5.1,5.4, 5.5.1, 5.5.3,5.5.4, Chapter 6 – 6.1,6.3.
3. C.S.R.Prabhu, "Data Warehousing concepts, techniques, products & applications", PHI, Second Edition.) (UNIT IV & V)

REFERENCES:

1. Pieter Adriaans, Dolf Zantinge, "Data Mining" Pearson Education, 1998.
2. Arun K Pujari, "Data Mining Techniques",Universities Press(India) Pvt, 2003.
3. S.Rajashekharan, G A Vijaylakshmi Bhai,"Neural Networks,Fuzzy Logic,and Genetic Algorithms synthesis and Application", PHI
4. Margaret H.Dunham," Data Mining Introductory and Advanced topics",Pearson Eductaionn 2003.

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CORE COURSE VIII

COMPILER DESIGN

OBJECTIVES :

On successful completion of the subject the students should have Understood the different phases of compiler and needs of the compiler.

UNIT I

Introduction to compilers – Analysis of source program – Phase of compiler – Cousins of compilers – Grouping of phases – Simple one pass compiler: overview – Syntax definition Lexical analysis: removal of white space and comments – Constants – Recognizing identifiers and keywords – Lexical analysis – Role of a lexical analyzer – Input buffering –Specification of tokens – Recognition tokens.

UNIT II

Symbol tables: Symbol table entries – List data structures for symbol table – - Hash tables – Representation of scope information – Syntax Analysis: Role of parser – Context free grammar – Writing a grammar – Top down parsing – Simple bottom up parsing – Shift reducing parsing.

UNIT III

Syntax directed definition: Construction of syntax trees – Bottom up evaluation of S-Attributed definition – L-Attributed definitions – Top down translation - Type checking: Type systems – Specifications of simple type checker.

UNIT IV

Run-time environment: Source language issues – Storage organizations – Storage allocation strategies - Intermediate code generation: Intermediate languages – Declarations – Assignment statements.

UNIT V

Code generation: Issue in design of code generator – The target machine – Runtime storage management – Basic clocks and flow graphs - Code optimization: Introduction – Principle source of code optimization – Optimization of basic blocks

Text Books:

1. AHO, ULLMAN, "**COMPILERS, PRINCIPLES AND TECHNIQUES AND TOOLS",** PEARSON EDUCATION – 2001 6TH EDITION.

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CORE PRACTICAL - III

DATA MINING LAB

Objective : To get hands on experience in developing applications using data mining tool.

Practical	Practical List

Exercise 1	Preprocessing
	    a. Datatype Conversion
	    b. Data Transformation

Exercise 2	Filters- **Practical**
	    a. Replace Missing Values
	    b. Add Expression

.	Feature Selection
	Select Attributes- **Practical**
	    a. Filter
	    b. Wrapper
	    c. Dimensionality Reduction

Exercise 4	Supervised Technique Classifier - Function - **Practical** a. Multilayer Perceptron Tree - **Practical**J48

Exercise 5	Classifier- Bayes –**Practical**
	    a. Naive Bayes Rule- **Practical**
	    b. ZeroR

Exercise 6	Unsupervised Techniques
	Clustering- Theory
	    Partitioned – Algorithm – Practical
	    Hierarchical Algorithm – Practical
	    Semi Supervised Algorithm – Practical

Exercise 7	Association Rule Mining
	    A-Priori –Algorithm –Practical
	    Predictive A-Priori –Practical

Exercise 8	Experimenter
	    Dataset – Test – Practical
	    Algorithm based –Test –Practical

Exercise 9	Knowledge Flow
	    Feature Selection – Practical
	    Clustering –Practical

Exercise 10	Knowledge Flow Classification – Practical

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CORE COURSE IX
CLOUD COMPUTING

Objective:

To provide understanding on concepts & technologies associated with Cloud Computing.

UNIT I   FOUNDATIONS : Introduction to Cloud Computing :

Cloud Computing in a Nutshell – Roots of Cloud Computing – Layers and types of Clouds – Desired features of a Cloud – Cloud Infrastructure Management – Challenges and Risks – Migrating into a Cloud: - Introduction – Broad Approaches – The Seven step model – Enriching the 'Integration as a Services' Paradigm for the Cloud Era: - Introduction – The Evolution of SaaS – The Challenges of SaaS Paradigm – Approaching the SaaS Integration Enigma – New Integration Scenarios – The Integration Methodologies – SaaS Integration Services – The Enterprise Cloud Computing Paradigm: - Introduction – Background – Issues – Transition Challenges – The Cloud Supply Chain.

UNIT II   INFRASTRUCTURE AS A SERVICE : Virtual Machine Provisioning and Migration Services:

Introduction – Background – Manageability – Migration Services – Management of Virtual Machines for Cloud Infrastructures: - Anatomy of Cloud Infrastructures – Distributed Management of Virtual Infrastructures – Scheduling techniques for Advance Reservation of Capacity – Enhancing Cloud Computing Environments Using a Cluster as a Service: - Introduction – Related Work – RVWS Design – The Logical Design – Secure Distributed Data Storage in Cloud Computing: - Introduction – Cloud Storage from LANs to WANs – Technologies for Data Security – Challenges.

UNIT III   PLATFORM AND SOFTWARE AS SERVICE (PAAS/IAAS) Aneka Integration of Private and Public Clouds :

Introduction– Technologies and Tools – Aneka Cloud Platform - Aneka Resource Provisioning Service – Hybrid Cloud Implementation – CometCloud: An Autonomic Cloud Engine: - Introduction – CometCloud – Architecture – Autonomic Behavior of CometCloud – Overview of CometCloud-based Applications – Implementation and Evaluation

UNIT IV   PLATFORM AND SOFTWARE AS SERVICE (PAAS/IAAS) TSystems Cloud-based Solutions for Business Applications:

Introduction – Enterprise Demand of Cloud Computing – Dynamic ICT Service – Importance of Quality and Security in Clouds – Dynamic Data CentreProducing Business-ready; Dynamic ICT Services – The MapReduce Programming Model and Implementations: - Introduction – MapReduce Programming Model – MapReduce implementations for the Cloud.

UNIT V   MONITORING AND MANAGEMENT: An Architecture for Federated Cloud Computing

Introduction – A typical Usecase – The Basic Principles of Cloud Computing – A Federated Cloud Computing Model – Security Considerations – Service Providers Perspective of SLA Management in Cloud Computing: - Traditional Approaches to SLO Management – Types of SLA – Life Cycle of SLA – SLA Management in Cloud –Automated Policy-based Management – Performance Prediction for HPC on Clouds: - Introduction – Background – Grid and Cloud – Performance related issues of HPC in the Cloud.

Text Book:

Rajkumar Buyya, James Broberg, Andrzej Goscinsky, "Cloud Computing Principles and Paradigms", Wiley India Pvt. Ltd., 2011.

Reference Books:

1. Barrie Sosinsky, "Cloud Computing Bible", 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2011.
2. Michael Miller, "Cloud Computing", 1st Edition, Pearson Education Inc., New Delhi, 2008.

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WIRELESS SENSOR NETWORKS

Objective:

On Successful completion of the course the students should have understanding wireless sensor nodes, networks and tools.

UNIT I   OVERVIEW OF WIRELESS SENSOR NETWORKS:

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

UNIT II   ARCHITECTURES :

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III   NETWORKING SENSORS :

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols-Energy-Efficient Routing, Geographic Routing.

UNIT IV   INFRASTRUCTURE ESTABLISHMENT:

Topology Control, Clustering, Time synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT V   SENSOR NETWORK PLATFORMS AND TOOLS:

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

TEXT BOOKS

1. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

REFERENCES

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, And Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

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CORE PRACTICAL IV

OPEN SOURCE LAB

Objectives:

To provide fundamental concept of Internet, JavaScript, XML, JSP, ASP with a view to developing professional software development skills.

1. Write a server side PHP program that displays marks, total, grade of a student in tabular format by accepting user inputs for name, number and marks from a HTML form.
2. Write a PHP program that adds products that are selected from a web page to a shopping cart.
3. Write a PHP program to access the data stored in a mysql table.
4. Write a PHP program interface to create a database and to insert a table into it.
    i). Write a PHP program using classes to create a table.
    ii). Write a PHP program to upload a file to the server.

5. Write a PHP program to create a directory, and to read contents from the directory.
6. Write a shell program to find the details of an user session.
7. Write a shell program to change the extension of a given file.
8. Create a mysql table and execute queries to read, add, remove and modify a record from that table.

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Project Work

Objective:

The student can get the knowledge to prepare the document , to implement tools for the specific problem and learn the industrial need programs for their placement .

PROJECT WORK

SL	Area of Work	Maximum marks
1.	PROJECT WORK: (i) Plan of the Project	20
	(ii) Execution of the plan / Collection of data /Organization of materials/ Fabrication Experimental study / Hypothesis, Testing etc., and Presentation of the report.	45
	(iii) Individual Initiative	15
2.	VIVA VOCE EXAMINATION	20
	TOTAL	100

Note : PASSING MINIMUM – 50 MARKS

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ELECTIVE COURSE I

1.1 MOBILE COMMUNICATION

Objective :

On successful completion of this subject, the students should have understood Wireless networks WAP architecture

Unit I

Introduction: Applications-Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing – Wireless Transmission – Multiplexing – Spread Spectrum and cellular systems – Medium Access Control – Comparisons

Unit II

Telecommunications System: Telecommunication System– GSM – Architecture – Protocols – Hand over - Security – UMTS and IMT 2000 – UMTS System Architecture-UTRAN-Core   Network-Handover- Satellite System

Unit III

Wireless LAN : IEEE S02.11 –System Architecture- Protocol Architecture-Medium Access Control Layer-MAC Frame-MAC Management—Roaming-Bluetooth:Architecture-Link Manager Protocol- Security -and Link Management.

Unit IV

Mobile IP: Goals – Packet Delivery – Strategies – Registration – Tunneling and Reverse Tunneling – Adhoc Networks – Routing Strategies

Unit V

WIRELESS APPLICATION PROTOCOL: Wireless ApplicationProtocol (WAP) – Architecture – XML – WML Script – Applications

Text Books

1. J.Schiller, Mobile Communication, Addison Wesley, 2000.

References

1. William C.Y.Lee, Mobile Communication Design Fundamentals, John Wiley, 1993.
2. William Stallings, Wireless Communication and Networks, Pearson Education, 2003.
3. Singhal, WAP-Wireless Application Protocol, Pearson Education, 2003.

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1.2 WEB SERVICES

OBJECTIVES:

On successful completion of this subject student should have: understood how to build real world application using web services

Unit I

Introduction-What are web services-SOAP-WSDL-UDDI Basic web services standards, technologies and concepts: XML fundamentals: Documents-Namespaces-schema-processing XML-Simple API for XML(SAX)-Document object model(DOM)

Unit II

SOAP and WSDL: The SOAP model-SOAP messages-SOAP encoding WSDL: Structure-The types element-Managing WSDL descriptions-Using SOAP and WSDL Service implementation and Invoking web services.

Unit III

UDDI: Introduction- UDDI specification - UDDI and lifecycle management. Conversation: Overview-web services conversation language-WSCL interface components.

Workflow: Business process management-workflows and workflow management. Quality of Service: What is QoS- Why is QoS important for web services- QoS metrics for web services-QoS enabled web services. Mobile and Wireless mobile services- challenges with mobile.

Unit IV   XML and HTML:

The limits of HTML-The scope of HTML-Structure-Structure and Content-Structure and Synthesis-Structure and Presentation-Representing Structure. **The XML Language**: Markup languages-Defining Markup Languages in XML.

Unit V   Linking in XML:

Links(Information, Resources, and Hot Spots)-Link Management-Working with names-Choosing the linking methodology. **XML Style**: The publishing Process-At which stage do I structure my data?-Where do I process from one stage to the next?-When do I Convert?-Publishing data-Choosing a Client-side processing Application-Choosing a Server-side processing application

Text Book:

1. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services: An Architects Guide", Prentice Hall, Nov 2003
   Unit I : Chapter 1 (Pg. 1 to 8), Chapter 2 (Pg.19 to 64)
   Unit II : Chapter 3 (Pg. 71 to 86 , 100 – 119)
   Unit III: Chapter 4 (Pg. 121 to 122, Pg. 129 , Pg. 137 to 139), Chapter 5 (Pg. 147-166)
   Chapter 6 (Pg. 177-183), Chapter 9 (Pg. 345– 350, Pg. 364-368) Chapter 10 (Pg. 377-387)
2. Rick Darnell "HTML 4 Unleashed" Techmedia Publication, Second Edition,
   Unit IV: Chapter 27 (Pg. 564-591), Chapter 28 (Pg. 606-626)
   Unit V: Chapter 29 (Pg. 636-649,660-661) Chapter 30 (Pg. 664-670,672-674)

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ELECTIVE COURSE I

1.3 HUMAN COMPUTER INTERACTION

Objective:

To impart knowledge related to the various concepts, methods of Human Computer Interaction techniques with design basics, design rules and evaluation techniques

Unit I   The Interaction

Introduction – Models of interaction – Frameworks and HCI Ergonomics – Interaction styles – Elements of the WIMP interface – Interactivity – The context of the interactions. Paradigms :   Introduction – Paradigms for interaction.

Unit II   Interaction, Design basics

Introduction – What is design? – User focus – Scenarios – Navigation design – Screen design and layout – Interaction and prototyping. HCL in the Software Process : Introduction – The software lifecycle – Usability engineering – interactive design and prototyping – Design rationate.

Unit III   Design Rules

Introduction – Principles to support usability – Standards – Guidelines – Golden rules and heuristics – HCI patterns. Implementation Support : Introduction – Elements of windowing systems – Programming the application Using toolkits – User interface management systems.

Unit IV   Evaluation Techniques

What is evaluation – Goals of evaluation – Evaluation through expert analysis – Evaluation through user participation – Choosing an evaluation method. Universal Design : Introduction – Universal design principles – Multi-modal interaction – Designing for diversity – Summary.

Unit V   User Support

Introduction Requirements of user support – Approaches to; user support – Adaptive help systems designing user support systems.

Text Book :

1. Human - Computer Interaction, Third Edition, "Alan Dix, Janet Finlay, Gregory D. Abowd and Russell Beale", Pearson Education, 2004.

Reference Book :

1. Human – Computer Interaction in the New Millennium, "John C. Carroll", Pearson Education" 2002.

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ELECTIVE COURSE II

2.1: EMBEDDED SYSTEMS

Objectives:

To provide fundamental concept of Embedded systems and real time operating systems.

UNIT I

Introduction to Embedded systems – processor in the system – software embedded into a system – structural units in a processor – processor, memory selection, Memory devices - Allocation of memory to program segments and blocks and memory map of a system.

UNIT II

Device drivers – Interrupt servicing mechanisms – context and periods for context switching - Programming concepts and Embedded programming in C and C++: Software programming in ALP and in high level language 'C' – 'C' program elements: Header source files and preprocessor directives – Macros and functions: Data types – data structures – modifiers – statements – loops and pointers – Embedded programming in C++ and Java.

UNIT III

Program modeling concepts in single and multiprocessor systems – software – development process: modeling process for software analysis – programming model for event controlled or response time constrained real time program- modeling of multiprocessor systems. Multiple processes – sharing data by multiple tasks and routines – inter process communications.

UNIT IV

Real time operating systems: OS services – IO sub systems – Real time and embedded operating systems – Interrupt routines in RTOS environment – RTOS task scheduling models, Interrupt latency and response times of the task as performance metrics – performance metrics in scheduling models.

UNIT V

Hardware Software code design: Embedded system project management – Embedded system design and Co-design Issues – Design Cycle – uses of target system – use of software tools for development – use of scopes and logic analysers for system hardware tests – issues in embedded system design.

Text Books:

1. Embedded systems – Architecture, Programming and Design By Raj Kamal – TMH, 2007.

REFERENCE:

1. Mohamed Ali Maszidi & Janice Gillispie Maszidi, "The 8051 Microcontroller and Embedded System", Pearson Publishers

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ELECTIVE COURSE II

2.2 ARTIFICIAL INTELLIGENCE

Objective:

On Successful completion of the course the students should have: understood the AI & Expert Systems.- Learnt the Heuristic techniques and reasoning

UNIT I

Introduction: AI Problems - Al techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems

UNIT II

Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First - Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.

UNIT III

Using Predicate logic: Representing simple facts in logic - Representing Instance and Is a relationships - Computable functions and predicates - Resolution.

UNIT IV

Representing knowledge using rules: Procedural Vs Declarative knowledge – Logic programming - Forward Vs Backward reasoning - Matching - Control knowledge.

UNIT V

Game playing – The minimax search procedure – Expert System - Perception and Action

TEXT BOOKS

1. Elaine Rich and Kevin Knight," Artificial Intelligence", Tata McGraw Hill Publishers company Pvt Ltd, Second Edition, 1991.
   Unit1: Chapter 1(1.1,1.3.1.5), Chapter 2(2.1,2.2)
   Unit2: Chapter 3(3.1,3.2,3.3,3.6), Chapter 4(4.1,4.2,4.3,4.4).
   Unit3: Chapter 5(5.1,5.2,5.3,5.4).
   Unit4: Chapter 6.
   Unit5: Chapter 12(12.1,12.2),Chapter 20 and Chapter 21.

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2.3 PATTERN RECOGNITION

Objective:

1. To understand Fuzzy Pattern Classifiers and Perception.
2. To explore different classification models.
3. To study about feature extraction and structural pattern recognition.
4. To know about Supervised and unsupervised Learning.

UNIT I   PATTERN CLASSIFIER

Overview of Pattern recognition – Discriminant functions – Supervised learning – Parametric estimation – Maximum Likelihood Estimation – Bayesian parameter Estimation – Problems with Bayes approach– Pattern classification by distance functions – Minimum distance pattern classifier.

UNIT II   CLUSTERING :

Clustering for unsupervised learning and classification – Clustering concept – C Means algorithm – Hierarchical clustering – Graph theoretic approach to pattern Clustering – Validity of Clusters.

UINT III   FEATURE   EXTRACTION   AND   STRUCTURAL   PATTERN RECOGNITION 9 KL

Transforms – Feature selection through functional approximation – Binary selection -Elements of formal grammars - Syntactic description - Stochastic grammars - Structural representation.

UNIT IV   HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINE 9

State Machines – Hidden Markov Models – Training-classification-support vector machine-Feature selection.

UNIT V   RECENT ADVANCES 9

Fuzzy logic – Fuzzy Pattern Classifiers – Pattern Classification using Genetic Algorithms – Case Study Using Fuzzy Pattern Classifiers and Perception.

REFERENCES:

1. M. Narasimha Murthy and V. Susheela Devi, "Pattern Recognition", Springer 2011.
2. S.Theodoridis and K.Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press, 2009.
3. Robert J.Schalkoff, "Pattern Recognition Statistical, Structural and Neural Approaches", John Wiley & Sons Inc., New York, 1992.
4. C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
5. R.O.Duda, P.E.Hart and D.G.Stork, "Pattern Classification", John Wiley, 2001
6. Andrew Webb, "Stastical Pattern Recognition", Arnold publishers, London, 1999.

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ELECTIVE COURSE III

3.1   PARALLEL PROCESSING

Objective:

To study the Parallel computer Architecture, theories of parallel computing, interconnection networks and applications of cost effective computer systems.

UNIT I

Introduction to Parallel Processing – Evolution of Computer Systems – Parallelism in Uniprocessor Systems – Parallel Computer Structures – Architectural Classification Schemes– Parallel Processing Applications.

UNIT II

Memory and Input-Output Subsystems – #Hierarchical Memory Structure# – Virtual Memory System – Memory Allocation and Management – Cache Memories and Management – Input-Output Subsystems.

UNIT III

Principles of Pipelining and Vector Processing – Pipelining : An Overlapped Parallelism – Instruction and Arithmetic Pipelines – Principles of Designing Pipelined Processors – Vector Processing Requirements.

UNIT IV

Vectorization and Optimization methods – Parallel Languages for Vector Processing – Design of Vectorizing Compiler – Optimization of Vector Functions – SIMD Array Processors – SIMD Interconnection Networks

UNIT V

Multiprocessors Architecture and Programming – Functional Structures – Interconnection Networks - Parallel Memory Organizations – Multiprocessor Operating Systems – Language Features to Exploit Parallelism – Multiprocessor Scheduling Strategies.

Text Book:

Kai Hwang and Faye A. Briggs,Computer Architecture and Parallel Processing,McGraw Hill International Edition, 1985. [Chapters : 1, 2, 3, 4.5.1 – 4.5.3, 5.1, 5.2, 5.4, 6.3, 7.1, 7.2.1, 7.2.2, 7.2.3, 7.3.1, 7.3.3, 7.4, 7.5.1, 8.3]

UNIT I Chapter 1 Section 1.1 – 1.5
UNIT II Chapter 2 Sections 2.1 – 2.5
UNIT III Chapter 3 Sections 3.1 – 3.4
UNIT IV Chapter 4 Sections 4.5 , Chapter 5 Sections 5.1 ,5.2 , 5.4
UNIT V Chapter 7 7.1 – 7.4, 7.5-7.5.1, Chapter 8 Sections 8.3

Books for Reference:

1. Richard Kain, Advanced Computer Architecture, PHI, 1999.
2. V. Rajaraman and C. Siva Ram Murthy, Parallel Computers, Architecture and Programming, PHI, 2000.

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3.2 ADVANCED COMPUTER ARCHITECTURE

Objectives:

To study the advanced computer Architecture, theories of parallel computing, network properties and applications of cost effective computer systems to meet the above requirements.

UNIT I

Parallel computer models :- The state of computing - Multiprocessors and multicomputers – Multivector and SIMD computers.

UNIT II

Program and Network properties:- Conditions of parallelism – Program partitioning and scheduling – program flow mechanisms – system interconnect architectures.

UNIT III

Processors and memory hierarchy :- Advanced processor Technology – Super scalar and vector processors – Linear Pipeline Processors – Nonlinear pipeline Processors.

UNIT IV

Multiprocessors and Multicomputers:- Multiprocessor System nterconnects – Message Passing Mechanisms – SIMD Computer Organizations – The Connection Machine CM 5 – Fine-Grain Multicomputers.

UNIT V

Software for Parallel Programming:- Parallel Programming Models – Parallel Languages and Compilers – Dependence Analysis of Data Arrays.

Text Book

1. Kai Hwang, "Advanced Computer Architecture "McGraw-Hill International Edn., Singapore , 1993. Chapters 1.1-1.3, 2, 4.1, 4.2, 6.2, 7.1, 7.4, 8 4, 8.5, 10.1, 10.2, 10.3

Reference Books:

1. Kai Hwang and Faye A.Briggs, "Computer Architecture and Parallel Processing", McGraw- Hill International Editions, Singapore , 1985.
2. Michael J.Quinn, "Parallel Computing, Theory and Practice", McGraw-Hill International Edn., Singapore , 1994.

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ELECTIVE COURSE III

3.3. PERVASIVE COMPUTING

Objective: :

On successful completion of the course the students should have: Understand the concept of web applications and WAP fundamentals. Learn the PDA.

Unit I

Pervasive Computing: Past, Present and Future - Pervasive Computing Market – m-Business – Application examples: Retail, Airline check-in and booking – Health care – Car information system – E-mail access via WAP and voice.

Unit II

Device Technology: Hardware – Human Machine Interfaces – Biometrics – Operating Systems – Java for Pervasive devices.

Unit III

Device Connectivity: Protocols – Security – Device Management - Web Application Concepts: WWW architecture – Protocols – Transcoding - Client Authentication via Internet.

Unit IV

WAP and Beyond: Components of the WAP architecture – WAP infrastructure – WAP security issues – WML – WAP push – Products – i-Mode - Voice Technology: Basics of Speech recognition- Voice Standards – Speech applications – Speech and Pervasive Computing.

Unit V

PDA: Device Categories – PDA operation Systems – Device Characteristics – Software Components - Standards – Mobile Applications - PDA Browsers - Pervasive Web Application architecture: Background – Development of Pervasive Computing web applications - Pervasive application architecture.

Text Book:

Pervasive Computing, Technology and Architecture of Mobile Internet Applications, JochenBurkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff, Pearson Education, 2006.

Reference Book:

Fundamentals of Mobile and Pervasive Computing, Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, McGraw Hill edition, 2006.

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ELECTIVE COURSE IV

4.1   NETWORK SECURITY

Objective:

To impart knowledge related to the various concepts, methods of Network Security using cryptography basics, program security, database security, and security in networks.

Unit I

Overview-Symmetric Ciphers: Classical Encryption Techniques

Unit II

Symmetric Ciphers: Block ciphers and the Data Encryption Standards Public-key Encryption and Hash Functions: Public-Key Cryptography and RSA

Unit III

Network Security Practices: Authentication applications-Electronic Mail Security

Unit IV

Network Security Practices: IP Security-Web Security

Unit V

System Security: Intruders-Malicious Software-Firewalls

Text Book:

1. William Stallings, Cryptography and Network Security-Principles and Practices, Prentice-Hall, Third edition, 2003 **ISBN:** 8178089025

References:

1. Johannes A. Buchaman, Introduction to cryptography, Springer-Verlag 2000.
2. AtulKahate, Cryptography and Network Security, Tata McGraw Hill. 2007

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4.2   COMPUTER SIMULATION AND MODELING

Objective :

To impart knowledge in real time modeling process and the simulation of any system using the real time mode

Unit I :

Introduction to Simulation: When Simulation is the Appropriate Tool- When Simulation is not Appropriate- Advantages and Disadvantages of Simulation- Areas of Application- Systems and System Environment- Components of a System- Discrete and Continuous Systems- Model of aSystem- Types of Models- Discrete- Event System Simulation –Steps in a simulation study.Simulation Examples: Simulation of Queuing Systems, Simulation of Inventory Systems.

Unit II :

Simulation Software: History of Simulation Software- Selection of Simulation Software- Simulation in JAVA, Simulation in GPSS, Simulation in SSF- Simulation software – Experimentation and Statistical and analysis tools .

Unit III :

Statistical Models in Simulation: Review of Terminology and Concepts- Useful Statistical Models- Discrete Distributions- Continuous Distributions- Poisson process. Queuing models- Characteristics of queuing systems.

Unit IV :

Random-Number Generation: Properties of Random Numbers-Generation of Pseudo- Random Numbers-Techniques for Generating Random Numbers-Linear congruential Method- Random number streams -Tests for random numbers- Frequency tests - Test for Autocorrelation.Random-Variate Generation: Inverse Transform Technique-Exponential Distribution-Uniform Distribution- Weibull Distribution.

Unit V :

Input Modeling: Data Collection - Identifying the Distribution with Data- parameter estimation- goodness of fit tests. Verification and Validation of Simulation Models: Model Building, Verification, and Validation-Verification of Simulation Models- Calibration and Validation of Models.

Text Book:

1. Jerry Banks, John S. Carson, II Barry L. Nelson., *Discrete-Event System Simulation*, FourthEdition, PHI Edition, 2009.
   Unit:I :Chapter 1 Sections (1.1-1.11), Chapter 2 Sections (2.1, 2.2)
   Unit:II :Chapter 4 Sections (4.1, 4.2, 4.4-4.7)
   Unit:III :Chapter 5 Sections (5.1-5.5), Chapter 6 Sections (6.1)
   Unit:IV :Chapter 7 Sections (7.1, 7.2, 7.3.1, 7.3.3, 7.4), Chapter 8 Sections (8.1.1-8.1.3)
   Unit:V :Chapter 9 Sections (9.1-9.4), Chapter 10 Sections (10.1-10.3)

Book for Reference:

E.Winsberg, Science in the age of computer simulation, Chicago: University Press, 2010.

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4.3   SOFT COMPUTING

Objective:

To impart knowledge in Fuzzy Set Theory, Optimization, Neural Networks, Nero Fuzzy Modeling and Application Of Computational Intelligence

Unit I FUZZY SET THEORY :

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set – Theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

Unit II   OPTIMIZATION :

Derivative based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative Free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

Unit III   NEURAL NETWORKS:

Supervised Learning Neural Networks – Perceptrons – AdalineBackpropagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

Unit IV   NEURO FUZZY MODELING:

Adaptive Neuro – Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

Unit V   APPLICATION OF COMPUTATIONAL INTELLIGENCE:

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

TEXT BOOK

1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro Fuzzy and Soft Computing", PHI, Pearson Education, 2004.

REFERENCE BOOK

1. Timothy J. Ross, "Fuzzy Logic with Engineering Application, "McGraw Hill, 1977.
2. Davis E. Goldberg, "Genetic Algorithms Search, Optimization and Machine Learning", Addision Wesley, 1989.
3. S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.   Emereo Pty Limited, July 2008.
4. Ahmar, Abbas, "Grid Computing - A Practical Guide to technology and Applications", Charles River media, 2003.

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5.1 BIG DATA ANALYTICS

Objective:

To impart knowledge in Fundamentals, Big Data Analytics, Technologies and databases, Hadoop and Map Reduce Fundamentals

Unit I

Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment

Unit II

Big data analytics: Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment

Unit III

Big data technologies and Databases: Introduction to NoSQL, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Overview of NewSQL, Comparing SQL, NoSQL and NewSQL, Introduction to MongoDB and its needs, Characteristics of MongoDB, Introduction of apache cassandra and its needs, Characteristics of Cassandra

Unit IV

Hadoop foundation for analytics: History, Needs, Features, Key advantage and Versions of Hadoop, Essential of Hadoop ecosystems, RDBMS versus Hadoop, Key aspects and Components of Hadoop, Hadoop architectures

Unit V

HadoopMapReduce and YARN framework: Introduction to MapReduce, Processing data with Hadoop using MapReduce, Introduction to YARN, Components, Need and Challenges of YARN, Dissecting YARN, MapReduce application, Data serialization and Working with common serialization formats, Big data serialization formats

Text Book

Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016

Reference Books

1. 1."Big Data" by Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, Wiley Publications, 2014.
2. 2."Big Data Imperatives : Enterprise Big Data Warehouse, BI Implementations and Analytics" by Soumendra Mohanty, Madhu Jagadeesh and Harsha Srivatsa, Apress Media, Springer Science + Business Media New York, 2013
3. "Mining of Massive Datasets", Anand Rajaraman, Jure Leskovec, Jeffery D. Ullman, Springer, July 2013.
4. "Hadoop: The definitive Guide", Tom White, O'Reilly Media, 2010.

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ELECTIVE COURSE V

5.2 MANET

Objective:

This course aims to build concepts regarding the fundamental principles of distributed systems. The design issues and distributed operating system concepts are covered

UNIT I   INTRODUCTION :

Introduction to adhoc networks – definition, characteristics features, applications. Charectristics of Wireless channel, Adhoc Mobility Models:- Indoor and out door models. Ad hoc Wireless Networks – What is an Ad Hoc Network? Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Ad hoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks – Ad hoc wireless Internet.

UNIT II   AD HOC ROUTING PROTOCOLS :

Introduction – Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols – Table–Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) – Wireless Routing Protocol (WRP) – Cluster Switch Gateway Routing (CSGR) – Source–Initiated On–Demand Approaches – Ad hoc On–Demand Distance Vector Routing (AODV) – Dynamic Source Routing (DSR) –Temporally Ordered Routing Algorithm (TORA) – Signal Stability Routing (SSR) –Location–Aided Routing (LAR) – Power–Aware Routing (PAR) – Zone Routing Protocol (ZRP).

UNIT III   MULTICASTROUTING IN ADHOC NETWORKS :

Introduction – Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols –Classifications of Multicast Routing Protocols – Tree–Based Multicast Routing Protocols– Mesh–Based Multicast Routing Protocols – Summary of Tree and Mesh based Protocols – Energy–Efficient Multicasting – Multicasting with Quality of Service Guarantees – Application – Dependent Multicast Routing – Comparisons of Multicast Routing Protocols

UNIT IV   END-END DELIVERY AND SECURITY :

Transport layer : Issues in desiging- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT V   CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary prespective. Intergration of adhoc with Mobile IP networks.

TEXT BOOKS

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd eition, Pearson Education. 2007.
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

REFERENCES

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobilead hoc networking, Wiley-IEEE press, 2004.
2. Mohammad Ilyas, The handbook of adhoc wireless networks, CRC press, 2002.
3. T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad Hoc Network"
4. C. K. Toh, "Ad Hoc Mobile Wireless Networks Protocols and Systems", Prentice Hall, PTR, 2001.
5. Charles E.Perkins,"Ad Hoc Networking", Addison Wesley, 2000

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ELECTIVE COURSE V

5.3 DIGITAL IMAGE PROCESSING

Objective:

To study the various concepts, methods and algorithms of digital image processing with image transformation, image enhancement, image restoration, image compression techniques

Unit I   CONTINUOUS AND DISCRETE IMAGES AND SYSTEMS :

Light, Luminance,Brightness and Contrast, Eye, The Monochrome Vision Model, ImageProcessing Problems and Applications, Vision Camera, Digital ProcessingSystem, 2-D Sampling Theory, Aliasing, Image Quantization, Lloyd MaxQuantizer, Dither, Color Images, Linear Systems And Shift Invariance, FourierTransform, ZTransform, Matrix Theory Results, Block Matrices and KroneckerProducts.

Unit II   IMAGE TRANSFORMS :

2-D orthogonal and Unitary transforms, 1-D and 2-DDFT, Cosine, Sine, Walsh, Hadamard, Haar, Slant, Karhunen-loeve, Singularvalue Decomposition transforms.

Unit III   IMAGE ENHANCEMENT :

Point operations - contrast stretching, clipping andthresholding density slicing, Histogram equalization, modification andspecification, spatial operations - spatial averaging, low pass, high pass, bandpass filtering, direction smoothing, medium filtering, generalized cepstrum andhomomorphic filtering, edge enhancement using 2-D IIR and FIR filters, colorimage enhancement.

Unit IV   IMAGE RESTORATION :

Image observation models, sources of degradation,inverse and Wiener filtering, geometric mean filter, non linear filters, smoothingsplines and interpolation, constrained least squares restoration.

Unit V   IMAGE DATA COMPRESSION AND IMAGE RECONSTRUCTION FROM PROJECTIONS:

Image data rates, pixel coding, predictive techniques transformcoding and vector DPCM, Block truncation coding, wavelet transform coding ofimages, color image coding. Random transform, back projection operator,inverse random transform, back projection algorithm, fan beam and algebraicrestoration techniques.

Book for study :

1. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI, 1995.
2. Sid Ahmed M.A., "Image Processing", McGraw Hill Inc, 1995.
3. Gonzalaz R. and Wintz P., "Digital Image Processing", Addison Wesley, 2nd Ed, 1987.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.
M.Sc. Environmental Science   Course Structure under CBCS
(For the candidates admitted from the academic year 2016-2017 onwards)

Sem	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks Int.	Marks Ext.	Total
I	Core Course – I (CC)	Principles of Ecology and Environmental Science	6	4	3	25	75	100
	Core Course – II (CC)	Environmental Chemistry and Toxicology	6	4	3	25	75	100
	Core Course – III (CC)	Environmental Microbiology and Biotechnology	5	4	3	25	75	100
	Core Course – IV (CC)	Climate Change and Current Issues	5	4	3	25	75	100
	Core Practical – I (CP)	Environmental Chemistry, Microbiology and Biotechnology (P)	8	4	3	40	60	100
	TOTAL		**30**	**20**				**500**
II	Core Course – V (CC)	Environmental Pollution Studies	6	5	3	25	75	100
	Core Course – VI (CC)	Environmental Geology, Geography and Remote Sensing	6	5	3	25	75	100
	Core Practical – II (CP)	Environmental Geology and Geography and Remote Sensing (P)	8	4	3	40	60	100
	Elective Course – I (EC)	Biodiversity and Conservation	5	5	3	25	75	100
	Elective Course – II (EC)	Environmental Ethics, Law and Policy	5	5	3	25	75	100
	TOTAL		**30**	**24**				**500**
III	Core Course – VII (CC)	Waste Management and Remediation	6	5	3	25	75	100
	Core Course – VIII (CC)	Energy and Green Technology	6	5	3	25	75	100
	Core Practical – III (CP)	Energy and Remediation (P)	8	4	3	40	60	100
	Elective Course – III (EC)	Natural Resource Management	5	5	3	25	75	100
	Elective Course – IV (EC)	Statistical and Computer Applications in Environmental Studies	5	5	3	25	75	100
	Total		**30**	**24**				**500**
IV	Core Course – IX (CC)	Environmental Analytical Methods	5	5	3	25	75	100
	Core Course – X (CC)	Environmental Impact Assessment and Environmental Audit	5	5	3	25	75	100
	Core Practical - IV (CP)	Environmental Analytical Methods (P)	8	4	3	40	60	100
	Elective Course – V (EC)	Industrial Pollution and Safety Management	5	4	3	25	75	100
	Project		7	4	-	-	-	100
	TOTAL		**30**	**22**				**500**
	GRAND TOTAL		**120**	**90**				**2000**

Note:

Project   - 100 Marks
Dissertation   - 80 Marks
Viva Voice   - 20 Marks

Core Papers   - 10
Core Practical   - 4
Elective Papers   - 5
Project   - 1

Note:

1. Theory   Internal   25 marks   External   75 marks

2. Practical   ”   40 marks   ”   60 marks

3. Separate passing minimum is prescribed for Internal and External

   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The passing minimum not less than 50% in the aggregate.

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CORE COURSE I

PRINCIPLES OF ECOLOGY AND ENVIRONMENTAL SCIENCE

OBJECTIVES

1. To study the ecological factors, structure and function of ecosystem.
2. To study about biodiversity and natural resources in the Biosphere.
3. To understand the causes, effects and control measures of pollution.

UNIT I

Definition, principle, branches and scope of ecology. Ecological factor: Abiotic –Physical and chemical factors: Soil, air, water, temperature, pH, humidity, radiation, wind, pressure, precipitation. Biotic – Limiting factors – Species interaction: Commensalism, amensalism, mutualism, competition, parasitism, prey-predator relationship. Basic components of an ecosystem – structure and functional aspects of an ECO System, Tropic structure – Ecological Niche – Ecological dominance –stability diversity rule.

UNIT II

Population: definition, characteristics, population density, natality, mortality, age distribution, growth patterns, population fluctuation, population equilibrium, biotic potentials, population dispersion and regulation of population. Ecological age pyramid. Ecological succession types, process, climax and significance of succession. Food chain –types of food chain with examples, food web, energy flow, ecological pyramid of biomass.

UNIT III

Definition, concept, structure and function of an ecosystem: producers, consumer and decomposers. Primary and secondary productivity. Ecosystem types: Terrestrial – forest, mountain, deserts and grassland. Aquatic – Freshwater (lentic and lotic) and marine (Estuary, mangroves, corals, deep sea).

UNIT IV

Definition, concept and types of biodiversity. Introduction to taxonomy. Biogeographical classification in India. Values of biodiversity. Status of biodiversity – Global, national and local status. Hot-spots of biodiversity. Endangered and threatened species. Strategies for biodiversity conservation – Insitu and Exsitu conservation, Cryopreservation, Gene banks, Gene pool and species conservation. National parks and sanctuaries. Common flora and fauna in India. Bioprospecting.

UNIT V

Definition, principle and scope of Environmental science. Earth, man and Environment interactions. Geographical classification and zones. Significance of Atmosphere, lithosphere and Hydrosphere. Biosphere – global distribution of plant biomes, spatial distribution of animals – zoogeographic realms. Environmental pollution: definition types (Air, water and soil). Biogeochemical Cycles – Availability and rate of cycling of nutrients – gaseous and Sedimentay cycle.

REFERENCES

1. Aguirre, A. Alonso. "Biodiversity and human health." EcoHealth 6.1, (2009): 153-156
2. Asthana, DK and Meera Asthana, (2014). A Textbook of Environmental Studies. S. Chand Publication, New Delhi
3. Begon M, Townsend CR & Harper JL, (2006). Ecology: from individuals to ecosystems
4. Daniel chiras, (2001). Environmental Science, 6th Edition. Jones and Bartket publishers
5. Jørgensen SE and Johnson I, (1981). Principles of Environmental Science and Technology. By Copenhagen, Denmark
6. Ranveer Kumar, BS Singh and MP Singh, (2012). Walter pollution and Environment. Enkay Publishing House
7. Sharma PD, (2003). Ecology and Environment. Rastogi Publication, Meerut
8. Shormila Mukherji, (2004). Fragile Environment, Manak publication Pvt. Ltd. New Delhi
9. Singh JS, Singh SP and SR Gupta, (2008). Ecology, Environmental and Resource conservation. Anamaya Publishers, India
10. Smith R and Smith RM, (2000). Ecology and Field Biology. (6th ed.). Prentice Hall
11. Subramanian V, (2002). A Text Book on Environmental Science. Narosa Publishing House. New Delhi
12. Suresh K. Dhameja, (2003). Environmental Science and Engineering, S.K.Kataria & Sons Publishers and Distributors, New Delhi

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CORE COURSE II

ENVIRONMENTAL CHEMISTRY AND TOXICOLOGY

OBJECTIVES

1. To understand the sources, distribution, transport, chemodynamics and fate of chemicals/pollutants in the ecosystems.
2. To acquire broad knowledge of Environmental Chemistry including development of methods for ultra-trace analysis of pollutants in air, water, soil and biological matrices.
3. To describe important chemical reactions in the lithosphere, hydrosphere and atmosphere, including smog formation, ozone chemistry, acid rain chemistry, etc.

UNIT I   : Fundamentals of environmental chemistry

Stoichiometry, Gibb's energy, chemical potential, chemical equilibria, acid-base reactions, solubility product, solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons, radionuclides.

UNIT II   : Chemical composition of air

classification of elements, chemical speciation. Particles, ions and radicals in the atmosphere. Chemical processes for formation of inorganic and organic particulate matter. Thermochemical and photochemical reactions in the atmosphere. Oxygen and ozone chemistry. Chemistry of air pollutants. photochemical smog and acid rain.

UNIT III   : Water chemistry

Physico-Chemical parameters of water, concept of DO, BOD, COD, sedimentation, coagulation, filtration, Redox potential, hydrological cycle, sampling techniques.

UNIT IV   : Soil chemistry

Structure of lithosphere, nature of soil - physical properties of soil - soil water - soil air - soil temperature - mechanical composition- structure and texture. Chemical properties of soil: Minerals of soil - colloids in soil; ion exchange reactions in soil. Soil fertility and evaluation - organic matter in soil and their transformation - soil pH.

UNIT V   : Environmental toxicology and toxicogenomics

Introduction to toxicology, toxicity evaluation methods-LD_{50}, LC_{50}, etc. Toxic chemicals in the environment -Teratogens, mutagens and carcinogens. Pollutant uptake, biotransformation, accumulation, detoxification and elimination by organisms. Toxicant effects – molecular effects and biomarkers, sublethal, acute and chronic effects. Impact of toxic chemicals on enzymes and hormones - Biochemical effects of arsenic, lead, mercury,

pesticides, PCBs, flame retardants, Environmental toxicology of nanoparticles/materials.

REFERENCES

1. Banerji SK, (2002). Environmental chemistry. Prentice-Hall of India, New Delhi
2. Bhatia SC, (2002). Environmental chemistry. CBS publishers and Distributors, New Delhi
3. Chatwal A, (1999). Instrumental methods of chemical analysis. Himalaya publishing House, Mumbai
4. Cunningham P, Cooper H, Eville G, and MT Hepworth, (1999). Environmental Encyclopedia. Jaico Publishing House, Mumbai
5. De AK, (1990). Environmental Chemistry. Wiley Eastern Ltd., New Delhi
6. Johnson DO, Netteville JT, Wood JC and James M, (1973). Chemistry and the Environment W.B. Saunders Co., Philadelphia
7. Sharma BK and Kaur H, (1994). Environmental Chemistry. Goel Publishing House, Meerut
8. Sindhu PS, (2002). Environmental chemistry. New age international publishers, New Delhi
9. Sodhi CS, (2000). Fundamental concepts of environmental chemistry. Narosa Publishing house, New Delhi
10. Manahan SE, (2009). Environmental Chemistry.CRC Press
11. Baird and Cann, (2012). Environmental Chemistry.W. H. Freeman
12. vanLoonand Duffy, (2011). Environmental Chemistry: A Global Perspective. OUP Oxford
13. Crosby. (1998). Environmental Toxicology and Chemistry. Oxford University Press USA
14. Wrightand Welbourn, (2002). Environmental toxicology. Cambridge University Press
15. Newman and Clements, (2008). Ecotoxicology: a comprehensive treatment. CRC Press

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CORE COURSE III

ENVIRONMENTAL MICROBIOLOGY AND BIOTECHNOLOGY

OBJECTIVES

1. To provide the students with an opportunity to learn about the fundamentals of microbes and environment interactions.
2. To make the students to understand the biotechnological aspects of microbes in biodegradation and environmental remediation.

UNIT I   : Introduction to microbiology and biotechnology

Structure and reproduction of microbes in general - Bacteria, Fungi, Virus, and Actinomycetes - Sterilization and microbial culture methods - Preparation of culture media - isolation and   identification of microorganisms by biochemical and molecular methods - Microbial growth kinetics - Molecular methods - Nucleic acids isolation - Restriction enzymes - PCR.

UNIT II   : Aquatic microbiology

Microbiology of water - Bacteriological analysis in Water - Water pollution - Eutrophication - Waterborne diseases - Sewage microbiology - Sewage treatment - Activated sludge process.

UNIT III   : Soil microbiology

Soil Microbial Community - Microbial interactions - Biogeochemical cycles - Carbon cycle - Nitrogen cycle - Biological Nitrogen fixation, ammonification, nitrification and denitrification - Phosphorus cycle - Sulphur cycle - Role of bacteria and fungi in soil fertility.

UNIT IV   : Environmental application of microorganisms

Biological wastewater treatment - Effluent treatment - Anaerobic digestion and biogas production - Biodegradation, Biotransformation, Mineralization, Bioremediation of Environmental Pollutants - organic pollutants and heavy metals remediation - Bio-mining.

UNIT V   : Biotechnological products of microbes

Biodegradation and Bioconversion lignocellulose to fuels - Microbial Fuels Bioethanol, Biobutanol production, Biohydrogen production   - Biodeterioration - Bio-fertilizers - Bio-pesticides, Microbial enzyme - cellulases, hemicellulases - ligninases, laccases, amylases, xylanase.

REFERENCES

1. Thakur IS, (2012). Environmental Biotechnology: Basic Concepts and Applications (2nd Second Edition). I. K. International Publishing Housing, New Delhi
2. Singh DP, Singh SK and DP Dwivedi, (2005). Environmental Microbiology and Biotechnology. New Age International (P) Limited , Publishers
3. Alexander N Glazer and Hiroshi Nikaido, (2007). Microbial Biotechnology: Fundamentals of Applied Microbiology (2nd Edition)
4. Ian L Pepper, Charles P Gerba and Terry J Gentry, (2015). Environmental Microbiology (Third edition), (Eds.) C.P. Gerba, T.J. Gentry, Academic Press

WEB RESOURCES

1. https://en.wikipedia.org/wiki/Microbial_ecology
2. http://www.environmentalscience.org/environmental-microbiology-gis
3. http://www.greenpeace.org/australia/PageFiles/434214/GM_Fact%20Sheet_Health_%20and_Env_Impacts.pdf
4. http://enhs.umn.edu/current/5103/gm/harmful.html
5. http://igmoris.nic.in/
6. www.wastewatertreatment.co.in/index.php
7. www.microbialfuelcell.org
8. www.pollutionissues.com/A-Bo/Bioremediation.html
9. www.bioreactors.net
10. http://www.cpeo.org/techtree/ttdescript/biorec.htm
11. http://www.personal.psu.edu/jel5/biofilms/
12. www.rdp.cme.msu.edu

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CORE COURSE IV

CLIMATE CHANGE AND CURRENT ISSUES

OBJECTIVESS

1. To understand the structure and composition of the Earth.
2. To describe the climatology pattern, changes and its effect on earth.
3. To discuss the climate change impact and its mitigation.

UNIT I

Overview of the structure and composition of the atmosphere; earth and sun relations - rotation, revolution and seasons. Atmosphere, Hydrosphere, Lithosphere, Biosphere and their linkage, Earth's geological history and development and evolution of the atmosphere; Gaina Hypothesis. Element of climate, climate controls. Species and temporal patterns of climate parameters.

UNIT II

Meteorology fundamental – Energy, radiation, temperature and heat; pressure, pressure belts, wind and atmospheric circulation; atmospheric moisture humidity, condensation, formation of precipitation, dew, fog and clouds; atmospheric stability, adiabatic process; scales of meteorology; application of micro-meteorology to vegetated surfaces, urban areas; atmospheric stability diagrams, turbulences, diffusion. Wind roses, Topographic effects, Pollutant climatology

UNIT III

Atmosphere and climate. Basic atmosphere properties, climate controls. Climate classifications and variability. Atmospheric climate - global scale, regional scale, locals scale. Oceans: General circulation patterns. Air-Sea interaction. Tropical systems– equatorial trough, ITCZ, jet streams, vortices; Indian monsoon.

UNIT IV

Global Energy balance: Source, transfer, distribution. Energy balance of the atmosphere. Wind, stability and turbulence; El Niño, southern oscillations cyclones. Natural climate changes: Records of climate change (glacial cycles, ocean sediments, corals, tree rings). Climatic considerations in industrial locations and city planning. Oceans and variation in climate.

UNIT V

Human impact on climate-causes and consequences of Global warming – Global and regional trends in greenhouse gas emissions –Sea level rise; role of oceans and forests as carbon sinks, Ozone hole. Impacts of climate changes- Effects on organisms including humans; effects on disease;

Extinction risk for temperature –sensitive species; UV effects climate change and policy: Montreal protocol; Kyoto Protocol; carbon trading. Physiography, spatial and temporal patterns of climatic parameters - temperature, rainfall and its variability in India with special reference to NE monsoon, general circulation.

REFERENCES

1. Barry RG, (2003). Atmosphere, weather and climate. Routledge Press, UK
2. Burrough WS, (2007). Climate change; A multidisciplinary Approach, CUP
3. Critchfield Howard J, (1998). General climatology, prentice Hall India Pvt .Ltd., New Delhi.
4. Critichfield HJ, (2002). General Climatology, PHI.
5. Das Monsoon PK, NBT 17.
6. David D Houghton, (2002). Introduction to climate change: Lecture notes for meteorologist, World Meteorologist Organization.
7. Donald Ahrens C. Meteorology Today – An introduction to weather, climate and the environment Brooks/Cole Thompson Learning.
8. Firor J and Jacobsen JE, (2002). The crowded green house: population, climate changes and creating a sustainable world. Yale University press.
9. Gorden, (1998). Dynamic Meteorology - A basic course, Arnold,
10. Harvery D, (2000). Climate and Global climate changes. Premtioce Hall.
11. Menon, P.A. Our Weather, NBT.
12. Natalia Trofimenko, (2011). Climate change: current issues
13. Oliver J.E. and Hidore J.J. Climatology and atmospheric science.

WEB RESOURCES

1. http://nca2014.globalchange.gov .
2. http://rhg.com/wpcontent/uploads/2014/06/RHG_AmericanClimatePr ospectus_June2014_LowRes1.pdf.
3. http://www.unc.edu/~jjwest/ClimateCourse-Syllabus_2015.pdf
5. www.hmmtreasury.gov.uk/independent_reviews/stern_review_economic s_climate _ change/ stern review_report.cfm.
6. www.aip.org/history/climate.
7. www.realclimate.org.
8. www.globalchange.gov/engage/process-products/sap-summary

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CORE PRACTICAL I

ENVIRONMENTAL CHEMISTRY, MICROBIOLOGY AND BIOTECHNOLOGY (P)

OBJECTIVES

1. To provide practical knowledge on basic environmental chemistry.
2. To develop experimental skills of the students in handling microbes.
3. To develop experimental skills of the students in production of microbial products for environmental applications.

PRACTICAL

1. Determination acidity, alkalinity, pH and conductivity.
2. Estimation of total solids (TS), total dissolved solids (TDS) and total suspended solids (TSS)
3. Preparation of culture media and isolation of microorganims from soils, mine contaminated area bacterial growth kinetics.
4. Isolation of bacterial DNA and gel electrophoresis.
5. PCR amplification of 16S rRNA gene, sequencing and identification of Bacteria.
6. Enumeration bacteria from water and wastewater - total coliform and total fecal coliform.
7. Estimation of Ammonium and Phosphorus content of wastewater.
8. Biodegradation of environmental pollutant by bacteria – phenol degradation.
9. Microbiological treatment of industrial (dye or paper) effluent and determination of COD.
10. Production fungal biocontrol agent for pathogen control.
11. Production and quantification of enzyme activity.

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CORE COURSE V

ENVIRONMENTAL POLLUTION STUDIES

OBJECTIVES

1. Define pollution and describe the sources, types and effects of major pollution.
2. Appreciate why access to sewage treatment and clean water are important to people in developing countries.
3. Examine the topic of pollution, its possible solutions, and the government agencies that are responsible to deal with environmental issues.
4. Enable students to understand environmental problems, looking at causal linkages between pollution sources, exposure pathways and impacts to environmental quality and human health.

UNIT I : Air Pollution

Structure of the atmosphere, Types of air pollutants, primary and secondary particulate and gaseous contaminants, their sources and impact on vegetation, animals and human beings. Photochemical smog, Bhopal gas disaster. Acid rain formation its effects on environment. Community air pollution survey. Meteorological factors in air pollution survey. Meteorological factors in air pollution, wind, Atmospheric stability, plume behaviour. Air pollution monitoring, principles of sampling and analysis of particulate and gaseous contaminants.

UNIT II : Water Pollution

Sources and types of water pollution. Classification of water pollutants - Oxygen demanding wastes, pathogens, plant nutrients, synthetic organic compounds, inorganic chemicals and mineral substances. Thermal pollution - sources and effects, an episode of thermal pollution. Sewage - nature of sewage.

UNIT III : Land Pollution

Sources, types and nature of solid wastes, effects of solid wastes, solid industrial wastes, defecation and its effects, fertilizer pollution, types of fertilizers, field run off-effects. Pesticides pollution, history, types - effects of biocides, Other forms of environmental degradation, monoculture and its impacts, Dam water development projects and its impacts.

UNIT IV :Radioactive Pollution, Noise pollution and Marine pollution

Radiation - types and units-sources natural and man-made. Effects of radioactive pollution, atomic explosions and episode. Noise pollution: Sources, types, characteristics of sound, noise, intensity annoyance, impacts of noise pollution. Marine pollution: Sources of marine pollution and control. Criteria employed for disposal of pollutants in marine system.

Impact of marine pollution. Oil pollution - sources and effects, an episode of oil pollution. - coastal management

REFERENCES

1. Abbasi SA, (1998). Environmental pollution and its control, Cogent international, Pondicherry
2. Asthana K and Asthana M, (2003). Environment. Chand and Co. Ltd., New Delhi
3. Bhatia HS, (1998). Environmental pollution and its control ,Golgotia publications (P) Limited, Delhi
4. Dara SS, (2002). A text book of environmental chemistry and pollution control, Chand and Co. Ltd., New Delhi
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10. Murty JVS, (1994). Watershed Management in India. Wiley Eastern Ltd., New Delhi
11. Rao MN and HVN Rao, (1989). Air Pollution .Tata McGraw Hill Publishing Co. Ltd., New Delhi
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14. Sharma BK and H Kaur, (1994). Soil and Noise Pollution. Goel Publishing House. Meerut.
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17. Trivedy RK, (1995). River Pollution in India. Enviromedia, Karad
18. Trivedy RK and PK Goel, (1995). An introduction to air pollution. Enviromedia, Karad
19. Kannan K, (1991). Fundamentals of Environmental Pollution. S chand Co, New Delhi
20. Best GA, (1999). Environmental Pollution Studies. Liverpool University Press
21. Daniels RJR, and Krishnaswamy J, (2014). Environmental Studies. Wiley India Private Limited
22. VK Sharma, (2011). Environmental Pollution: A Brief Study. Delhi: Neha Publishers & Distributors

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ENVIRONMENTAL GEOLOGY, GEOGRAPHY AND REMOTE SENSING

OBJECTIVES

1. To introduce the fundamental process and dynamics that place in various components of the Geosphere.
2. To understand the structure of the earth, its formation and composition.
3. To throw light on rock cycle inclusive weathering, soil formation and land forms.
4. To understand the basics of Sedimentology including formation chemistry and transport.
5. To develop an understanding on geochronology, tectonic and ocean crust

UNIT I   : Introduction to geosphere components

Fundamentals of Atmosphere (Troposphere, Mesosphere, Stratosphere, Exosphere), Hydrosphere, Lithosphere, Pedosphere and their interaction, material balance principle, Thermodynamics princ and entropy.

UNIT II   : Geology and its perspective

Earth in the solar system: origin, size, shape, mass, density, rotational and revolution parameters. Formation of core, mantle, curst, and elemental abundance in each constituent. Convection in the earth's core and production of its magnetic field. Mineral: physical properties (form, colour, lusture, strak, cleavage, fracture, hardness, specific gravity) and chemical composition. Silicate structure and their classification.

UNIT III   : Rock Cycle and weathering

Types of rocks and their composition, controlling factors and products of weathering. Soil formation, soil profile and soil types. Important erosional and depositional landforms produced by running water: waterfalls, rapids, meanders, oxbow lakes, floodplains, levees, alluvial fans, stream terraces and deltas. Youth, mature and old stages of river systems. Stream patterns.

UNIT IV   : Radioactivity and age of the earth

Radio isotope dating methods and geochronology, Elementary ideas of various geotectonic units namely shield, craton, platform, orogenic belt, mid-oceanic ridge, ocean island arc, deep sea trenches and their examples. Elementary ideas about seafloor spreading, plate tectonics, and continental drift.

UNIT V   : Remote Sensing and GIS

Remote Sensing and GIS – Definition, Principles and Concept of Remote Sensing, Types, Components of GIS, Concept. Sensors – Satellite Remote Sensing Sensors. Data Processing – Digital Image Processing, Visual

Interpretation. GIS – GIS Softwares, Spatial Database Creation, Integration, Analysis. Application of Remote Sensing and GIS for Environmental Studies – Land Use/Land Cover Changes, Forest Management, Natural Resource Management, Pollution Mapping and Biodiversity Assessment.

REFERENCES

1. Chandna RC, (2002). Environmental Geography, Kalyani, Ludhiana
2. Edward A. Keller (2011) Environmental Geology (9th Edition) 9th Edition, Prentice Hall, Inc. A Pearson Company
3. Tom L. McKnight (2005) Physical Geography A Landscape Appreciation, 8th Edition, ISBN#:   0-13-145302-5, Prentice Hall, Inc. A Pearson Company
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5. Kang-tsung Chang, (2003). Introduction to Geographic Information Systems, Tata McGraw Hill Edition, New Delhi
6. IA Mirsal, (2004). Soil Pollution, Springer Publications
7. Lillesand and Kiefer, (2004). Remote Sensing and Image Interpretation, John Wiley and Sons, NJ, USA
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CORE PRACTICAL II

ENVIRONMENTAL GEOLOGY, GEOGRAPHY AND REMOTE SENSING (P)

OBJECTIVES

1. To experimentally understand the basic structure of rocks and their mineral composition
2. To read the toposheet and identify topographical features for further environmental analysis
3. To process maps and analyze environmental data using GIS softwares
4. To visualize the satellite imageries and interpret geographical, geological and ecological features using ERDASS software.

1. Structure of geology and geophysical method

2. Identification of rock types

3. Introduction of toposheet /Basic Mapping and Creation of a database

4. Georeferencing of toposheet and Projection and transformation of Raster data (toposheet)

5. Basic of Digitization, Data editing and topology creation

6. Data analysis and output map generation

7. Study of satellite Imagery in different bands and visual interpretation

8. Identification of feature on satellite imagery

9. Georeferencing of image using Erdas Imagine

10. Demonstration of GPS (Global position system)

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ELECTIVE COURSE I

BIODIVERSITY AND CONSERVATION

OBJECTIVES

1. To maintain essential ecological processes and life supporting systems.
2. To preserve the diversity of species or the range of genetic material found in the worlds organisms.
3. To make sustainable utilization of species and ecosystems.

UNIT I   : Biodiversity – Concept and Definition

Scope and Constraints of Biodiversity Science, Composition and Scales of Biodiversity: Genetic Diversity, Species/ Organismal Diversity, Ecological/ Ecosystem Diversity, Landscape/ Pattern Diversity, Agrobiodiversity, Biocultural Diversity and Urban Biodiversity.

UNIT II   : Values of biodiversity

Instrumental/Utilitarian value and their categories, Direct use value; Indirect/ Non-consumptive use value, Introduction to Ecological Economics; Monetizing the value of Biodiversity; Intrinsic Value; Ethical and aesthetic values, Anthropocentrism, Biocentrism, Ecocentrism and Religions; Intellectual Value; Deep Ecology.

UNIT III   : Threats to biodiversity

Habitat Destruction, Fragmentation, Transformation, Degradation and Loss: Causes, Patterns and consequences on the Biodiversity of Major Land and Aquatic Systems Invasive Species' pathways, biological impacts on terrestrial and aquatic systems. Extinction: Types of Extinctions, Processes responsible for Species Extinction, Current and Future Extinction Rates, IUCN Threatened Categories, Sixth Extinction/Biological Crisis.

UNIT IV   : Introduction to conservation biology

The history and distinctions of conservation Biology, Emergence of Global Conservation (Developing and Developed Nations) strategies

In response to expanding anthropogenic demands, In response to global climate changes, Multidimensional aspects of conservation biology-*in situ, ex situ*, Biogeographic classification.

UNIT V   : Conservation challenges in the twenty first century:

Urbanisation; Creating knowledge society, Conflict management and decision making, Management of introduced species**.**

Evaluation of priorities for conservation of habitats and species

Selection criteria for protection of species – species quality, IUCN Guidelines for Red List categories and criteria (version 7.0), Red List of Indian Flora and Fauna, Selection criteria for protection of habitats – hotspots, Conservation indices.

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2. Krishnamurthy KV, (2003). Textbook of Biodiversity. Science Publication
3. Primack R, (2014). Essentials of Conservation Biology. Sinauer Associates, Inc., USA
4. Hambler C and SM Cannly, (2013). Conservation. Cambridge University Press.
5. Van Dyke F, (2008). Conservation Biology Foundations, Concepts, Applications 2nd Edition, Springer

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ENVIRONMENTAL ETHICS, LAW AND POLICY

OBJECTIVES

1. To learn the basic concepts of constitutional frame work of India with emphasis to Environmental protection
2. To understand the pollution control laws in India with respect air, water soil, wildlife and biodiversity
3. To develop and understanding about the powers of Government and Judiciary in Environmental Protection

UNIT I

Environment and Constitution of India – Environmental Legislature Machinery – Constitutional Status of Environment – Duty to Protect Environment – Role of Public Interest Litigation in Environmental Protection – Constitutional Justification – Ethics - Concepts - Ethical theories - consequential theory - deontological theory - virtue ethics - situation ethics - feminist ethics.

UNIT II

Laws on Water Pollution Control – Powers of Central and State Pollution Control Boards – Prevention and Control of Water Pollution – Judicial Restraint Order – Closure or Stoppage of Water and Electricity Supply – Citizen Suit Provision – Power of Central Government to Supersede the Central Board – Power of State Government to Supersede the State Board.

UNIT III

Laws on Air Pollution Control – Powers and Functions of Boards – Air Pollution Control Areas –Prohibition of Emissions of Air Pollutants – Judicial Restraint Order – Citizen Suit Provision – Offenses and Penalties.

UNIT IV

Legal Protection of Forests and Wild Life – The Forest Act 1927 – Constitutional Status – The Forest (Conservation) Act 1980 Application of Act to Union Territories – Hunting of Wild Animals – Sanctuaries or National Parks – Prohibition of Trade or Commerce in Wild Animals, Animal Articles – Offences and Penalties. Biodiversity Act and Rules.

UNIT V

Environment (Protection) Act 1986 – Powers of Central Government – Legal Regulation of Hazardous Substances – Hazardous Wastes (Management and Handling) Rules 1989 – The Natural Environment Tribunal Act 1995 – Legal Measures to Control Noise Pollution. EIA 1994 and 2006.

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2. Mohammad Naseem (2011) Environmental Law in India. Wolters Kluwer, The Netherlands
3. Shyam Divan and Armin Rosencranz (2001) Environmental Law and Policy in India: Cases, Materials, and Statutes , Oxford University Press
4. Singh RB and Mishra (1996) Environmental law in India – Issues and Responses Concept Publishing, New, Delhi
5. Tiwar AK (2006) Environmental law in India, Deep & Deep Publishing, New, Delhi

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CORE COURSE VII

WASTE MANAGEMENT AND REMEDIATION

OBJECTIVES

1. To provide information about various types wastes and waste characteristics.
2. To introduce about the waste management practices - collection and treatment of various types of wastes.
3. To impart knowledge on waste remediation and recycling processes.

UNIT I   : Introduction to waste and pollution

Wastes - Introduction, sources, collection, characteristics, composition, types of wastes – Global scenario of wastes - wastes generation per capita - Wastes collection, storage, segregation – disposal methods - sanitary land fillings.

UNIT II   : Municipal Solid wastes management

MSW – Sources, types, collection, transportation and disposal – Waste segregation, resource recovery, recovery of recyclable and non-recyclable wastes – reuse and recycling of MSW – Disposal – Incineration, pyrolysis, composing, aerobic and anaerobic digestion. Biomedical wastes – source, types, disposal principles.

UNIT III   : Hazardous Waste Management

Introduction, characteristics, sources – Types of hazardous wastes (industrial, hospital, domestic) – Handling of hazardous solid wastes – segregation and recovery – Disposal of hazardous wastes – Radioactive hazardous wastes – source, types, control, management and remediation.

UNIT IV   : Plastic and E-wastes

Plastic wastes - Sources, Facts and figures of plastic wastes in national and international level, environmental effects and control measures – E-wastes – sources, types, recovery, reuse – E-wastes pollutant chemicals - E-wastes Environmental impacts.

Unit V   : Remediation of Pollutants

Bioremediation - Description – Biostimulation, Gaseous nutrient stimulation organic liquid stimulation – Bio-augmentation – Limitations and Concerns – Biofertilizer technology – Bio composting techniques.

REFERENCES

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2. Singh J and Ramanathan AL, Solid Waste Management – Present and Future Challenges. I.K. International Publishing House. Pvt. Ltd.
3. Subash Anand, (2010). Solid Waste Management, Mittal Publication, New Delhi
4. Rakesh Johri, (2008). E-waste implications, regulations & Management in India and Current global best practices, TERI Press, New Delhi
5. John Pitchel, (2005). Waste Management Practices, Municipal, Hazardous, and Industrial. Taylor & Francis Group, LLC
6. Bhide and Sundaresan, (2000). Solid Waste Management in Developing Countries – Indian National Scientific Documentation Center, New Delhi
7. CPHEEO, (2010). Technical EIA Guidance Manual for Common Municipal Solid Waste Management Facilities
8. CPHEEO, (2000). Manual on Solid Waste Management
9. Hester RE and RM Harrison, (2009) Electronic Waste Management, Design Analysis & Application, RSC Publishing, UK

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2. http://www3.epa.gov/epawaste/nonhaz/municipal/
3. http://www.cpeo.org/techtree/ttdescript/pyrols.htm
4. www.satavic.org/vermicomposting.htm
5. http://web.mit.edu/urbanupgrading/urbanenvironment/sectors/solid-wastelandfills.html
6. www.cement.org/waste/wt_apps_radioactive.asp
7. www.ipma.co.in/recycle.asp
8. www.algae.info
9. http://www.epa.vic.gov.au/business-and-industry/lower-your-impact/~/media/Files/bus/EREP/docs/EREP-waste-management-seminar.pdf
10. http://www.tn.gov.in/dtp/publications/SWM/SWM_161to184.pdf
11. http://energy.gov/em/services/waste-management
12. https://www.unesco-ihe.org/online-course-solid-waste-management
13. http://www.bostonelectronicwaste.com/go-green/what-is-ewaste
14. http://www.ces.iisc.ernet.in/energy/paper/ewaste/ewaste.html
15. http://ec.europa.eu/environment/waste/plastic_waste.htm

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CORE COURSE VIII

ENERGY AND GREEN TECHNOLOGY

OBJECTIVES

1. To study the energy and its effects.
2. To understand the concepts of green technology composite on environment.
3. To study ecological economics and green energy management.

UNIT I

Types of energy: oil, natural gas, coal, solar, wind, their merits and demerits, (effect of price controls, cost benefit) and environmental perspectives - Renewable and non-renewable energy - The McCkelvey classification of energy resources. Commercial and non-commercial energy economic issues

UNIT II

New Energy Materials: Carbon nano-tubes (CNTs) and multiwall carbon nanotubes (MWCNTs) methods of production, properties and its utility in energy devices. Recent advances in new energy materials, concepts of Green Composites: Low Energy Approaches to Water Management. Management of Solid Wastes and Sewage. Urban Environment and Green Buildings.

UNIT III

Approaches from ecological economics; indicators of sustainability; ecosystem services and their sustainable use; bio-diversity; Indian perspective; alternate theories. environmental reporting and ISO 14001; climate change business and ISO 14064; green financing; financial initiative by UNEP; green techniques and methods, green energy management.

UNIT IV

Criteria for choosing appropriate green energy technologies, life cycle cost; the emerging trends –process/product innovation; Eco/green technologies for addressing the problems of water, energy, health, agriculture and biodiversity- WEHAB (eco-restoration/ phyto-remediation, ecological sanitation, renewable energy technologies, industrial ecology, agro ecology and other appropriate green technologies); design for sustainability (4Ds).

UNIT V

The inseparable linkages of life supporting systems, biodiversity and ecosystem services and their implications for sustainable development; future energy Systems- clean/green energy technologies; International agreements/conventions on energy and sustainability - United Nations Framework Convention on Climate Change (UNFCCC).

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9. Parry C Field, (2001). Natural Resource Economics, Mcraw Hill. Chapters 10 & 11
10. Wilson, R. & Jones, W. J., Energy, Ecology and the Environment, Academic Press Inc.

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ELECTIVE COURSE III

NATURAL RESOURCE MANAGEMENT

OBJECTIVES

This course will provide the students with the knowledge of natural resources, their types and their availability. The students will understand the environmental impact of overuse of these resources. The students will learn the importance of management of these resources and how to manage them.

UNIT I

Introduction to Natural Resource (Renewable & Non –renewable Resources) Bases: Concept of resource, classification of natural resources. Factors influencing resource availability, distribution and uses. Interrelationships among different types of natural resources. Concern on Productivity issues. Ecological, social and economic dimension of resource management.

UNIT II

Forest resources: forest vegetation, status and distribution, major forest types and their characteristics. Timber extraction, mining, dams and their effects on forest and tribal people, deforestation and forest management. Developing and developed world strategies for forestry. Land resources: Dry land, land use classification, land -degradation, man induced landslides, soil erosion and desertification. Landscape impact analysis, wetland ecology and management. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Water ecology and management. Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

UNIT III

Marine resources: Production, status, dependence on fish resource, unsustainable harvesting, issues and challenges for resource supply, new prospects. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Resource Management Paradigms. Resource conflicts: Resource extraction, access and control system. Approaches in Resource Management: Ecological approach; economic approach; Poverty and implications in Resource Management in developing countries .

UNIT IV

Management of Common International Resources: Ocean, climate, International fisheries and management commissions; Biological classification of India: Endangered and endemic species of India: Antarctica:

the evolution of an international resource management regime. Environmental Scenario in India, National Forest policy act in 1998.

UNIT V

Case Studies: Resource management in mountain ecosystem, Dry-land ecosystem**,** Management of marine and coastal resources**,** shifting cultivation**,** Mangrove ecosystem and their management

REFERENCES

1. Agarwal KC, (2001). Environmental Biology, Nidhi Publication Ltd. Bikaner
2. Chapin FS, Kofinas GP, Folke C, (2009). Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World. Springer; 1 edition. ISBN-10: 038773032X. ISBN-13: 978-0387730325
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11. Odum EP, (1971). Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
12. Townsend C, Harper J, and Michael Begon. Essentials of Ecology, Blackwell Science

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ELECTIVE COURSE IV

STATISTICAL AND COMPUTER APPLICATIONS IN ENVIRONMENTAL STUDIES

OBJECTIVES

1. To study the basics of statistics and information technology,
2. To understand the statistical and computer application in Environmental Studies.
3. To learn applications of computer, hard ware and software.

UNIT I

Introduction to Statistics: scope, limitations of statistics, statistical method and experimental method. Collection of data, sampling, classification and tabulation of data. Diagrammatic & graphic presentation of data. Information technology: Information Types, needs, data processing, computer network and Internet. Computer application in Environmental Studies.

UNIT II

Descriptive statistics – Introduction, measure of central location, mean, mode, median, measure of shapes. Properties of mean, measure of spread, variance and standard deviation, co-efficient of variation. Sampling theories and Hypothesis testing, techniques and experimental designs. Testing hypothesis: Significance level and X2 test, t and F test.

UNIT III

Correlation, regression and ANOVA: Analysis of variance: One way and two way ANOVA, MONOVA, Regressions: Defining the fit, Correlation, polynomial regression, multiple regression, P-Value.

UNIT IV

Introduction: History of Computer; character and organization – types and generation of computer. Hard ware and Software: Types of memory; primary (RAM, ROM, PROM, EPROM, EEPROM) and secondary (Floppy, hard disc, eband DVD), video terminal, OMR, OCR, Printers and scanners Operating system- Introduction; DOS: UNIX, Linux, M.S. Office.

UNIT V

Environmental Statistics & Computer Application - Tabulation of data. Graphical presentation of data; line graph, bar chart, cumulative bar chart, percentage bar, chart, pie chart and three dimensional graphs. Frequency analysis; Univariate and bivariate frequency tables. Calculation of mean, median and mode. Calculation of modal frequency; grouping table and analysis table. Testing and hypothesis; application of't' test. ANOVA:

application and problems. Calculation of correlation and regression. Data sheet and data management. Simple statistical work using Excel spread sheet.

REFERENCES

1. Bryan FJ, Manly, (2008). Statistics for Environmental Science and Management, Second Edition, ISBN 9781420061475.
2. Ford ED, (2000). Scientific methods for Ecological Research. Cambridge University Press, Cambridge
3. John Schuenemeyer, Larry Drew, (2011). Statistics for Earth and Environmental Scientists.
4. Rosner B, (1986), Fundamentals of Biostatistics, Duxbury Press, Boston
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6. Zar JH, (1984). Biostatistical Analysis. Prentice-hall, Inc Englewood Cliff, New Jersey

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ENVIRONMENTAL ANALYTICAL METHODS

OBJECTIVES

1. To explain fundamental principles for environmental analytical methods (titration, spectrophotometry, spectroscopy, chromatography, electro-chemistry, etc.)
2. To develop both the analytical toolsets and mindset for quantitative research.
3. To develop ability to acquire suitable analytical techniques for analyzing a specific compounds in an environmental matrix.

UNIT I   : Microscopy

Introduction to microscopy. Principles and applications of light, phase contrast, fluorescence, confocal, atomic force, scanning and transmission electron microscopy (SEM & TEM) -. Cytophotometry, fixation and staining.

UNIT II   : Biomolecular Separation Techniques

Centrifugation - Differential and Ultracentrifugation. Chromatography - Principles and applications of gel filtration, and Column Chromatography ion-exchange, Size exclusion and affinity chromatography. Paper and Thin Layer Chromatography, High Pressure Liquid Chromatography (HPLC).

UNIT III   : Bioanalytical Techniques

Titrimetry,   Gravimetry,   Colourimetry,   Flame   Photometry. Spectrophotometers – Fluorescence, Visible, UV and IR. NMR spectroscopy. AAS, ICPOES, ICPMS, Amino Acid analyzer, HPLC, GC, GC-MS, LC-MS, SELDI-TOF-MS, MALDI-TOF-MS and Bio-Sensors. Application of X-ray - fluorescence and diffraction.

UNIT IV   : Molecular Techniques

Electrophoresis   -   PAGE,   PFGE,   SDS-PAGE,   Agarose   gel, Immunoelectrophoresis, 2D electrophoresis - Gel documentation. Principle and applications of PCR, RT-PCR, RFLP, RAPD, AFLP and DNA fingerprinting. Principle and applications of DNA sequencing - Automated DNA sequencing, Gene silencing and Knock out- Microarray technique.

UNIT V   : Blotting and Tracer Techniques

Principles and techniques of Southern, Northern and Western blotting techniques and Hybridization. Principles and applications of radioactive isotopes, Autoradiography and Scintillation counter, Geiger Muller counter.

REFERENCES

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2. Debajyoti Das, (2001). Biophysics and Biophysical Chemistry, Academic Publishers Kolkata
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CORE COURSE X

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL AUDIT

OBJECTIVES

1. To understand about development projects and their impacts on Environment
2. To learn about the EIA practice in India and the legal framework in environmental clearance
3. To know about the EIA process and various steps involved in baseline studies, methods in assessment of environmental impacts and environmental management plan
4. To understand about environmental audit and the methods to carry out audit process

UNIT I   : Introduction to Environment and Development

Development Projects - Impacts on Environment -Long-term Impacts - Short-term Impacts – Reversible and Irreversible Impact **-** Sustainable Development – Role of EIA in Sustainable Development – Aim of EIA - EIA inputs to project planning - Benefits of EIA

UNIT II   : EIA Basics

Concept of EIA, Evolution of EIA, EIA practice in India, **EIA Notifications 1992, 1994, 1997 2009 of MoEF&CC, Coastal Regulation Zone Notifications**, Project Screening in EIA, Defining and Examining Scope, OBJECTIVESs and Alternatives in EIA Projects, Project Planning and processes, Baseline information, Impact prediction, decision making.

UNIT III

Types of EIA, Rapid ElA, Comprehensive EIA, Strategic EIA, Data Collection, Ecological Impacts, Environmental Impacts (Air, water, Land Noise), Socioeconomic and cultural Impacts, Health impacts, Prediction of Impacts; Methodologies, Cost Benefit analysis, Environmental Management Plan (EMP). Preparing and Writing of Environmental Impact Statements (EIS), Computer aided techniques, Reviewing EIA/EIS, Use of EIA in Public participation and decision making,

UNIT IV   : Introduction ISO14000 and Environmental Audit

ISO 14000 Organizational Standards -Environmental Management Systems (EMS) - Environmental Auditing (EA) - Environmental Performance Evaluation (EPE) – EMS overview: Environmental Policy Development – Plan, do, check act. Environmental Audit program development and management - EMS Audit program design - type and scope of audits - Program administration

UNIT V   : Audit Process

Pre-audit activities - On-site activities - Post site activities - Report and followup -Case Study Analysis - Audit Assessment. Auditor qualification, Auditing standards - Evaluating information - Internal reporting and communicating -External reporting and communicating

REFERENCES

1. AK Shrivastava, (2003). Environmental Impact Assessment, APH Publishing Corporation, New Delhi
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CORE PRACTICAL IV

ENVIRONMENTAL ANALYTICAL METHODS (P)

OBJECTIVES

1. Demonstrate insight into how to tackle practical analytical chemical problems
2. Demonstrate understanding of the basic theory and relevant parameters in analytical chemistry
3. Apply methods of instrumental chemical analysis to natural materials and (eco)systems
4. Demonstrate awareness of the limitations of the various methods
5. Report about experimental chemical analytical results and draw correct conclusions

PRACTICAL

1. Paper Chromatography
2. Thin-layer Chromatography
3. Gas Chromatography
4. Cell fractionation
5. Isolation of DNA from liver tissue
6. Electrophoresis
7. Isolation and estimation of chlorophyll by UV-spectrophotometry
8. Sample extraction methods: Liquid-liquid extraction (LLE), Solid phase extraction (SPE), Ultrasound assisted extraction (UAE), soxhlet extraction
9. Determination of pesticides in water samples using liquid liquid extraction

REFERENCES

1. Edited Helmut Gunzler and Alex Williams, (2001). Handbook of Analytical Techniques WILEY Germany
2. Roger N. Reeve, (2002). Introduction to Environmental Analysis. John Willey & Sons Ltd.

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INDUSTRIAL POLLUTION AND SAFETY MANAGEMENT

OBJECTIVES

1. Examine the relationship between work activities and their effect on the environment
2. Identify the main sources of man-made pollutants and examine their typical patterns of emission and distribution
3. Consider the technical and scientific control measures available to mitigate the impact of industrial emissions and discharges into the environment
4. Understand the different types of wastes generated in an industry, their effects on living and non-living things
5. Understand environmental regulatory legislations and standards and climate changes

UNIT I   : Tanneries and Distillary

Production of leather, vegetable tanning and chrome tanning processes. Sources and characteristics of wastes. Effect of tannery effluent and other wastes on receiving bodies and treatment methods of the wastes. Sugar mills and Distilleries - their manufacturing processes, sources and characteristics of their wastes. On receiving bodies, Treatment of their wastes and disposal.

UNIT II   : Paper and Pulp, and textile industries

Manufacturing processes, sources and characteristics of wastes. Effect of wastes. Treatment processes of the wastes. Textile mills - manufacturing processes, sources and characteristics of wastes. Effects of the wastes on receiving bodies. Treatment of the wastes.

UNIT III   : Cement and energy Industries

Manufacturing process, sources of pollution and wastes. Effect of wastes. Control technique of pollution. Oil refineries and thermal power plants-processes involved. Sources of pollution characteristics of pollutants and their effects. Pollution control techniques.

UNIT IV   : Fertilizer and pharmaceutical Industries

Manufacturing processes, sources and characteristics of wastes and their effects. Treatment processes pharmaceutical plants: manufacturing processes sources and characteristics of wastes and their effects. Treatment of wastes.

Unit V   : Safety Management and Industrial Acts

Industrial safety- Causes of accident, Accident reporting system, Accident prevention, Disaster planning, Safety committee. Hazards control- Elimination, Control, Isolation, Substitution, Personal protective equipment, medical first aid- management of medical emergencies.

Labour laws: factories act 1948, Mines act 1952, ESI act 1948- Health organizations: NIOH,AIIHPH, NHO,WTO.OSHA standards.
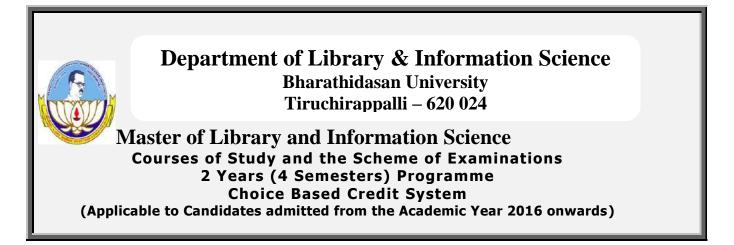
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3. Mahajan SP, (1986). Pollution Control in process industries. Tata McGraw Hill Co. Ltd., New Delhi
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7. Benjamin O Alli, (2008). Fundamental principles of Occupational Health and Safety, Second Edition, International Labour Office, Geneva
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9. Bill Walash and Lawrence Russel, (1974). ABC of industrial safety, Pitman Publishers, UK
10. Charles D. Reese, (2008). Occupational Health and Safety Management: A Practical Approach, CRC Press, USA
11. Herman Korean, Michael S Bises, (1996). Handbook of environmental health and safety, Principles and Practice, Lewis publishers
12. Paul A Erickson, (1996). Practical Guide to Occupational Health and Safety, Academic Press, USA
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CURRICULUM OF M.L.I.S
2016-17

MLISc. (Integrated Course) - Curriculum and Syllabi
(For candidates to be admitted from the academic year 2016-2017 onwards)

Semester- I	Paper	Inst. Hours	Exam Hours	Marks			Total
				Credit	Int.	Ext.	
P16MLS1	Core Course: 1.1 – Foundations of Library and Information Science	6	3	5	25	75	100
P16MLS2	Core Course: 1.2 – Knowledge Organisation- (Theory-1)	6	3	5	25	75	100
P16MLS3	Core Course: 1.3 – Information Resources	6	3	5	25	75	100
P16MLS4P	Core Course: 1.4 - Information Technology: Basics (Theory)	6	3	4	25	75	100
P16MLS5P	Core Course: 1.5 – Knowledge Organization-I (Practice): Classification DDC/CC	6	3	5	40	60	100
II P16MLS6	Core Course: 2.1 – Management of Library and Information Centres	6	3	5	25	75	100
P16MLS7	Core Course: 2.2 Knowledge Organization (Theory – II)	6	3	5	25	75	100
P16MLS8P	Core Course: 2.3 – Knowledge Organisation Practice – II (Cataloguing – AACR 2R, CCC)	6	3	4	40	60	100
P16MLS9	Core Course –2.4–Information Systems & Services (Theory)	6	3	5	25	75	100
P16MLS10P1 P16MLS10P2	Core course 2.5 - Elective I 1. Library Information Services (Practice) 2. Library Documentation and Administration (Practice)	6	3	4	40	60	100
III P16MLS11	Core Course: -3.1- Research Methods	6	3	5	25	75	100
P16MLS12	Core Course: 3.2 – Communication Skills and Public Relations	6	3	5	25	75	100
P16MLS13P	Core Course: 3.3 - Application of ICT (Practical)	6	3	4	40	60	100
P16MLSECA P16MLSECB	Elective: II 3.4 A. Marketing of information products and services B. Knowledge management	6	3	4	25	75	100
P16MLSECC P16MLSECD	EDC: 1 and 2 (3.5)	6	3	3	25	75	100
IV P16MLS14	Core Course: – 4.1 – Digital Libraries and Web Technology	6	3	5	25	75	100
P16MLS15	Core Course: 4.2 Project Dissertation = 80 Marks [2 Reviews – 20+20=40 Marks, Report Valuation = 40 Marks]-Viva= 20 Marks	12	-	5	-	-	100
P16MLS16P P16MLSECE P16MLSECF	Core Course: 4.3 Internship	-	-	4	-	-	100
	Elective III E. Informetrics F. User Studies	6	3	4	25	75	100
P16MLSECG P16MLSECH	Elective – IV G. Technical Writing H. Intellectual Property Rights	6	3	4	25	75	100
Total Credits				90			2000

Department of Library & Information Science
Bharathidasan University
Tiruchirappalli – 620 024

Master of Library and Information Science
Courses of Study and the Scheme of Examinations
2 Years (4 Semesters) Programme
Choice Based Credit System
(Applicable to Candidates admitted from the Academic Year 2016 onwards)

SEMESTER - I
Course –1.1: FOUNDATIONS OF LIBRARY AND INFORMATION SCIENCE –
Course Code:(P16MLS1)

Objectives:

- To enable the students to understand the concept of information characteristics and Information centres.
- To enable the students to understand the Communication Channels and barriers of
- communication.
- To enable the students to understand the concept of information science as a discipline.
- To enable the students to understand the importance of information in the context of social, political, cultural, economical and industrial environments.

Unit –I

Notion and nature of Information: Definition: data, information, knowledge and wisdom, characteristics of information; various patterns and models of information – factors influencing growth of information, information transfer cycle; Impact of socio-economic changes.

Unit –II

Communication: Concepts, definition, theories and model, channel of communication: Barriers of communication.

Unit – III

Library: Types, Five Laws of Library Science and their implications; Professional ethics of librarian; Role of Professional associations: National and International Levels– ILA, IASLIC, IATLIS, IFLA, ALA

Unit -IV

Library movement and legislation in India- Model Library Bill, Delivery of Books and Newspaper Act – Intellectual Property Rights – Information policy, Right to Information, Knowledge Commission.

Unit – V

> Promoters of Library and Information Services – UNESCO, RRRLF - Extension Activities: ICT enabled services to public – Evolution, growth and development of LIS Schools in India – Current Trends.

Unit-VI

> Forms of Mobile communication- Case Study

Selected Readings:

1.   Khanna, J.K. Library and Society. Kurushektra: Research Publication, 1987

2.   Atherton, .Pauline. Handbook of Information, system and services. Paris: UNESCO, 1977.

3.   Benge, R.C. Libraries and cultural change. London: Clive Bingley, 1983.

4.   Gravey, William. D. Communication: Essence of Science facilitating information exchange among libraries, Scientists, Engineers and students. Oxford: Perganton Press, 1979.

5.   McGarry, Kevin. Communication, Knowledge and Libraries. London: Clive Bingley, 1981.

6.   Ranganathan, S.R. Five Laws of Library Science. London: Vikas, 1957.

7.   Richerd E Rubin. Foundations of Library and Information Science. New York, NY: Neal-Schuman Publishers. 2004.

8.   UNESCO. National Libraries their problems and prospects. UNESCO Paris.1960.

9.   Murison (WA): Public Libray: Its origin and purposes & significance as social Institutions, London Harrap, 1953.

10.   White (Carl M) Ed. Basics of Modern Librarianship New York.

Course Outcome

1. Acquired the knowledge the concepts of information and characteristics of Information centers and its functions

2. Attained the types of Communication Channels and barriers of communication

3. Elaborate knowledge attains the concept of information science as a discipline.

4. Acquired necessary knowledge about the importance of information in the context of social, political, cultural, economical and industrial environments.

5. Acquired necessary knowledge about the importance of information in the context of social, political, cultural, economical and industrial environments.

6. Well known knowledge the importance and functions of Library associations in state level, national level and international level.

7. Well known knowledge the importance and functions of Library associations in state level, national level and international level.
8. Aware of the roles of professional association and its functions in LIS field

Course -1. 2   Knowledge Organization (Theory – I)

Course Code: P16MLS2

Objectives:
1. To enable students to understand the concept of knowledge organization.
2. To know the basic concepts of IPR
3. To understand the importance of various IPR systems and techniques
4. To enable students to asquint with different classification schemes, cataloguing codes and to know various standard bibliographic formats.

Unit - I
Universe of Subjects and Knowledge: Structure and attributes -Modes of formation of subjects
Unit - II
General theory of Library Classification: Normative Principles and their application. Canons and Facet Analysis
Unit – III
Standard schemes of Library classification: Introduction, Features and Application- CC, DDC, UDC and LC

Unit – IV
Cataloguing: Purpose, structure, types; normative principles, Canons & Laws; Standard codes of Cataloguing –CCC and AACR II
Unit – V
Subject cataloguing – subject heading lists-SLSH, LCSH. Bibliographic Control –ISBD (G) and UBC.

Unit-VI

Advancement study for LOC, Online DDC, CIP

Selected Readings:
1. Anglo-American Cataloguing Rules. (1988). 2nd rev. ed. Chicago: American Library Association.
2. Austin, D. (1984). PRECIS. A Manual of Concept Analysis. 2nd Ed.

London: British Library.

3. Austin, D. and Digger, J. (1985). PRECIS: The Preserved Context Index System. In: Chan, L.M., (ed.). Theory of Subject Analysis. Littleton Col.: Libraries Unlimited. pp. 369-89.

4. Bhattacharyya, G.(1981). Elements of POPSI. In: Rajan T.N., (ed.). Subject Indexing System. Calcutta:. IASLIC.

5. Chan, Lois Mai (1986). Library of Congress Subject Headings. 7th ed. Colorado: Libraries Unlimited.

6. Chan, Lois Mai (1994). Cataloguing and Classification: An Introduction. 2nd ed. New York : McGraw-Hill.

7. Chan, Lois Mai [et al.] (1996). Dewey Decimal Classification: A Practical Guide. 2nd ed. revision for DDC-21. Albany, New York: Forest Press/OCLC, pp. 1-24.

8. Coates, E.J. (1988). Subject Catalogues. London: Library Association.

9. Library Association. Comaromi, John P. and Satija, M.P. (1990). Exercises in the 20th Edition of the Dewey Decimal Classification. New Delhi: Sterling.

10. Foskett, A.C. (1996). The Subject Approach to Information. 5th ed. London : Library Association Publishing.

11. Hunter, E.J. and K.G.B. Bakewell. (1993). Cataloguing 2nd ed. London: Clive Bingley.

12. Hunter, Eric J. (2002). Classification made simple. 2nd edition. Aldershot: Ashgate.

13. Husain, Shabahat (1993). Library Classification: Facets and Analysis. New Delhi: Tata McGraw-Hill. pp. 272-277.

14. Kishan Kumar (1993). Theory of Cataloguing. New Delhi: Har-Anand.

15. Krishan Kumar (1988). Theory of Classification. 4th ed. New Delhi: Vikas Publishing.

16. Mcllwaine, I.C. (2000). The Universal Decimal Classification: a guide to its use. London: BSI Business Information.

17. Needham, C.D. (1977). Organizing Knowledge in Libraries: An Introduction to Information Retrieval. 2nd rev. ed. London: Andre Deutsch.

18. Parkhi, R.S. (1972). Library Classification, Evolution of a Dynamic Theory. New Delhi: Vikas Publishing House.

19. Raju A.A.N. (1991). UDC (IME, 1985): A Practical and Self Instructional Manual. Madras: T.R. Publications

20. Raju, A.A.N. (1984). Decimal, Universal Decimal and Colon Classification: A Study in Comparison. Delhi: Ajanta Publications.

21. Ranganathan, S. (1987). Colon Clasifi6ation. 7th ed. Edited by M.A. Gopinath. Bangalore Sarada Ranganathan Endowment for Library Science.

22. Ranganathan, S.R. (1962). Elements of Library Classification. 3rd ed. Bombay: Asia Publishing.

23. Ranganathan, S.R. (1989). Prolegomena to Library Classification. 3rd ed. Bangalore : Sarada Ranganathan Endowment for Library Science.

24. Ranganathan, S.R. (1992). Classified Catalogue Code with Additional Rules for Dictionary-Catalogue. 5th ed. reprint. Bangalore: Sarada Ranganathan Endowment for Library Science.

25. Rowley, Jennifer and Farrow, John (2000). Organizing knowledge. 3rd edition. Aldershot: Gower

26. Satija, M.P. and Comaromi, John P. (1998). Exercises in the 21st Edition of the Decimal Classification. New Delhi: Sterling.
27. Sen Gupta, B. (1974). Cataloguing: Its Theory and Practice. 3 rd ed. Calcutta: World Press. Viswanathan, C.G. (1983). Cataloguing Theory and Practice. 5th ed: Lucknow: Print House.
28. UDC: International Medium Edition - English Text (BS IOOOM: 1985). Londcn: British Standards Institution.
29. Universal Decimal Classification: Abridged Edition. (2003). London: BSI Business Information.
30. Wynar, Bohdhan, S. (1985). Introduction to Cataloguing and Classification. 7th Ed. Littleton, Colorado: Libraries Unlimited.

Course Outcome

1. Earned enough knowledge to enable and understand the concept of knowledge organization.

2. Learned the basic concepts of Knowledge Organization

3. To examined the importance of various KO systems and techniques

4. Analyzed elaborately the different classification schemes, cataloguing codes and to know various standard

5. Learned the skills about online classification theme

6. Attained the concept of cataloguing theory and necessary of in LIS field

7. Gained the knowledge of SLSH (Sears list of Headings)

8. Familiarized the knowledge of cataloguing of all documents

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Course - 1. 3: INFORMATION RESOURCES

Course Code: P14MLS3

Objectives:

1. To introduce various information sources
2. To enable the students to acquaint themselves with the various sources
3. To enable the students to evaluate and use the resources

Unit-I

Types of Information resources - Documentary - Non documentary - characteristics - Scope. Primary, Secondary and Tertiary sources; Human sources of Information - Invisible colleges.

Unit –II

Ready Reference Sources -Types and value - Dictionaries, Encyclopedias, Annuals, Biographical sources, Handbooks and Manuals, Geographical sources.

Unit-III

Bibliographical sources – Bibliographies, list of serials; Union Catalogues; – Indexing and abstracting sources, news summaries.

Unit –IV

Digital Resources: E-Books, E-Journals, Databases and ETD, – Subject Gateways; Web Portals

Unit-V

Evaluation of Information sources – Print Reference sources; Web Resources

Unit-VI

Recent trends on pattern Databases: India, Europe and US-ETDs -NDL Shodhganga, Protocols- PubMed.

Selected Readings:

1. Alan Poulter, Gwyneth Tseng and Goff Sargent: The Library and Information Professional's Guide to the World Wide Web. London : Facet Publishing, 1999.
2. Bangalore, 2000.
3. G. G. Chowdhruy and Sudatta Chowdhury : Searching CD-ROM and Online Information Sources. London : Facet Publishing, 2001.
4. G. G. Chowdhury and Sudatta Chowdhury. Information Sources and Searching on the World Wide Web. London : Facet Publishing, 2001.
5. Gopinath, M.A : Information Sources and Communication Media. DRTC Annual Seminar, Bangalore-1984 .
6. Grogan, Dennis: Science & Technology: An Introduction to Literature,   London, Clive Bingley,1982.
7. Kundan godia, Electronic Services in Library and Information Science,New Delhi, Adhyayan Publishing & Distributors,2007.
8. Jogender Singh Burman, Libraries and Reference Services, New Delhi, Rajat Publications, 2007.
9. Linda S Katz Library Users and Reference Services (Reference Librarian) Routledge (May 2013)
10. Higgens, Gavin. Printed Reference Meterials. London: Library Association,1980
11. Katz, W.A : Introduction to Reference Work, ,London, Butterworths,2000, 2V.

12. Madan Mohan Sinha Use of New Technology in Library Reference Services,

    Anmol Publications (2012), New Delhi

13. S. K. Bajpai Reference Services In Libraries, Friends Publications (2008), New

    Delhi.

Course Outcome

1. Capabilities of known the types of availability resources for academic, R& D and other kinds of users

2. Discussed and introduced the various information sources and how to retrieved

3. Learned the knowledge about types of sources and how to utilize for user community

4. Learned elaborate knowledge to evaluate and use the resources

5. Learned the enough knowledge about computer hardware and software

6. Familiarized the reference service sources

7. Known well aware about the web resources for the self and user services

8. Learned the knowledge of all kind resources available in print and electronic form

Course - 1. 4: INFORMATION TECHNOLOGY: BASICS (THEORY & PRACTICE)

Course Code: P16MLS4P
Objectives:

1. To know the basic concepts of Information technology
2. To train the students in applying Information technology in Libraries and information centers.
3. To understand the concepts of networking and web technology.

Unit -I

Information Technology: Concept, Definition and Components, Types of Computer, CPU, Storage, I/O Devices, Client-Server architecture: LAN and WAN.

Unit -II

Data representation in Computers: Binary Number System, Character encoding standards – ASCII, ISCII and UNICODE. Protocols: Information Transfer Protocols.

Unit –III

Computer Software: System Software and Application Software; Programming Concepts: Open source and Propriety, Operating Systems: Windows, LINUX, UNIX. Android and Java.

Unit –IV

File organization: Database Management System; File Format

Unit –V

Office Management: Word processing, Spreadsheet, Presentation Software. Database (MS-Access)

Unit-VI

Recent trends in Database Management in Libraries, Latest development of Mobile Apps in Libraries

Practice: Use of operating systems, Word Processor, Spread Sheets; Database Creation using at least one DBMS Software.

Selected Readings:

1. Arvind Kumar. Ed. Information Technology For All (2 Vols.) New Delhi, Anmol, 2006.
2. Bansal, S.K. Information Technology and Globalisation, New Delhi: A.P.H. Publishing corporation, 2005.
3. Basandra, S.K: Computers Today and Globalisation, New Delhi, Golgotia, 2002.
4. Deeson, Eric. Managing with Information Technology, Great Britan, Kogan page Ltd. 2000.
5. Forrester W.H. and Rowlands, J.L. The Online searcher's companion. London, Library Association, 2002.
6. Gupta, Vikas, Rapidix computer course, New Delhi, Pustak Mahal, 2005.
7. Hunter & Shelly: Computers and Common sense, New Delhi, Prentice-Hall, 2002.
8. Kashyap, M.M: Database Systems, New Delhi, Vikas, 2003.
9. ITL Education Solution. Introduction to Information Technology, Pearson Education. Singapore, 2006. (Google E-Book)
10. Rajaraman, V. Introduction to Information Technology, PHI Learning, New Delhi, 2013. (Google E-Books)

Course Outcome

1. Analyzed the basic concepts of Information technology

2. Learned deep analysis how applying Information technology in Libraries and information centers services

3. Discussed the concepts of networking and web technology.

4. Learned the basic knowledge of Microsoft and know how to implement in our LIS functions

5. Learned the enough knowledge about computer hardware and software

6. Familiarized the file organization and its concepts

7. Attain full trained about retrieved information from various databases

8. Expert to know the software and hardware for integrating LIS fields

Course- 1.5: KNOWLEDGE ORGANIZATION - I: Classification Practice
Course Code: P16MLS5P

Objective:

To make the students familiar in classification of subjects of library documents and assigning the call number using CC and DDC

Exercise

Classification of Books and periodicals according to CC (6th Edition)

Classification of Books and periodicals according to DDC (Available Edition)

Selected Readings:

1. Mitchell, Joan S (2003). Dewey Decimal Classification and Relative Index. 22nd ed. 4 Vol. New York: Forest Press.
2. Comaromi, John P (1989). Dewey Decimal Classification and Relative Index. 20th ed. 4 Vol. New York: Forest Press.
3. Custer, Benjamin A. (1979). Dewey Decimal Classification and Relative Index. 19th ed. 3 Vol. New York: Forest Press.
4. Comaromi, John P. and Satija, M.P. (1990). Exercises in the 20th Edition of the Dewey Decimal Classification. New Delhi: Sterling.
5. Kumar, P S G (2003).Knowledge Organization: Information Processing and Retrieval Practice. New Delhi: B.R Publishing
6. Satija, M.P. and Comaromi, John P. (1998). Exercises in the 21st Edition of the Decimal Classification. New Delhi: Sterling.
7. Ranganathan, S. R (1963). Colon Clasifi6ation. 6th ed. Bangalore: Sarada Ranganathan Endowment for Library Science.
8. Sachdev, Mohan Singh (1983).Colon Classification; Theory and Practice. NewDelhi: Sterling
9. Khanna,J K(1982).Colon Classification; Theory and Practice. New Delhi: Ess Ess
10. Chan, Lois Mai [et al.] (1996). Dewey Decimal Classification: A Practical Guide. 2nd ed. revision for DDC-21. Albany, New York: Forest Press.

Course Outcomes

1. Familiar in how classified the documents using different classification of subjects of library documents and assigning the call number using CC and DDC

2. Aware about the analysis the classification rules and apply for relevant principles

3. Make them individually eligible to classify document by subject based on classification

4. Earned enough knowledge to how classify the library documents used through internet

5. Attained the skills of classified to any kind of document through Colon Classification, Dewey Decimal Classification and Universal decimal classifican

6. Learned how to get support from online for classifying the documents

7. Learned skills how to organized the documents after classifying

8. Learned skills for classifying all documents including non book materials

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SECOND SEMESTER

Course - 2.1: Management of Library and Information Centres
Course Code: P16MLS6

Objectives:

      1. To know the concept of management and its evolution
      2. To understand the various managerial operations of LICs
      3. To apply the relevant management techniques in modern LICs

Unit - I

Management: Concept, Definition, scope, principles and functions of Management; Schools of Management Thought; Systems Analysis and Design

Unit- II

Planning and planning strategies: Library Planning - Concept, definition, need, types and steps in planning – MBO.

Unit-III

Human Resource Management: Concept, Need, Purpose and Functions; Job description and Job analysis – Selection, Recruitment, Training and Development, Leadership – Team building – Motivation and Decision Making; Total Quality Management.

Unit-IV

Financial Management: Planning and Control – Resource generation. Budget and Budgetary control techniques – Cost Effective and Cost Benefit analysis in Libraries.

Unit-V

Resource Management: Collection development – Policy, Issues; Library routines, Circulation, Maintenance Preservation and conservation - Evaluation.

Unit-VI

Case Study- BDU, NIT, IIM, St Joseph College (Acquisition, Circulation, Periodicals and Technical Processing

Selected Readings:

1. Bakewell, K. G. B. Library and information services for management London : Clive Bingley, 1968.
2. Brophy, Peter and Courling Kote. Quality Management for Information and Library Managers. Bombay: Jaico, 1997.
3. Bryson, J.O. Effective Library and Information Management. Bombay: Jaico, 1996.
4. Dutta, D N.Manual of library management, Calcutta The World Press Private Ltd. 1978.
5. Gajbhiye, Rishi S., and Sapnarani S. Ramteke. "Management of Library and Information Centres." (2013).
6. Kumar P.S.G. Management of Library and Information Centres.Delhi: B. R. Publishing corporation, 2003.
7. Lowell, Mildred Hawksworth, The management of libraries and information centres, New Jersey: The Scarecrow Press, Inc., 1968.

8. Mittal, R.L Library Administration: Theory and Practice. New Delhi: S.S Publication, 2007.
9. Mookerjee, Subodh Kumar Library organisation and library administration, Calcutta: The world press private ltd. 1972.
10. Narayana, G. J. Library and information management. New Delhi : Prentice-Hall of india, 1991.
11. Paliwal, P.K. Compendium of Library Administration. New Delhi: Ess Ess, 2000.
12. Panwar, B. S; Vyas, S. D. Library management, Delhi : B. R. Publisher, 1986.
13. Ranganathan, S. R. Library Administration. ESS Publications, 2006.
14. Sharma, Lokesh. Library management, New Delhi : Shri Sai Printographers, 2003.
15. Siwatch, Ajit Singh. Library Management: Leadership style strategies and organizational climate. New Delhi: Shree, 2004.
16. Stuert, Robert D. and Moran, Barbara B. Library and Information Center Management. Colorado: Libraries unlimited, 2004.

Course Outcomes

1. Discussed the concept of management and its evolution

2. Discussed the various managerial operations of LICs

3. Learned knowledge how to apply the relevant management techniques in modern LICs

4. Learned the basic concepts of management and schools of management thoughts

5. Known the criteria's for total quality management and decision making skills attain the knowledge about financial management skills for maintaining the libraries

6. Attain the knowledge about financial management skills for maintaining the libraries

7. Learned the skill of material management related to LIS field

8. Acquired the skills for maintaining the all functions for different types of libraries

Course - 2.2   Knowledge Organization (Theory – II)
Course Code: P16MLS7

Objectives:
1. To enable the students to familiarize with various Metadata Standards,Digital Object

identifiers and Mark up languages.
2. To familiarize with various indexing systems
3. To develop skills of information search strategies
4. To know the information retrieval models

Unit –I

Information Retrieval System – concepts – Tools and Techniques; Models

Unit – II

Indexing systems – General Theory of Indexing languages. Indexing: Pre coordination and Post coordination, Keyword Indexing, Evaluation of Indexing System, thesaurus and vocabulary control; Web Indexing

Unit-III

Organization of digital resources – Metadata standards – Dublin core, MARC21, ISO 2709, UNIMARC, CCF and DOI (Digital Object identifier)

Unit- IV

Query formulation - search process; Search Techniques and strategies in Web of Science, Scopus, BLAISE, INSPEC, MEDLINE.

Unit -V

Evaluation of Information Retrieval Systems: Purpose – Criteria; Recall and Precision and steps in evaluation – Major Evaluation Studies – MEDLARS and SMART Retrieval.

Unit-VI

Recent Trends on Information retrieval on Databases and Search engines techniques

Selected Readings:

1. Aitchison, J. (1970). The Thesaurofacet: A Multipurpose Retrieval Language Tool. Journal of Documentation. 26; 187-203
2. Aitchison, J. and Gilchrist, A. (1987). Thesaurus Construction: A Practical Manual. 2nd ed. London : ASLIB. Aldershot: Gower
3. Atchison, Jean & Gilchrist, Alan. Thesaurus construction: a practical manual. London: Aslib. 1972.
4. Austin, D. Precis, A manual of concept analysis and subject indexing. 2nd ed. 1984.
5. B. C. Vickery. Techniques of information retrieval. London: Butterworths, 1970.
6. Bikowitz.,W R. Knowledge Management. Delhi: PHI, 2000.
7. Brown, A.G. (1982). Introduction to Subject Indexing. 2nd ed. London: Clive Bingley.
8. Cataloging Electronic Resources: Olson manual. http://www.library.cornell.edu/ tsmanual/CIRM/Intro.html
9. Chakraborty, A.R. and Chakraborty, Bhubaneswar (1984), Indexing : Principles, Processes and Products. Calcutta: World Press.
10. Chowdhruy, G G. Introduction to Modern Information Retrieval. 2nd edn. London, Facet Publishing, 2003.
11. Chowdhury, G.G. (2004). Introduction to modern information retrieval. 2nd Ed. London: Facet Publishing.
12. Chowdhury, G.G. and Chowdhury, S. (2001). Information sources and searching on the World Wide Web. London: Library Association Publishing.
13. Chowdhury, G.G. and Chowdhury, S. (2001). Searching CD-ROM and online information sources. London: Library Association Publishing.
14. Hunter, Eric J. (1985). Computerized Cataloguing. London: Clive Bingley.

15. Lancaster, F. W. (1985). Vocabulary Control for Information Retrieval. 2nd ed. Arlington, Va. : Information Resources Press.
16. Lancaster, F.W. (2003). Indexing and abstracting in theory and practice. 3rd ed. London: Facet Publishing.
17. Machine-Readable Bibliographic Information Committee (MARBI). (1996). The MARC21 formats: background and principles. Revised. http://www.loc.gov/marc/ 96principl.html#one
18. MARC21 formats: background and principles. http://lcweb.loc.gov/marc/ 96principl.html
19. Rowley, Jennifer E. (1998). Abstracting and Indexing. 2nd ed. London: Clive Bingley.
20. Sarkhel, J.K. (2001). Information analysis in theory and practice. Kolkata: Classique Books.
21. Soergel, D. (1974). Indexing Language and Thesauri: Construction and Maintenance. Los Angeles, California Melville Publishing.

Course Outcomes

1. Familiarize with various Metadata Standards, and web 2.0

2. Discussed the Digital Object identifiers and Mark up languages

3. Familiarize deep knowledge with various indexing systems

4. Learned the develop skills of information search strategies how to implement the library services.

5. Emphasized the types of information retrieval models

6. Learned the knowledge of indexing systems and thesaurus and vocabulary control

7. Learned the knowledge of digital resource organization

8. Attained the knowledge of indexing and classifying the library materials

Course - 2.3 Knowledge Organization Practice - II: (Cataloguing – AACR-II and CCC)

Course Code: P16MLS8P
Objective:

- To enable the students to classify and catalogue the library documents using DDC, CC and AACR-2R

Exercise

1. Classification of Books and Periodicals according to DDC and CC

2. Cataloguing of Documents: Print and Non-Print using AACR-2R

Selected Readings:

1. Anglo-American Cataloguing Rules. (1988). 2nd rev. ed. Chicago: American Library Association
2. Barry, Chris, et al. "Information Systems Development: Challenges in Practice, Theory, and Education Volume 2." (2010).
   Lal, C and Kumar, K. Practical Cataloguing AACR-2. ESS Publications, New Delhi. 2006.
3. Mcllwaine, I.C. (2000). The Universal Decimal Classification: a guide to its use. London: BSI Business Information.
4. Raju A.A.N. (1991). UDC (IME, 1985): A Practical and Self Instructional Manual. Madras: T.R. Publications
5. UDC: International Medium Edition - English Text (BS IOOOM: 1985). London: British Standards Institution.
6. Universal Decimal Classification: Abridged Edition. (2003). London: BSI Business Information.

Course Outcome

1. Elaborate discussion how to do Classification and Cataloguing using UDC

2. Learnt the knowledge how to Classification of Books and Periodicals according to UDC (Standard Edition)

3. Attained the elaborate knowledge how to Cataloguing of library Documents, Print and Non-Print sources using through AACR-II

4. Elaborate discussion how to do Classification and Cataloguing using AACR II

5. Attained the knowledge of classifying the documents using Colon Classification Schemes

6. Learnt the knowledge of information organization on traditional and digital environment

7. Attain the capabilities for retrieving classification system from web resources

8. Learnt the skills of making classify based on different classification scheme

Course - 2.4   Information Systems and Services (Theory)
Course Code:P16MLS9

Objectives:
1. To know the various information systems and their functioning.
2. To train the students on various Library and Information services in different library environments.

Unit-I

Information systems: Concept, purpose, types and levels: Open, Closed, Local, national and International.

Unit –II

Information Services; Reference Service, Information Alert, News Clippings, CAS, SDI, Abstracting and Indexing Services.

Unit-III

Digital Information Services; Institutional Repository, Web OPAC, EDDS, Citation and Indexing Services; Digital Reference Services

Unit –IV

Global Information System: UNISIST -AGRIS – INIS- ENVIS. National Information Systems; NISCAIR, DESIDOC, NASSDOC

Unit – V

Library consortia: National and International; Library Networks: National and International

Unit-VI

Recent Trends case study activities on Documentation services- J-gate- Indian science Abstract- Dissertation Abstract-Mail forum-Online Information Display-Display through Library Websites.

Selected Readings:

1. Atherton, P. Handbook of Information Systems and Services, 1977.
2. Burch, J.C. and Stretev, F.R. Information Systems: Theory and Practice, 1974.
3. Choudhary, G. G. and Choudhary, S. Searching CD-ROM and online information sources, 2001
4. Colin, H. Ed. Management Information Systems in Libraries and Information Services. London: Tayler Graham, 1989.
5. Fourie, D. and Dowell, D. Libraries in the information age. New York, Libraries unlimited, 2002
6. Guha, B. Information and Documentation. Calcutta: World Press, 1983.
7. Gupta, B.M. et.al. Handbook of Libraries, Archives, Information Centres in India. New Delhi, Aditya Prakashan, 1991. Related volumes
8. Gurdev Singh Information Sources Services and Systems PHI, New Delhi, 2013
9. Kochtanek, Thomas R. and Mathews, Joseph R. Library and Information Systems: From Library automation to distributed information access solutions. West port: Libraries unlimited, 2004.
10. Prashant Kaushik Library Information Services and Systems   Anmol Publisher, New Delhi, 2006,
11. Sewa Singh. Handbook of International sources on reference and information, 2001
12. Sherman, C. and Price, G. The invisible web: uncovering Information Sources Search engines can't see. 2001.
13. Singh, Gurdev. Information Sources, Services and Systems. PHI Learning Pvt. Ltd., 2013.
14. U.S. Jadhav and Suresh Jange Library and Information Sources and Services Regency Publications A Divison of Astral International (P) Ltd. New Delhi, 2013

Course Outcomes

1. Elaborated analysis to various information systems and their functioning.

2. Attain the knowledge how to teach and train on the various Library and Information services in different library

3. Discussed the national and international information systems and services in library

4. Discussed to get idea about consortia in different levels and different areas.

5. Attained the knowledge on various sources and services provided by library

6. Discussed elaborately the Digital Information Services; Institutional Repository, Web OPAC, Online DDS, Citation and

7. Attained the knowledge of Library consortia-India; UGC-INFONET, INDEST, N-LIST;

8. Aware the knowledge of Library Networks: INFLIBNET, DELNET, ERNET.

Course - 2.5: Elective – I:

(A) Library Information Services (Practice)
Course Code:P16MLS10P1

Objectives
- To make familiar with Library routine works and Information Services
- To enable the students to learn to provide Conventional and ICT enabled library services.

Exercise

Information Analysis and consolidation, Documentation, Indexing and Abstracting Literature Search, Current Awareness, Reference Services

Library Routines; Acquisition, Technical, Circulation, Maintenance, Serials

Digitization; Question Paper, News paper Clippings

Web Based Information Services, Citation based Service

Course Outcomes

1. Revealed the information how to maintain library practices and Library routine works and Information Services

2. Analyzed how to provide Conventional and ICT enabled library services.

3. Awareness how to create information literacy, library marketing and library practice

4. Awareness, Reference Services

5. Attain full knowledge on Library Routines; Acquisition, Technical, Circulation, Maintenance

6. Learned the Digitalization; Question Paper, News paper Clippings

7. Learned the skills to make digital preservation on library documents
8. Acquired knowledge of the methods of digitization and preservation of print and electronic sources

(B) Library Documentation and Administration (Practice) - Course Code:P16MLS10P2

Objectives
  ➢ To get the students familiarized with the process of Library documentation
  ➢ To enable the students to administer the documents.

Exercise

Creation and maintenance of Accession Register, Periodicals Register and Circulation Register.

Creation and maintenance of digital records

Compilation of Bibliography; Referencing and citation Pattern,

Course Outcome

1. Revealed the information how to maintain library documents practices and Library routine works and Information Services

2. Analyzed how to provide Conventional and ICT enabled library administration

3. Awareness how to create information literacy, library marketing and library practice

4. Awareness Library Administration Services

5. Attain full knowledge on Library Routines; Acquisition, Technical, Circulation, Maintenance

6. Learned the Digitalization; Question Paper, News paper Clippings

7. Learned the skills to make digital preservation on library documents
8. Acquired knowledge of the methods of digitization and preservation of print and electronic sources

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SEMESTER - III

Course - 3.1: RESEARCH METHODS AND TECHNIQUES
Course Code:P16MLS11

Objectives:
1. To know the basic concepts of research, their types, planning and methods
2. To understand the methods and tools of collection of research data.
3. To teach on research tools and techniques in analyze and reporting.

Unit-I

Research Methods: Definition, Concepts, Purposes and Types; Selection and Formulation of Research Problems.

Unit-II

Research Design: Definition, Need, Types ; Sampling: Types and Techniques ; Hypothesis: Definition, Types, Formulation and Testing.

Unit-III

Methods and tools of data collection: Survey, Experimental, Case-study, Questionnaire, Observation, Interview schedules. Delphi Technique.

Unit-IV

Analysis of Data: Measures and Scaling Techniques, Presentation of data, Interpretation, Inferences,

Unit –V

Report Writing: Components of Research Report; Style manuals

Unit-VI

Case studies-Survey-Information Needs: E-resources usage; Research profile compilation- Library website evaluation

Selected Readings:

1. Busha, Charles, H. and Harter, Stephen, S. Research Methods in Librarianship. Techniques and Interpretation. Orlando, Academic press, 1980.
2. Charles, H. et.al. Research Methods in Librarianship: Techniques and Interpretations. New Delhi, Sage, 1993.
3. Goode.W.J & Hatt.P.K. Method of Social Research. McGraw Hill. Auckland, 1989
4. Kothari.C.R.. Research methodology: Ed2 Wishwa. New Delhi, 1990.
5. Krishna Kumar: Research methods in library in Social science. Vikas, New Delhi, 1992
6. Krishna Swamy, O.R. Methodology of research in social sciences. Himalaya, Bombay, 1993
7. Line,Maurice.B. Library surveys; An introduction to the use, planning procedure and presentation of survey. Ed2 Clive Bingley, London, 1982:.
8. Ravichandra Roa, I.K. Quantitative methods in library and information science, Wiley Eastern. New Delhi, 1988.
9. Slatter,Margaret, Ed. Research ,methods in library and information science. London, L.A, 1990.
10. Stevens, Rolland.E. Research methods in librarianship, Clive Bingley, London, 1971.

11. Tabuer, M.F and Stephens, I.R. Ed. Library surveys. Columbia University Press, New York, 1968.
12. Wilson, E.S. Introduction to scientific research McGraw Hill, New Delhi, 1952.
13. Young,P.V.Scientific social surveys and research. Ed4. Prentice Hall of India, New Delhi, 1982
14. John W. Creswell. Research Design: Qualitative, and Mixed methods Approaches. Sage Publications, 2013.
15. Ranjit Kumar. Research Methodology: a step-by-step guide for beginners. 2014. (Google E-Books)

Course Outcomes

1. Learnt depth in the basic concepts of research, types, planning and methods

2. Examined the methods and tools how to collect the research data.

3. Learnt the knowledge of kinds of research tools and techniques for analyze and reporting.

4. Learnt the knowledge of the techniques of various data collection methods from population

5. Learnt to Wright the research report and using knowledge to check the plagiarism

6. Attained the knowledge for applying technical tools to data analysis and interpretation

7. Learnt knowledge about writing the research article or paper

8. Acquired the knowledge of different types of sampling and methodology

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Course – 3.2:   COMMUNICATION SKILLS AND PUBLIC RELATIONS – Course Code:P16MLS12

Objectives:

1. To teach the concepts of Public Relations in LIS environment and develop communication skills.
2. To enable the students to learn technical writing and reporting methods.

Unit –I

Communication skills: Concept, elements, types and stages.

Unit- II

Verbal Communication: Concept, Techniques, Writing skills and tools; preparation and presentation of a project proposal.

Unit-III

Non-verbal communication; Body language. Posture, Kinesics, Gesture, Haptics, Paralanguage

Unit – IV

Personality development: Stress management, Time management and crisis management.

Unit-V

Public Relations; Concept, Meetings and Negotiation-strategies.

Unit-VI

Case Study- Visiting the English Language Lab at BDU

Selected Readings:

1. Andy Green, Effective Communication Skills for Public Relations (PR in Practice) , Kogan Page Business Books (December 2005).
2. http://persmin.gov.in/otraining/UNDPProject/undp_modules/PublicRelationsNDLM.pdf
3. http://heidicohen.com/public-relations-definition/
4. http://managementhelp.org/organizationalcommunications/internal.htm
5. http://www.pria.com.au/sitebuilder/forms/forms/file/34-174/Melanie%20James%20article%20Asia%20Pacific%20PR%20Journal.pdf
6. http://www.elon.edu/docs/e-web/academics/communications/research/02MatthewsEJSpring10.pdf
7. Information and Communication for Development: Global Trends and Policies, Washington: World Bank, 2006
8. Mahalanobis, Parvati, Text book of Public Relations and Corporate Communications, Dominant Publishers, New Delhi, 2005
9. Krishna Mohan, Developing Communication Skills Macmillan Publishers India; Second edition (2009)
10. Shah, Vimal P, Development Communications and Change: Impact Study, Prentice- Hall, 2006
11. McGrath, E H, Basic Managerial Skills for All, Prentice-Hall, New Delhi, 1996
12. Sharma, Diwakar, Public Relations, Deep & Deep, New Delhi, 2004
13. Nirmal, Bhatnagar, Public Relations: an emerging specialized profession, Deep & Deep, New Delhi, 2004
14. Sanjay Kumar Communication Skills Oxford University Press, 2011

Course Outcomes

1. Learnt importance the concepts of Public Relations in LIS environment and how to develop the communication skills.

2. Examined elaborately how to write report technically in different methods.
3. Attain the knowledge of Communication skills: Concept, elements, types and stages.
4. Discussed about Verbal Communication: Concept, Techniques, Writing skills and tools; preparation and presentation of a project proposal.
5. Learnt about Non-verbal communication; Body language. Posture, Kinesics, Gesture, Haptics, Paralanguage
6. Known depth in Personality development, Time management and crisis management.
7. Learnt the knowledge of Public Relations; Concept, Meetings and Negotiation-strategies.
8. Gained the knowledge of stress management and been in haselfre

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Course - 3.3   APPLICATION OF ICT: PRACTICE

Course Code:P16MLS13P

Objectives: To make familiar the various ICT practices applied in Library services.

Hands-on experience with the following Software's:

1: Library Automation Software's: WINISIS, LIBSYS, KOHA

2: Digital Library Software's: Greenstone and Dspace

3: Web Technologies: Weblog; Website; Mobile Applications

Course Outcomes

1. Examined how to make familiar the various ICT practices applied in Library services

2. Attain skills know about various Library Automation Software's: WINISIS, LIBSYS, KOHA and how to implement for library functions

3. Analyzed the knowledge of Open source Digital Library Software's: Greenstone and Dspace

4. Learnt about the knowledge of Web Technologies and how to create for library website and personal web blogs

5. Known the knowledge of creating Weblog; Website; Mobile Applications

6. Got well trained on Web Technologies: Weblog; Website; Mobile Applications

7. Learnt depth knowledge on Digital Library Software's: Greenstone and Dspace

8. Acquired the knowledge of creating institutional repositories for library as well as personal

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Course - 3.4: Elective-I:

(A) MARKETING OF INFORMATION PRODUCTS AND SERVICES

Course Code:P16MLSECA

Objectives:
1. To know the basics of marketing, principles and models of marketing.
2. To teach the marketing strategies of information products and services

Unit-I

Information as a Resource: Economics of Information; Marketing concepts and Marketing Strategies

Unit-II

Portfolio Management BCG Matrix Model; Product Market Matrix; Product Life Cycle, Pricing Information

Unit-III

Marketing Mix; Kotler's Four C's; McCarthy's Four P's

Unit-IV

Marketing Plan & Research: Market Segmentation, User Behavior and Adoption

Unit-V

Marketing of Library Information products and services. Role of Information Industries.

Unit-VI

Case Studies-IIM Library Trichy- NIT Library Trichy- IIT Library Chennai- Publication Division ,Ministry of Information & Broadcasting Government of India

Selected Readings:

1. Chandraiah, I., Lincolin and Diana Shotton. Introduction to Marketing of Library and Information Services, New Delhi: Manglam Publications, 2009.
2. Beth C. Thomsett-Scott (Ed) Marketing with Social Media. Chicago: ALA Techsource, 2014.
3. Dinesh K. Gupta, Christie Koontz, Angels Massisimo, & Réjean Savard (Eds.)Marketing library and information services: International perspectives. Munich: K.G. Saur, 2006.
4. Eisner, J, ed. Beyond PR: Marketing for libraries. A Library Journal Special Report, 1981.

5. Anderson A R. Advancing library marketing. Journal of Library Administration. 1(3), 1980, pp. 17 – 32.
6. Anderson, W. T. Jr., Bentley, C. C. and Sharpe, L K IV. Multi-dimensional marketing: Managerial, societal, philosophical. Austin TX: Austin Press 1976.
7. Bellardo, T. and Waldhart, T J. Marketing products and services in academic libraries, Libri. 27(3), 1977. pp. 181 – 194.
8. Berry J. The test of the marketplace. Library Journal. 104. Sept. 1979. pp. 1605.
9. Dragon, A C. Marketing the library. Wilson library bulletin. 53, 1979, pp. 498 – 500.

Course Outcomes

1. Discussed the basics of marketing, principles and models of marketing.

2. Learnt the marketing strategies of information products and services

3. Discussed on Information as a Resource: Economics of Information; Marketing concepts and Marketing Strategies

4. Learnt about the Portfolio Management BCG Matrix Model; Product Market Matrix; Product Life Cycle, Pricing Information

5. Gained the knowledge of Marketing Mix; Kotler's Four C's; McCarthy's Four P's

6. Analyzed in depth of Marketing Plan & Research: Market Segmentation, User Behavior and Adoption

7. Known the knowledge of Marketing of Library Information products and services. Role of Information Industries

8. Attained the skills of information products and marketing based on user demands

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(B) Knowledge Management
Course Code: P16MLSECC

Objectives:
> To know the concepts and types of knowledge management.
> To familiar the knowledge management practices and process in libraries.

Unit –I

> Knowledge Management: Concept and definitions – Need, Types; explicit and tacit Knowledge.

Unit-II

> Knowledge creation and capturing: Knowledge creation model – Capturing tacit knowledge

Unit –III

Knowledge codification and organization: Knowledge mapping, decision trees, decision tables.

Unit - IV

Knowledge Management Tools and techniques: Portal, e-learning, Community of Practice, Storytelling.

Unit –V

Case studies – Corporate and Special Libraries

Unit-VI

Case studies- Emerald Management Extra-Fortune 500 companies- Library visits

Selected Readings:

1. Michael, E.D. Koenig,Knowledge Management Lessons Learned, New Delhi, Ess Ess Publications,2008
2. Al-Hawamdeh, Suliman (2003). Knowledge Management : cultivating knowledge professionals. Oxford : Chandos Publ.
3. Arvidsson, Niklas (2000). Knowledge management in the Multinational enterprise. p.176-163 IN The Flexible firm : capability management in network organizations/edited by Julian
4. Holsapple, Clyde W. (ed.) (2003). Handbook on Knowledge Management 1 : Knowledge Matters. New Delhi : Springer
5. Holsapple, Clyde W. (ed.) (2003). Handbook on Knowledge Management 2: Knowledge Directions/(editor). New Delhi : Springer their identification; information seeking behavior

Course Outcomes
1. Acquired knowledge the concepts and types of knowledge management.
2. Learnt how to familiar the knowledge management practices and process in libraries.
3. Learnt depth im Knowledge creation and capturing: Knowledge creation model – Capturing tacit knowledge
4. Gained the Knowledge codification and organization: Knowledge mapping, decision trees, decision tables
5. Learnt depth the Knowledge Management Tools and techniques
6. Elaborate discussion on Case studies about Corporate and Special Libraries
7. Well trained to create the library Portal, e-learning, Community of Practice, Storytelling.
8. Attained the knowledge for creating subject gateway

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FOURTH SEMESTER

Course - 4.1   Digital Libraries and Web Technology
Course Code: P16MLS14

Objectives:

To teach the concepts of digital library, organization of digital information, latest web tools used in digital information access.

To know the methods and practices involved in digital libraries.

Unit-I

Digital Libraries: Definitions, Concept, Characteristics, functions and Advantages-Digital Library collection - Major Digital Library Initiatives.

Unit-II

Digital Library Components: Design, Architecture, Protocols, Standards and Interoperability,

Unit-III

Digital content creation: Process of digitization, types of materials, file formats, Archives and Preservation.

Unit- IV

Web Technologies: Concepts, Internet Protocols, Web Server. Search Engines: General, Meta, Federated Search Engines. Web Browsers.

Unit-V

Social Networking and Bookmarking Sites

Unit-VI

Creation of Tamil interface using D-Space, MERTOL-NPOR-SWAYAM

Selected Readings:

1. C. Xavier. World Wide Web Design with HTML, New Delhi: TMH, 200
2. Chowdhury, G G and Chowdhury, Sudatta (2003). Introduction to digital libraries. London : Facet.
3. Deegan, Marilyn & Tanner, Simon : (2002) Digital futures : strategies for the information age. London : Library Association.
4. G.G. Chowdhury. Introduction to Digital Libraries. London: Facet Publishing, 2003.
5. John M. Colon, Annl Kelsey, Keith Michael Fiels. Planning for Automagtion: A How-to-do-it for Librarian. 2nd ed.(S.I.): Neal-Schuman, 1997.
6. Kausik Bose Information Networks in India: Problems and Prospects / New Delhi: Ess Ess Publications, 1994.

Course Outcomes

1. To teach the concepts of digital library, organization of digital information, latest web tools used in digital information access.
2. Acquired skills to the methods and practices involved in digital libraries and library automation.
3. Attained the knowledge of Design and Organization of Digital Libraries: Architecture, Interoperability, Protocols and Standards

4. Learnt elaborative on Digital content creation: files formats, Archives and Preservation
5. Gained the knowledge concept of Web Technologies: WWW, Internet Protocols, Web Server.
6. Gained the knowledge concept of Search Engines: General, Meta, Federated Search Engines. Browsers: IE, Mozilla, Google Chrome.
7. Learnt depth in Social Networking Websites and Social Bookmarking
8. Aware about integrating Social media services to LIS environment

Course 4.2: Project
Course Code:P16MLS15

Dissertation = 80 Marks [2 Reviews – 20+20=40 Marks, Report Valuation = 40 Marks]-Viva= 20 Marks

Course Outcomes

1. Discussed the emerging areas of research in particular subject or area to benefit to society

2. Identify the emerging problem facing library services or automation or digitization

3. Evaluate and analyses to arrive optimum solution used any open source software

4. Gained the knowledge for designing the research problem and methods of research types

5. Attained the knowledge of collecting review of literature

6. Learnt how to applying the technical tools for collecting data to get result

7. Learnt the research writing skills and presentation skills

8. Become expert to write the research articles in LIS area

Course - 4.3 Internship

Course Code: P16MLS16P

Internship training for specified dates at University, IIT, IIM, NIT and selected College and Research Libraries

Course Outcomes

1. Internship training for specified dates at University, IIT, IIM, NIT and selected College and Research Libraries
2. Attained the knowledge of library circulation functions with traditional and digital environment
3. Attained the knowledge of library procurement section services with traditional and digital environment
4. Attained the knowledge of the library technical works and classifying documents with traditional and digital environment
5. Attain the knowledge of the library reference section with traditional and digital environment
6. Attain the knowledge of the library maintenance section works and information retrieval with OPAC
7. Gained the knowledge overall functions and services of different kind of libraries
8. Attained the knowledge of organizing information in academic or industrial libraries

Course - 4.4: Elective – III

(E) INFORMETRICS
P16MLSECE

Course Code:
Objectives:

1. To make students to understand the concept, theories, laws and parameters of bibliometrics.
2. To teach the students to understand the citation analysis operation research
3. To teach the students the application of bibliometrics to study the literature in different subjects.

Unit –I

Bibliometrics and Scientometric: Concept, definition, evolution and applications in Libraries.

Unit –II

Theory and Laws - Zipf's law, Lotka's Law, Bradford's Law. Price Theory

Unit – III

Quantitative and Qualitative techniques: Types, Multidimensional scaling, Cluster analysis, Correspondence analysis, Co-word analysis, media and audience analysis.

Unit –IV

Citation Theory and Analysis; Definition, Theory of citing, different forms of citations, Bibliographic Coupling, Age of citation – citation counts , Self –citation – Citation Index _ Impact Factor – H Index

Unit – V

Emerging Trends: Webometrics, Altmetrics, Analysis Tools (Hitscite and Bibexcel, PAJEK, VOS Viewer)

Unit- VI

Info graphics-SNIP-SJR-ALEXA - Webometric tools.

Selected Readings:

1. Belikov, A.V.; Belikov, V.V. (2015). "A citation-based, author- and age-normalized, logarithmic index for evaluation of individual researchers independently of publication counts". F1000Research 4: 884. doi:10.12688/f1000research.7070.1
2. Braam, Robert R. (1991). Mapping of science: Foci of intellectual interest in scientific literature. DSWO Press. ISBN 90-6695-049-8.
3. *De Bellis, Nicola (2009).* Bibliometrics and citation analysis: from the Science citation index to cybermetrics. *Scarecrow Press. p. 417.* ISBN 0-8108-6713-3.
4. Egghe, Leo; Rousseau, Ronald (1990). Introduction to Informetrics: Quantitative Methods in Library, Documentation, and Information Science. Elsevier. ISBN 978-0-444-88493-0.
5. Glänzel, W. (2003). Bibliometrics as a research field: A course on theory and application of bibliometric indicators.1.
6. Hamdaqa, M.; A Hamou-Lhadj (2009). Citation Analysis: An Approach for Facilitating the Understanding and the Analysis of Regulatory Compliance Documents. Las Vegas, NV: IEEE. pp. 278–283. doi:10.1109/ITNG.2009.161. ISBN 978-1-4244-3770-2.
7. Leydesdorff, L. A. (2001). The challenge of scientometrics: The development, measurement, and self-organization of scientific communications (2nd ed.). Boca Raton, FL: Universal Publishers.
8. Noyons, E. C. M. (1999). Bibliometric mapping as a science policy and research management tool. Leiden: DSWO Press, University of Leiden.
9. Wilson, Concepción S. (1999). "Informetrics". Annual Review of Information Science and Technology (Medford, NJ: Information Today) 34: 107–247
10. Wolfram, D. (2003). Applied Informetrics for Information Retrieval Research. Libraries Unlimited.
11. Egghe, Leo. Power laws in the information production process: Lotkaian informetrics. Elsevier, 2005.

Course Outcomes

1. Discussed how to understand the concept, theories, laws and parameters of bibliometrics.
2. Evaluated how to understand the citation analysis operation research

3. Attained the knowledge how to the application of bibliometrics to study the literature in different subjects.
4. Learned the basic metric studies on Librarmetrics, Informetrics ,Bliometrics, Scientometrics, Webometrics, Altmetrics
5. Gained the knowledge Theory and Laws of bibliometrics ; Zipf's law, Lotka's Law, Bradford's Law. Price Theory
6. Gained the knowledge to applied and mesured the Quantitative and Qualitative techniques: Types, Multidimensional scaling, Cluster analysis, Correspondence analysis, Co-word analysis, media and audience analysis
7. Attained the knowledge of Citation Theory and Analysis
8. Gained the knowledge of Theory of citing, different forms of citations, Age of citation, citation counts , Self citation, Citation Index, Impact Factor and H Index

(F) User Studies
Course Code:P16MLSECF

Objectives
1. To understand information seeking behaviours and User information need and thus to design library services
2. To understand the techniques of assessing user needs and behaviours

UNIT I
User Studies – Concept, definition, need and purpose – Types and Techniques.

UNIT II
Information needs – Types - Information seeking behavior - Models.

UNIT III
Information Literacy - Concept - definition - need – methods, Models and sources used - evaluation of Information Literacy programmes.

UNIT IV
User education – Need – Purpose – Methods - online user education - Evaluation of user education programmes.

UNIT V
Evaluation of user studies - criteria - Techniques of evaluation – Questionnaire, Interview and record analysis.

Unit VI
User profile compilation- Usage metrics- Gate register- Website counters- IOT

Selected Readings:

1. Kumar, PSG. Use and User studies Publication. New Delhi: BR Publication.2006.
2. Deverajan. User studies, New Delhi :Allied publishers, 1987.
3. Kumar, PSG. A student's Manual of Library and Information Science. New Delhi: BR. Publishers, 2002.
4. Allen, Bryce. Information tasks: Toward a user-centered approach to   Information systems. Academic Press, Inc., 1996.

5. Kumar, PSG. Library and Users: Theory and Practice. New Delhi: BR. Publishers, 2004.
6. Sridhar, MS. Library use and user research (with twenty case studies). New Delhi: Concept Publishing Company, 2002.
7. http://portal.unesco.org/edu
8. http://www.ifla.org

Course Outcomes

1. Ability to find the information seeking behaviors and User information need and thus to design library services
2. Highlighted the techniques of assessing user needs and behaviours foe finding user requirements
3. Discussion elaborately to knowledge about kinds of feedback
4. Well trained skills for how to find problems and solving in library services and information systems
5. Discussion how to collect feedback from users in different types for evaluating the library services
6. Acquired the skills on librarmetrics
7. Known the methods of online user survey
8. Expert of find the solution based on user requirements or demands in LIS

Course - 4.5: Elective – IV

(G) Technical Writing
Course Code:P16MLSECG

Objectives:
To enable the students of technical writing reporting methods
To teach the concepts of Technical Editing, Editorial Tools and Publication process

Unit 1:
Communication Process: Concept, Definition and channels

Unit II:
Planning and Organization of Technical / Scientific Writing: Definition, Structure, Purpose, peer review Process, Aberrations in Technical Writing.

Unit III:
Technical Editing and Editorial Tools: Editor – Editorial process

Unit IV:

Publication Process: Planning, Preparation, Style Manuals

Unit V:
Publication Ethics: Copy Right, IPR, Legal Issues; Plagiarism: Concept and Tools

Unit VI
Current Trends on Scientific Publication Activities and Latest trends on Copy

Right issues

Selected Readings :

1. Elbow, Peter. Writing without teachers. New York. Oxford University Press. 1973.
2. Gowers, Sir. Ernest. The complete plane words. London: HMSO. 1954.
3. Holsinger, Donald C. A classroom laboratory for writing history. Social studies review. 31(1), 1991. pp. 59 – 64.
4. Kapp, Ro. The presentation of technical information. London: Constable 1948.
5. Kirkman, John. Good style for scientific and engineering writing. London: Pitman. 1980.
6. Parry, John. The psychology of human communication. London. University of London Press. 1967.
7. Ramage John D and Bean John C. The allyn and bacon guide to writing. 2ed. London, Allyn and Bacon. 2000. pp. 658.
8. Turk, Christopher and Kirkman, John. Effective writing: Improving scientific, technical and business communication. 2ed. London: Spon Press. 2007.
9. Winokur, Jon. Ed. Writers on Writing. Philadelphia running press: 1986.

Course Outcomes

1. Revealed the skills how to writing reporting in different methods
2. Attained capabilities the concepts of Technical Editing, Editorial Tools and Publication process
3. Learned elaborately how to write a research report with proper manner
4. Highlighted the publication process methods and publication ethics
5. Aware about plagiarism and piracy
6. Learned the aware of fraud journals, Publication Process
7. Gained the knowledge about Publication Ethics: Copy Right, IPR, Legal Issues
8. Gain the knowledge of research writing Planning, Preparation and Style Manuals

(H) Intellectual Property Rights
Course Code:P16MLSECH

Objectives:

1. To know the basics of IPR, Copyrights and Right to Information Act.
2. To know the various National and International IPR Organization.

Unit -I

IPR & Copy right, Concepts and Issues, Digital Information Rights.

Unit -II

Copy right act: Press and registration of News Paper, Delivery of Books

Unit-III

Knowledge Commission and Right to Information Act.

Unit -IV
　　Forms of IPR: Patents, Designs, Trademarks

Unit -V
　　National and International Organization　– IPO – WIPO
Unit-VI:
　　Recent Trends in Patent, Database, IPR and Online use of documents

Selected Readings:

1 The Copyright Act, 1957 (Act 14 of 1957) with The Copyright Rules, 1958 & neighbouring rights, Sahni, Ajay, Lal, Nathuni, b. 1897, India

2. Austen, J. (1813), Pride and Prejudice, p. 1, available at: www.pemberley.com/janeinfo/ppv1n01.html

3. Stallman, R. (2001), ''Science must 'push copyright aside''', available at: www.nature.com/ nature/debates/e-access/Articles/stallman.html

4. The Law of Intellectual Property Rights: Edited by Shiv Sahai Singh, Deep & Deep Publications

5. Issues of Intellectual Property Rights: Edited by Ramesh Chandra, Isha, 2006

6. Modern Intellectual Property Law 3/e, Catherine Colston, Jonathan Galloway

Course Outcomes

1. Deep discussion of the basics concepts of IPR, Copyrights and Right to Information ACT.
2. Earned the characteristic of various National and International IPR Organization.
3. Reveals the complete awareness of the Right to Information Act
4. Learned knowledge how to create different kinds of copyright forms for their own property
5. Gained the knowledge about the Forms of IPR: Patents, Designs, Trademarks
6. Learned the IPR and National and International Scenario, IPO and WIPO
7. Attained the information of Knowledge Commission and Right to Information Act and copy right act
8. Aware about copy right and legal policies

Sem	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks Int.	Marks Ext.	Total
I	Core Course – I (CC)	Algebra	6	5	3	25	75	100
	Core Course – II (CC)	Real Analysis	6	5	3	25	75	100
	Core Course – III (CC)	Ordinary Differential Equations	6	5	3	25	75	100
	Core Course – IV (CC)	Graph Theory	6	5	3	25	75	100
	Core Course - V (CC)	Integral Equations, Calculus of Variations and Transforms	6	5	3	25	75	100
	TOTAL		**30**	**25**				**500**
II	Core Course – VI (CC)	Complex Analysis	6	5	3	25	75	100
	Core Course – VII (CC)	Linear Algebra	6	5	3	25	75	100
	Core Course – VIII(CC)	Partial Differential Equations	6	5	3	25	75	100
	Elective Course – I (EC)		6	3	3	25	75	100
	Elective Course – II (EC)		6	3	3	25	75	100
	TOTAL		**30**	**21**				**500**
III	Core Course – IX (CC)	Classical Dynamics	6	5	3	25	75	100
	Core Course – X (CC)	Measure and Integration	6	5	3	25	75	100
	Core Course – XI(CC)	Topology	6	5	3	25	75	100
	Elective Course – III (EC)		6	3	3	25	75	100
	Elective Course – IV (EC)		6	3	3	25	75	100
	TOTAL		**30**	**21**				**500**
IV	Core Course – XII (CC)	Functional Analysis	6	5	3	25	75	100
	Core Course – XIII (CC)	Differential Geometry	6	5	3	25	75	100
	Core Course – XIV(CC)	Advanced Numerical Analysis	6	5	3	25	75	100
	Elective Course – V (EC)		6	3	3	25	75	100
	Project		6	5	-	-	-	100
	TOTAL		**30**	**23**				**500**
	GRAND TOTAL		**120**	**90**				**2000**

List of Elective Courses (For 2016 – 2017) :

Elective I		Elective II	
1	Advanced Probability Theory	1	Stochastic Processes
2	Mathematical Modeling	2	Tensor Analysis and Special Theory of Relativity
3	Fuzzy sets and their Applications	3	Non linear Differential Equations
Elective III		**Elective IV**	
1	Design and Analysis of Algorithms	1	Financial Mathematics
2	Discrete Mathematics	2	Advanced Operations Research
3	Automata Theory	3	Combinatorics
Elective V			
1	Algebraic Topology		
2	Fluid Dynamics		
3	Algebraic Number Theory		

Note:

```
Project          :100 Marks
Dissertation     : 80 Marks
Viva Voice       : 20 Marks

Core Papers      -      10
Core Practical   -       4
Elective Papers  -       5
Project          -       1
```

Note:

```
1. Theory      Internal   25 marks    External   75 marks
2. Practical      "       40 marks       "       60 marks
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Note:

```
1. Theory      Internal   25 marks    External   75 marks
2. Practical      "       40 marks       "       60 marks
```
3. Separate passing minimum is prescribed for Internal and External
   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The passing minimum not less than 50% in the aggregate.

Reference/Text Books contain the following details:

   I.   Name of the Author
   II. Title of the Book
   III. Name of the Publisher
   IV. Year

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CORE COURSE I

ALGEBRA

Objectives

1. To give foundation in Algebraic structures like Groups ,Rings
2. To train the students in problem solving in Algebra

UNIT I

GROUP THEORY: A counting principle – Normal Subgroups and Quotient groups – Homomorphism – Cayley's theorem – Permutation groups – Another counting principle – Sylow's theorems.

UNIT II

RING THEORY : Homomorphisms -Ideals and quotient rings – More ideals and quotient rings –Euclidean Rings-A particular Euclidean Ring.

UNIT III

Polynomial rings – Polynomials over the rational field – polynomials over commutative Rings -Inner Product spaces.

UNIT IV

FIELDS: Extension fields – Roots of Polynomials – More about roots.

UNIT V

The elements of Galois theory– Finite fields.

TEXT BOOK

I.N. Herstein, Topics in Algebra, Second Edn, Wiley Eastern Limited.
UNIT – I   -Chapter 2 : Sec 2.5, 2.6, 2.7,2.9, 2.10, 2.11, 2.12
UNIT – II   -Chapter 3 : Sec 3.3, 3.4, 3.5,3.7,3.8.
UNIT – III   - Chapter 3&4 : 3.9,3.10,3.11, 4.4
UNIT – IV   -Chapter 5 : Sec 5.1, 5.3,5.5
UNIT – V   -Chapter 5&7:Sec 5.6,7.1

REFERENCE BOOKS

1. David S.Dummit and Richard M.Foote ,Abstract Algebra,Third Edition,Wiley Student Edition,2015.
2. John, B. Fraleigh, A First Course in Abstract Algebra, Addison-Wesley Publishing company.
3. Vijay, K. Khanna, and S.K. Bhambri, A Course in Abstract Algebra, Vikas Publishing House Pvt Limited, 1993.
4. Joseph A.Gallian,Contemporary Abstract Algebra,Fourth Edition,Narosa publishing House,1999.

*****

CORE COURSE II
REAL ANALYSIS

Objectives:

1. To give the students a thorough knowledge of the various aspects of Real line and Metric Spaces which is imperative for any advanced learning in Pure Mathematics.
2. To train the students in problem-solving as a preparatory for competitive exams.

UNIT I

Basic Topology: Finite, Countable and Uncountable Sets – Metric spaces – Compact sets – Perfect sets – Connected sets.
Numerical Sequences and Series: Sequences – Convergence – Subsequences - Cauchy Sequences – Upper and Lower Limits - Some Special Sequences – Tests of convergence – Power series – Absolute convergence – Addition and multiplication of series – Rearrangements.

UNIT II

Continuity: Limits of functions – Continuous functions – continuity and Compactness – Continuity and connectedness – Discontinuities – Monotonic functions – Infinite limits and limits at infinity. Differentiation: Derivative of a real function – Mean value Theorems - Intermediate value theorem for derivatives – L'Hospital's Rule – Taylor's Theorem – Differentiation of vector valued functions.

UNIT III

Riemann – Stieltjes Integral: Definition and Existence – Properties – Integration and Differentiation – Integration of vector valued functions.

UNIT IV

Sequences and series of functions: Uniform Convergence and Continuity – Uniform Convergence and Differentiation – Equicontinuous families of functions – The Stone – Weierstrass Theorem.

UNIT V

Functions of several variables: Linear Transformations - Differentiation – The Contraction Principle – The Inverse Function Theorem - The Implicit Function Theorem.

TEXT BOOKS

[1] Walter Rudin , Principles of Mathematical Analysis, Third Edition, Mcgraw Hill, 1976.

UNIT – I	Chapters 2 and 3
UNIT – II	Chapters 4 and 5
UNIT – III	Chapter 6
UNIT – IV	Chapter 7
UNIT – V	Chapter 9, Sections 9.1 to 9.29

REFERENCES

1. Tom P. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. A.J. White, Real Analysis : An Introduction, Addison Wesley Publishing Co., Inc. 1968.
3. Serge Lang, Analysis I & II, Addison-Wesley Publishing Company, Inc. 1969.
4. N.L.Carothers, Real Analysis, Cambridge University press, Indian edition, 2013.

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ORDINARY DIFFERENTIAL EQUATIONS

Objectives

1. To give an in-depth knowledge of differential equations and their applications.
2. To study the existence, uniqueness, stability behavior of the solutions of the ODE

UNIT I

The general solution of the homogeneous equation– he use of one known solution to find another – The method of variation of parameters – Power Series solutions. A review of power series– Series solutions of first order equations – Second order linear equations; Ordinary points.

UNIT II

Regular Singular Points – Gauss's hypergeometric equation – The Point at infinity - Legendre Polynomials – Bessel functions – Properties of Legendre Polynomials and Bessel functions.

UNIT III

Linear Systems of First Order Equations – Homogeneous Equations with Constant Coefficients – The Existence and Uniqueness of Solutions of Initial Value Problem for First Order Ordinary Differential Equations – The Method of Solutions of Successive Approximations and Picard's Theorem.

UNIT IV

Oscillation Theory and Boundary value problems – Qualitative Properties of Solutions – Sturm Comparison Theorems – Eigenvalues,Eigenfunctions and the Vibrating String.

UNIT V

Nonlinear equations: Autonomous Systems; the phase plane and its phenomena – Types of critical points; Stability – critical points and stability for linear systems – Stability by Liapunov's direct method – Simple critical points of nonlinear systems.

TEXT BOOKS

G.F. Simmons, Differential Equations with Applications and Historical Notes, TMH, New Delhi, 1984.
UNIT – I   Chapter 3: Sections 15, 16, 19 and Chapter 5: Sections 25 to 27
UNIT – II   Chapter 5 : Sections 28 to 31 and Chapter 6: Sections 32 to 35
UNIT – III   Chapter 7: Sections 37, 38 and Chapter 11: Sections 55, 56
UNIT – IV   Chapter 4: Sections 22 to 24
UNIT – V   Chapter 8: Sections 42 to 44

REFERENCES

1. W.T. Reid, Ordinary Differential Equations, John Wiley & Sons, New York, 1971.
2. E.A. Coddington and N. Levinson, Theory of Ordinary Differential Equaitons, McGraw Hill Publishing Company, New York, 1955.

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GRAPH THEORY

Objectives

1. To give a rigorous study of the basic concepts of Graph Theory.
2. To study the applications of Graph Theory in other disciplines.

Note: **Theorems, Propositions and results which are starred are to be omitted.**

Unit I   Basic Results

Basic Concepts - Subgraphs - Degrees of Vertices - Paths and Connectedness- Operations on Graphs - Directed Graphs: Basic Concepts - Tournaments.

Unit II   Connectivity

Vertex Cuts and Edge Cuts - Connectivity and Edge - Connectivity, Trees:Definitions, Characterization and Simple Properties - Counting the Number of Spanning Trees - Cayley's Formula.

Unit III   Independent Sets and Matchings

Vertex Independent Sets and Vertex Coverings - Edge Independent Sets -Matchings and Factors - Eulerian Graphs - Hamiltonian Graphs.

Unit IV   Graph Colourings

Vertex Colouring - Critical Graphs - Triangle - Free Graphs - Edge Colourings of Graphs - Chromatic Polynomials.

Unit V   Planarity

Planar and Nonplanar Graphs - Euler Formula and its Consequences - K5 and K3,3 are Nonplanar Graphs - Dual of a Plane Graph - The Four-Colour Theorem and the Heawood Five-Colour Theorem-Kuratowski's Theorem.

Textbook

1. R. Balakrishnan, K. Ranganathan, A Textbook of Graph Theory, Springer International Edition, New Delhi, 2008.
UNIT I   Chapter I & II: 1.1 to 1.4, 1.7, 2.1, 2.2
UNIT II   Chapter III & IV: 3.1, 3.2, 4.1, 4.3 to 4.4
UNIT III   Chapter V & VI: 5.1 to 5.4, 6.1, 6.2
UNIT IV   Chapter VII: 7.1 to 7.4, 7.7
UNIT V   Chapter VIII: 8.1 to 8.6

References

1. J.A. Bondy, U.S.R. Murty, Graph Theory with Applications, Mac MilanPress Ltd., 1976.
2. Gary Chartrand, Linda Lesniak, Ping Zhang, Graphs and Digraph,CRC press,2010.
3. F.Harary, Graph Theory, Addison - Wesley, Reading, Mass., 1969.

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CORE COURSE V

INTEGRAL EQUATIONS, CALCULUS OF VARIATIONS AND TRANSFORMS

Objectives.

1. To introduce the concept of calculus of variations and integral equations and their applications.
2. To study the different types of transforms and their properties.

UNIT I

Calculus of variations – Maxima and Minima – the simplest case – Natural boundary and transition conditions - variational notation – more general case – constraints and Lagrange's multipliers – variable end points – Sturm-Liouville problems.

UNIT – II

Fourier transform - Fourier sine and cosine transforms - Properties Convolution - Solving integral equations - Finite Fourier transform - Finite Fourier sine and cosine transforms - Fourier integral theorem - Parseval's identity.

UNIT III

Hankel Transform : Definition – Inverse formula – Some important results for Bessel function – Linearity property – Hankel Transform of the derivatives of the function – Hankel Transform of differential operators – Parseval's Theorem

UNIT IV

Linear Integral Equations - Definition, Regularity conditions – special kind of kernels – eigen values and eigen functions – convolution Integral – the inner and scalar product of two functions – Notation – reduction to a system of Algebraic equations – examples– Fredholm alternative - examples – an approximate method.

UNIT V

Method of successive approximations: Iterative scheme – examples – Volterra Integral equation – examples – some results about the resolvent kernel. Classical Fredholm Theory: the method of solution of Fredholm – Fredholm's first theorem – second theorem – third theorem.

TEXT BOOKS

[1] Ram.P.Kanwal – Linear Integral Equations Theory and Practise, Academic Press 1971.
[2] F.B. Hildebrand, Methods of Applied Mathematics II ed. PHI, ND 1972.
[3] A.R. Vasishtha, R.K. Gupta, Integral Transforms, Krishna Prakashan Media Pvt Ltd, India, 2002.

UNIT – I   Chapter 2: Sections 2.1 to 2.9 of [2]
UNIT – II   Chapter 7 of [3]
UNIT – III   Chapter 9 of [3];   UNIT – IV   -Chapters 1 and 2 of [1]
UNIT – V   Chapters 3 and 4 of [1]

REFERENCES

[1] S.J. Mikhlin, Linear Integral Equations (translated from Russian), Hindustan Book Agency, 1960.
[2] I.N. Snedden, Mixed Boundary Value Problems in Potential Theory, North Holland, 1966.

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CORE COURSE VI

COMPLEX ANALYSIS

Objectives

1. To learn the various intrinsic concepts and the theory of Complex Analysis.
2. To study the concept of Analyticity, Complex Integration and Infinite Products in depth.

UNIT I

Elementary Point Set Topology: Sets and Elements – Metric Spaces – Connectedness – Compactness – Continuous Functions – Topological Spaces;   Conformality: Arcs and Closed Curves – Analytic Functions in Regions – Conformal Mapping – Length and Area; Linear Transformations: The Linear Group – The Cross Ratio – Symmetry

UNIT II

Fundamental theorems in complex integration: Line Integrals – Rectifiable Arcs – Line Integrals as Functions of Arcs – Cauchy's Theorem for a Rectangle – Cauchy's Theorem in a Disk; Cauchy's Integral Formula: The Index of a Point with Respect to a Closed Curve – The Integral Formula – Higher Derivatives.

UNIT III

Local Properties of Analytic Functions - Removable Singularities - Taylor's Theorem – Integral representation of the n^{th} term - Zeros and Poles – Algebraic order of f(z) – Essential Singularity - The Local Mapping – The Open Mapping Theorem - The Maximum Principle.

UNIT IV

The General Form of Cauchy's Theorem: Chains and Cycles – Simple Connectivity – Homology – The General Statement of Cauchy's Theorem – Proof of Cauchy's Theorem – Locally Exact Differentials – Multiply Connected Regions; The Calculus of Residues: The Residue Theorem – The Argument Principle – Evaluation of Definite Integrals

UNIT V

Harmonic Functions: Definition and Basic Properties – The Mean-value Property – Poisson's Formula – Schwarz's Theorem – The Reflection Principle; Power series expansions-Weierstrass's Theorem – The Taylor Series – The Laurent Series;

TEXT BOOK

Lars V. Ahlfors, Complex Analysis, Third Ed. McGraw-Hill Book Company, Tokyo, 1979.
UNIT – I   Chapter 3: 1.1-1.6, 2.1-2.4,3.1-3.3
UNIT – II   Chapter 4: 1.1-1.5, 2.1-2.3
UNIT – III   Chapter 4: 3.1, 3.2, 3.3,3.4
UNIT – IV   Chapter 4: 4.1-4.7, 5.1-5.3
UNIT – V   Chapter 4: 6.1-6.5,   and   Chapter 5: 1.1-1.3

REFERENCES

1. Serge Lang, Complex Analysis, Addison Wesley, 1977.
2. S. Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, New Delhi, 1997.
3. Karunakaran, Complex Analysis,Alpha Science international Ltd,Second edition,2005.

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CORE COURSE VII

LINEAR ALGEBRA

Objectives

1. To give the students a thorough knowledge of the various aspects of Linear Algebra
2. To train the students in problem-solving as a preparatory for competitive exam.

UNIT I: Matrices:

Systems of linear Equations - Matrices and Elementary Row operations -Row-reduced echelon Matrices - Matrix Multiplication - Invertible Matrices -Bases and Dimension. (Only revision of Vector spaces and subspaces).

Unit II: Linear transformations:

The algebra of linear transformations - Isomorphism of Vector Spaces - Representations of Linear Transformations by Matrices - Linear Functionals - The Double Dual - The Transpose of a Linear Transformation.

Unit III: Algebra of polynomials:

The algebra of polynomials - Lagrange Interpolation - Polynomial Ideals -The prime factorization of a polynomial - Commutative rings – Determinant functions.

Unit IV: Determinants:

Permutations and the uniqueness of determinants - Classical Adjoint of a (square) matrix - Inverse of an invertible matrix using determinants -Characteristic values - Annihilating polynomials.

Unit V: Diagonalization:

Invariant subspaces - Simultaneous triangulation and simultaneous Diagonalization Direct-sum Decompositions - Invariant Direct sums – Primary Decomposition theorem.

TEXTBOOK

1. Kenneth Hoffman and Ray Alden Kunze, Linear Algebra, Second Edition, Prentice Hall of India Private Limited, New Delhi, 1975.
UNIT I   Chapter 1 & 2   1.2-1.6 and 2.3
UNIT II   Chapter 3
UNIT III   Chapter 4 & 5   4.1 - 4.5 and 5.1 - 5.2
UNIT IV   Chapter 5 & 6   5.3, 5.4   and 6.1 - 6.3
UNIT V   Chapter 6   6.4 - 6.8

REFERENCES

1. S. Kumaresan, Linear Algebra: A Geometric Approach, Prentice-Hall of India Ltd, 2004.
2. V. Krishnamurthy, V.P. Mainra, J.L. Arora, Introduction to Linear Algebra, East West Press Ltd, 1985.
3. A.R. Rao, P. Bhimashankaram, Linear Algebra, Second Edition, Tata McGraw Hill, 2000.
4. Edgar G.Goodaire, Linear Algebra-Pure & Applied World Scientific, Cambridge University Press India Ltd, 2014

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CORE COURSE VIII
PARTIAL DIFFERENTIAL EQUATIONS

Objectives

1. To give an in-depth knowledge of solving partial differential equations and apply them in scientific and engineering problems.
2. To study the other aspects of PDE

UNIT I

Partial differential equations- origins of first order Partial differential equations- Cauchy's problem for first order equations- Linear equations of the first order- Integral surfaces Passing through a Given curve- surfaces Orthogonal to a given system of surfaces -Non linear Partial differential equations of the first order.

UNIT II

Cauchy's method of characteristics- compatible systems of first order equations- Charpits method- Special types of first order equations- Solutions satisfying given conditions- Jacobi's method.

UNIT III

Partial differential equations of the second order : The origin of second order equations –second order equations in Physics – Higher order equations in Physics - Linear partial differential equations with constant co-efficient- Equations with variable coefficients- Characteristic curves of second order equations

UNIT IV

Characteristics of equations in three variables- The solution of Linear Hyperbolic equations-Separation of variables. The method of Integral Transforms – Non Linear equations of the second order.

Unit V

Laplace equation : Elementary solutions of Laplace's equations-Families of equipotential Surfaces- Boundary value problems-Separation of variables –Problems with Axial Symmetry.

TEXT BOOK

Ian N. Sneddon,Elements of Partial differential equations**,** Dover Publication –INC, New York, 2006.
UNIT I Chapter II Sections 1 to 7
UNIT II Chapter II Sections 8 to 13
UNIT III Chapter III Sections 1 to 6
UNIT IV Chapter III Sections 7 to 11
UNIT V Chapter IV Sections 2 to 6

REFERENCES

1. **M.D.Raisinghania**, Advanced Differential Equations , S.Chand and company Ltd., New Delhi,2001.
2. **E.T.Copson,** Partial Differential Equations, Cambridge University Press

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ELECTIVE I (1)
(Any one)
ADVANCED PROBABILITY THEORY

Objectives:

1. To make the students to understand about fields, σ-fields and random variables.
2. To enable the students to learn about expectations, convergence in random variables   and distribution functions.

Unit I   Fields and σ Fields:

Class of events –Functions and Inverse functions – Random variables – Limits of random variables.

Unit II   Probability Space:

Definition of probability – some simple properties – discrete probability space – General probability space – Induced probability space.

Unit III   Distribution functions:

Distribution functions of a random variable –Decomposition of distributive functions- Distributive functions of vector random variables – Correspondence theorem.

Unit IV   Expectation and Moments:

Definition of Expectation –Properties of expectation – Moments, Inequalities.

Unit V   Convergence of Random Variables:

Convergence in Probability –Convergence almost surely – Convergence in distribution – Convergence in the r^{th} mean -Convergence theorems for Expectations .

TEXT BOOK

B.R. Bhat (2007), MODERN PROBABILITY THEORY,3^{rd} edition, New Age International private ltd, New Delhi.
Unit I   : Chapter 1 and 2 Omit (1.1&1.2)
Unit II : Chapter 3 (Omit 3.6)
Unit III : Chapter 4
Unit IV : Chapter 5
Unit V   : Chapter 6(6.1 to 6.5)

REFERENCES

1   Chandra T.K and Chatterjee D. (2003),A first course in probability , 2^{nd} Edition, Narosa Publishing House, New Delhi.
2   Kailai Chung and Farid Aitsahlia, Elementary Probability, Springer Verlag 2003, New York.
3   Marek Capinski and Thomasz Zastawniak(2003), Probability through problems, Springer Verlag, New York.
4   Sharma .T.K(2005), A text book of probability and theoretical distribution, Discovery publishing house, New Delhi.

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ELECTIVE I (2)

MATHEMATICAL MODELING

Objectives:

1. To study the different mathematical models in ODE and Difference equations.
2. To study graph theoretical models.

UNIT I - Mathematical Modelling through Ordinary Differential Equations of First order :

Linear Growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models – Dynamics problems – Geometrical problems.

UNIT II - Mathematical Modelling through Systems of Ordinary Differential Equations of First Order :
Population Dynamics – Epidemics – Compartment Models – Economics – Medicine, Arms Race, Battles and International Trade – Dynamics.

UNIT III - Mathematical Modelling through Ordinary Differential Equations of Second Order:

Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modelling through Linear Differential Equations of Second Order – Miscellaneous Mathematical Models.

UNIT IV - Mathematical Modelling through Difference Equations :

Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients – Economics and Finance – Population Dynamics and Genetics – Probability Theory.

UNIT V - Mathematical Modelling through Graphs :

Solutions that can be Modelled through Graphs – Mathematical Modelling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Unoriented Graphs.

TEXT BOOK
J.N. Kapur, Mathematical Modelling, Wiley Eastern Limited, New Delhi, 1988.

REFERENCES

J. N. Kapur, Mathematical Models in Biology and Medicine, Affiliated East – West Press Pvt Limited, New Delhi, 19
*****

ELECTIVE I (3)

FUZZY SETS AND THEIR APPLICATIONS

Objectives:

1. To introduce the concept of fuzzy theory and study its application in real problems
2. To study the uncertainty environment through the fuzzy sets that incorporates imprecision and subjectivity into the model formulation and solution process.

UNIT I   From Classical Sets To Fuzzy Sets, Fuzzy Sets Verses Crisp Sets:

Fuzzy sets: Basic types – Fuzzy sets: Basic Concepts –Additional Properties of α – cuts-Extension   Principle for fuzzy sets **.**

UNIT II   Operations On Fuzzy Sets:

Types of operations– Fuzzy complements- Fuzzy Intersections:t-Norms – Fuzzy Unions:t-Conorms - Combinations of Operations**.**

UNIT III   Fuzzy Arithmetic:

Fuzzy numbers - Linguistic variables -Arithmetic operations on intervals –Arithmetic operations on Fuzzy numbers **.**

UNIT IV   Fuzzy Relations:

Binary Fuzzy Relations – Binary Relations on a Single Set – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations –Fuzzy Ordering Relations – Fuzzy Morphisms.

UNIT V   Fuzzy Decision Making:

Individual decision making – Multiperson Decision Making-Ranking methods – Fuzzy Linear programming.

TEXT BOOK

George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic Theory and Applications, Prentice Hall of India, (2005).
UNIT I   Chapter 1   Sections 1.3, 1.4, Chapter :2 Sections 2.1 and 2.3
UNIT II   Chapter 3   Sections 3.1, 3.2, 3.3, 3.4, 3.5.
UNIT III   Chapter 4   Sections 4.1,4.2, 4.3, 4.4.
UNIT IV   Chapter 5   Sections 5.3 ,5.4, 5.5, 5.6, 5.7, 5.8.
UNIT V   Chapter 15 Sections 15.2,15.3, 15.6, 15.7

 REFERENCES

1. H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers Limited (1991).
2. M. Ganesh, Introduction to Fuzzy sets and Fuzzy logic, Prentice Hall of India, New Delhi (2006).

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ELECTIVE II (1)
(Any one)
STOCHASTIC PROCESSES

Objectives

1. To understand the stochastic models for many real life probabilistic situations.
2. To learn the well known models like birth-death and queuing to reorient the knowledge of stochastic processes.

UNIT I

Stochastic Processes: Some notions – Specification of Stochastic processes – Stationary processes – Markov Chains – Definitions and examples – Higher Transition probabilities – Generalization of independent Bernoulli trails – Sequence of chain – Dependent trains.

UNIT II

Markov chains : Classification of states and chains – determination of Higher transition probabilities – stability of a Markov system – Reducible chains – Markov chains with continuous state space.

UNIT III

Markov processes with Discrete state space : Poisson processes and their extensions – Poisson process and related distribution – Generalization of Poisson process- Birth and Death process – Markov processes with discrete state space (continuous time Markov Chains).

UNIT IV

Renewal processes and theory : Renewal process – Renewal processes in continuous time – Renewal equation – stopping time – Wald's equation – Renewal theorems.

UNIT V

Stochastic processes in Queuing – Queuing system – General concepts – the queuing model M/M/1 – Steady state Behaviour – transient behaviour of M/M/1 Model – Non-Markovian models - the model GI/M/1.

TEXT BOOK

1. J. Medhi,Stochastic Processes, New age international pblishers,New Delhi– Second edition.

UNIT I   Ch. II & Ch.III   Sec 2.1 to 2.3, Sec 3.1 to 3.3
UNIT II   Ch III – Sec 3.4 tp 3.6, 3.8, 3.9 and 3.11
UNIT III   Ch IV : Sec 4.1 to 4.5
UNIT IV   Ch VI : Sec 6.1 to 6.5
UNIT V   Ch X : Sec 10.1 to 10.3, 10.7 and 10.8 (omit sec 10.2.3 & 10.2.3.1)

REFERENCES

1. Samuel Karlin, Howard M. Taylor, A first course in stochastic processes, Academic press, Second Edition,1975.
2. Narayan Bhat , Elements of Applied Stochastic Processes,John Wiley ,1972.
3. N.V. Prabhu, Stochastic Processes, Macmillan (NY).

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ELECTIVE II (2)
TENSOR ANALYSIS AND SPECIAL THEORY OF RELATIVITY

Objectives.

1. To introduce the notion of Tensor and study its properties.
2. To study the theory of relativity.

UNIT I

Invariance - Transformations of coordinates and its properties - Transformation by invariance - Transformation by covariance and contra variance - Covariance and contra variance - Tensor and Tensor character of their laws - Algebras of tensors - Quotient tensors - Symmetric and skew symmetric tensors – Relative tensors.

UNIT II

Metric Tensor - The fundamental and associated tensors - Christoffel's symbols - Transformations of Chrisffel's symbols- Covariant Differentiation of Tensors - Formulas for covariant Differentiation- Ricci Theorem - Riemann -Christoffel Tensor and their properties.

UNIT III

Einstein Tensor- Riemannian and Euclidean Spaces (Existence Theorem)-The e-systems and the generalized Kronecker deltas - Application of the e-systems.

UNIT IV

Special Theory of Relativity: Galilean Transformation - Maxwell's equations - The ether Theory – The Principle of Relativity Relativistic Kinamatics : Lorentz Transformation equations - Events and simultaneity - Example Einstein Train - Time dilation - Longitudinal Contraction -Invariant Interval - Proper time and Proper distance – World line - Example - twin paradox - addition of velocities - Relativistic Doppler effect.

UNIT V

Relativistic Dynamics : Momentum – energy – Momentum-energy four vector – Force – Conservation of Energy – Mass and energy – Example – inelastic collision – Principle of equivalence – Lagrangian and Hamiltonian formulations .
Accelerated Systems : Rocket with constant acceleration – example – Rocket with constant thrust .

TEXT BOOK

1. I.S. Sokolnikoff, Tensor Analysis, John Wiley and Sons, New York, 1964
2. D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985

UNIT I	Chapter 2 : Sections 18 to 28 of [1]
UNIT II	Chapter 2 : Sections 29 to 37 of [1]
UNIT III	Chapter 2 : Section 38 to 41 of [1]
UNIT IV	Chapter 7 : Sections 7.1 and 7.2 of [2]
UNIT V	Chapter 7 : Sections 7.3 and 7.4 of [2]

REFERENCES

1. J.L. Synge and A.Schild, Tensor Calculus, Toronto, 1949.
2. A.S. Eddington, The Mathematical Theory of Relativity, Cambridge University Press, 1930.
3. P.G. Bergman, An Introduction to Theory of Relativity, New york, 1942.
4. C.E. Weatherburn, Riemannian Geometry and Tensor Calculus, Cambridge, 1938

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ELECTIVE II (3)

NON LINEAR DIFFERENTIAL EQUATIONS

Objectives.

1. To study Non linear DE and its properties.
2. To study oscillation and stability properties of the solutions.

Unit I

First order systems in two variables and linearization: The general phase plane-some population models – Linear approximation at equilibrium points – Linear systems in matrix form.

Unit II

Averaging Methods: An energy balance method for limit cycles – Amplitude and frequency estimates – slowly varying amplitudes – nearly periodic solutions - periodic solutions: harmony balance – Equivalent linear equation by harmonic balance – Accuracy of a period estimate.

Unit III

Perturbation Methods: Outline of the direct method – Forced Oscillations far from resonance - Forced Oscillations near resonance with Weak excitation – Amplitude equation for undamped pendulum – Amplitude Perturbation for the pendulum equation – Lindstedt's Method – Forced oscillation of a self – excited equation – The Perturbation Method and Fourier series.

Unit IV

Linear Systems: Time Varying Systems – Constant coefficient System – Periodic Coefficients – Floquet Theory – Wronskian.

Unit V

Stability: Poincare stability – solutions, paths and norms – Liapunov stability Stability of linear systems – Comparison theorem for the zero solutions of nearly – linear systems.

TEXT BOOK

Nonlinear Ordinary Differential Equations , D.W.Jordan, & P.Smith, Clarendon Press, Oxford, 1977.

REFERENCES

1. Differential Equations by G.F.Simmons, Tata McGraw Hill, NewDelhi (1979).
2. Ordinary Differential Equations and Stability Theory By D.A.Sanchez, Freeman (1968).
3. Notes on Nonlinear Systems by J.K.Aggarwal, Van Nostrand, 1972.

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CORE COURSE IX

CLASSICAL DYNAMICS

Objectives

1. To give a detailed knowledge of the mechanical system of particles.
2. To study the applications of Lagrange's and Hamilton's equations .

UNIT I

Introductory concepts: The mechanical system - Generalised Coordinates - constraints - virtual work - Energy and momentum.

UNIT II

Lagrange's equation: Derivation and examples - Integrals of the Motion - Small oscillations.

UNIT III

Special Applications of Lagrange's Equations: Rayleigh's dissipation function - impulsive motion - Gyroscopic systems - velocity dependent potentials.

UNIT IV

Hamilton's equations: Hamilton's principle - Hamilton's equations - Other variational principles - phase space.

UNIT V

Hamilton - Jacobi Theory: Hamilton's Principal Function – The Hamilton - Jacobi equation - Separability.

TEXT BOOKS.

1. Donald T. Greenwood,Classical Dynamics, PHI Pvt. Ltd., New Delhi-1985.
UNIT – I   Chapter 1: Sections 1.1 to 1.5
UNIT – II   Chapter 2: Sections 2.1 to 2.4
UNIT – III   Chapter 3 : Sections 3.1 to 3.4
UNIT – IV   Chapter 4: Sections 4.1 to 4.4
UNIT – V   Chapter 5: Sections 5.1 to 5.3

REFERENCES.

1. H. Goldstein, Classical Mechanics, (2nd Edition), Narosa Publishing House, New Delhi.
2. Narayan Chandra Rana & Promod Sharad Chandra Joag, Classical Mechanics, Tata McGrawHill, 1991.

*****

MEASURE AND INTEGRATION

Objectives

1. To generalize the concept of integration using measures.
2. To develop the concept o f analysis in abstract situations.

UNIT I

Measure on Real line - Lebesgue outer measure - Measurable sets - Regularity - Measurable function - Borel and Lebesgue measurability.

UNIT II

Integration of non-negative functions - The General integral - Integration of series - Riemann and Lebesgue integrals.

UNIT III

Abstract Measure spaces - Measures and outer measures - Completion of a measure - Measure spaces - Integration with respect to a measure.

UNIT IV

Convergence in Measure- Almost uniform convergence- Signed Measures and Halin Decomposition –The Jordan Decomposition

UNIT V

Measurability in a Product space – The product Measure and Fubini's Theorem.

TEXT BOOKS

1. G.De Barra, Measure Theory and Integration, New age international (p) Limited.

UNIT – I   Chapter II: Sections 2.1 to 2.5
UNIT – II   Chapter III: Sections 3.1 to 3.4
UNIT – III   Chapter V: Sections 5.1 to 5.6
UNIT – IV   Chapter VII: Sections 7.1 and 7.2, Chapter VIII: Sections 8.1 and 8.2
UNIT – V   Chapter X: Sections 10.1 and 10.2

REFERENCES

1. M.E. Munroe,Measure and Integration, by Addison - Wesley Publishing Company, Second Edition, 1971.
2. P.K. Jain, V.P. Gupta, Lebesgue Measure and Integration, New Age International Pvt Limited Publishers, New Delhi, 1986, Reprint 2000.
3. Richard L. Wheeden and Antoni Zygmund, Measure and Integral: An Introduction to Real Analysis, Marcel Dekker Inc. 1977.
4. Inder, K. Rana, An Introduction to Measure and Integration, Narosa Publishing House, New Delhi, 1997.

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TOPOLOGY

Objectives

1. To study the concepts concerned with properties that are preserved under continuous deformations of objects.
2. To train the students to develop analytical thinking and the study of continuity and connectivity.

UNIT I   TOPOLOGICAL SPACES:

Topological spaces - Basis for a topology - The order topology - The product topology on X x Y - The subspace topology - Closed sets and limit points.

UNIT II   CONTINUOUS FUNCTIONS :

Continuous functions - the product topology - The metric topology.

UNIT III   CONNECTEDNESS:

Connected spaces- connected subspaces of the Real line - Components and local connectedness.

UNIT IV   COMPACTNESS:

Compact spaces - compact subspaces of the Real line - Limit Point Compactness – Local Compactness.

UNIT V   COUNTABILITY AND SEPARATION AXIOMS:

The countability Axioms - The separation Axioms - Normal spaces - The Urysohn Lemma - The Urysohn metrization Theorem - The Tietz extension theorem.

TEXT BOOK

James R. Munkres, Topology (2nd Edition) Pearson Education Pvt. Ltd., New Delhi-2002 (Third Indian Reprint).
UNIT – I   Chapter 2: Sections 12 to 17
UNIT – II   Chapter 2 : Sections 18 to 21 (Omit Section 22)
UNIT – III   Chapter 3 : Sections 23 to 25.
UNIT – IV   Chapter 3 : Sections 26 to 29.
UNIT – V   Chapter 4 : Sections 30 to 35.

REFERENCES

1   J. Dugundji, Topology, Prentice Hall of India, ,New Delhi, 1975.
2   George F.Sinmons, Introduction to Topology and Modern Analysis, McGraw Hill Book co.1963.
3   J.L. Kelly, General Topology, Van Nostrand, Reinhold Co., New York
4   L.Steen and J.Seeback, Counter examples in Topology, Holt, Rinehart and Winston, New York, 1970.

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DESIGN AND ANALYSIS OF ALGORITHMS

Objectives

1. To impart the students the knowledge of design and analysis of algorithms in computer science.
2. To study the complexity of algorithms.

Unit I   Algorithms:

Introduction- Algorithm - Algorithm specification: Pseudo code Conventions, Recursive algorithms - Performance analysis: Space Complexity, Time Complexity, Asymptotic Notation, and Practical Complexities.

Unit II   Data structures and Queues:

Linear data structures: Concepts of non-primitive data structures – storage structure for arrays - stacks - operations on stacks - queues - priority queues.

Unit III   Linked lists and trees:

Linked linear lists - operations on linked linear lists - circularly linked lists -doubly linked linear lists - Non-linear data structures: trees - binary trees -operations on binary trees - storage representation and manipulations of binary trees.

Unit IV   Search and Sort:

Divide and conquer - General method - Binary search - Finding the maximum and minimum in a set of items - Merge sort - Quick sort - Selection sort. Basic Traversal and Search Techniques for graphs: Breadth First Search – Depth First Search.

Unit V   Interpolations:

Backtracking - The 8-Queens problem - Algebraic problems - The general method - Evaluation and interpolation - Horner's rule - Lagrange interpolation- Newtonian interpolation.

TEXTBOOKS

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer algorithms, Galgotia Publications Pvt. Ltd., 2004. (For Units I, IV, V)
2. Jean-Paul Tremblay and Paul G.Sorenson, An introduction to data structures with applications, Second Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 1995. (For Units II, III)

REFERENCES

1. A.V. Aho, J.E.Hopcroft, J.D. Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley Publ. Comp., 1974.
2. Seymour E.Goodman and S.T. Hedetniemi, Introduction to the design and analysis of algorithms, McGraw Hill International Edition, 2002.

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ELECTIVE III (2)

DISCRETE MATHEMATICS

Objectives

1. To study the concepts like Boolean algebra, coding theory.
2. To introduce the different notions grammar.

Unit I   Relations and Functions:

Binary relations, equivalence relations and partitions, partial order relations, inclusion and exclusion principle, Hasse diagram, Pigeon hole principle. Functions, inverse functions, compositions of functions, recursive functions.

Unit II   Mathematical Logic:

Logic operators, Truth tables, Theory of inference and deduction, mathematical calculus, predicate calculus, predicates and qualifiers.

Unit III   Lattices:

Lattices as Partially Ordered Sets. Their Properties, Lattices as algebraic Systems, Sub lattices, Direct Product and homomorphism. Some Special Lattices - Complete, Complemented and Distributive Lattices, Isomorphic Lattices.

Unit IV   Boolean algebra:

Various Boolean identities, the switching Algebra Example, Sub Algebras, Direct Production and Homomorphism. Boolean Forms and their Equivalence, Midterm Boolean forms, Sum of Products, Canonical Forms. Minimization of Boolean Functions. The Karnuagh Map Method.
Coding Theory: Coding of binary information and error detection, Group codes, decoding and error correction.

Unit V   Grammar and Languages:

Phrase structure grammars, rewriting rules, derivation sentential forms, language generated by grammar, regular, context free and context sensitive grammar and languages.

TEXT BOOKS

1. Trembly. J.P & Manohar. P., "Discrete Mathematical Structures with Applications to Computer Science" McGraw- Hill.
2. Liu, C.L., "Elements of Discrete Mathematics", McGraw-Hill Book co.
3. K.D Joshi, "Foundations of Discrete Mathematics", Wiley Eastern Limited.

REFERENCES

1. Kolman, Busy & Ross, "Discrete Mathematical Structures", PHI.
2. Alan Doer: "Applied Discrete Structure for Computer Science", Galgotia Publications Pvt. Ltd.
3. Seymour Lipschutz, M. Lipson: "Discrete Mathematics", McGraw-Hill Edition.
4. Kenneth G. Roden: "Discrete Mathematics and its Applications", McGraw- Hill international editions, Mathematics Series.

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ELECTIVE III (3)

AUTOMATA THEORY

Objectives

1. To make the students to understand the nuances of Automata and Grammar.
2. To make them to understand the applications of these techniques in computer science.

Unit I: - Finite Automata and Regular expressions:

Definitions and examples - Deterministic and Nondeterministic finite Automata - Finite Automata with -moves. (Book 1, Chapter 2: Sections2.1-2.4)

Unit II: - Context free grammar:

Regular expressions and their relationship with automation - Grammar - Ambiguous and unambiguous grammars - Derivation trees – Chomsky Normal form. (Book 1, Chapter 2, Section 2.5, Chapter 4, Sections 4.1-4.3, 4.5,4.6)

Unit III: - Pushdown Automaton:

Pushdown Automaton - Definition and examples - Relation with Context free languages. (Book 1, Chapter 5: Section 5.2, 5.3)

Unit IV: - Finite Automata and lexical analysis:

Role of a lexical analyzer - Minimizing the number of states of a DFA - Implementation of a lexical analyzer. (Book 2, Chapter 3: Section 3.1-3.8)

Unit V: - Basic parsing techniques:

Parsers - Bottom up Parsers - Shift reduce - operator precedence - Top down Parsers - Recursive descent - Predictive parsers. (Book 2, Chapter 5: Section 5.1-5.5)

TEXTBOOKS

1. John E. Hopcroft and Jeffrey D. Ullman, Introduction to Automata theory, Languages and Computations, Narosa Publishing House, Chennai, 2000.
2. A.V. Aho and Jeffrey D. Ullman, Principles of Compiler Design, Narosa Publishing House, Chennai, 2002.

REFERENCES

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Second Edition, Prentice Hall, 1997.
2. A.V. Aho, Monica S. Lam, R. Sethi, J.D. Ullman, Compilers: Principles, Techniques and Tools, Second Edition, Addison-Wesley, 2007.

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FINANCIAL MATHEMATICS

Objectives

1. To study financial mathematics through various models.
2. To study the various aspects of financial mathematics.

UNIT I   SINGLE PERIOD MODELS:

Definitions from Finance - Pricing a forward - One-step Binary Model - a ternary Model - Characterization of no arbitrage - Risk-Neutral Probability Measure.

UNIT II   BINOMIAL TREES AND DISCRETE PARAMETER MARTINGALES:

Multi-period Binary model - American Options - Discrete parameter martingales and Markov processes - Martingale Theorems - Binomial Representation Theorem - Overturn to Continuous models.

UNIT III   BROWNIAN MOTION:

Definition of the process - Levy's Construction of Brownian Motion - The Reflection Principle and Scaling - Martingales in Continuous time.

UNIT IV   STOCHASTIC CALCULUS:

Non-differentiability of Stock prices - Stochastic Integration - Ito's formula - Integration by parts and Stochastic Fubini Theorem - Girsanov Theorem - Brownian Martingale Representation Theorem – Geometric Brownian Motion - The Feynman - Kac Representation.

UNIT V   BLOCK-SCHOLES MODEL:

Basic Block-Scholes Model - Block-Scholes price and hedge for European Options - Foreign Exchange - Dividends - Bonds - Market price of risk.

TEXT BOOK

Alison Etheridge ,A Course in Financial Calculus, , Cambridge University Press, Cambridge, 2002.

REFERENCES

1. Martin Boxter and Andrew Rennie, Financial Calculus: An Introduction to Derivatives Pricing, Cambridge University Press, Cambridge, 1996.
2. Damien Lamberton and Bernard Lapeyre, (Translated by Nicolas Rabeau and Farancois Mantion),
3. Introduction to Stochastic Calculus Applied to Finance, Chapman and Hall, 1996.
4. Marek Musiela and Marek Rutkowski, Martingale Methods in Financial Modeling, Springer Verlag, New York, 1988.
5. Robert J.Elliott and P.Ekkehard Kopp, Mathematics of Financial Markets, Springer Verlag, New York, 2001 (3rd Printing)

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ELECTIVE IV (2)

ADVANCED OPERATIONS RESEARCH

Objectives:

1. To enlighten the students in the field of operations research.
2. To help the students to apply OR techniques in business and management problems.

Unit I

Integer Programming.

Unit II

Dynamic (Multistage) programming.

Unit III

Decision Theory and Games.

Unit IV

Inventory Models.

Unit V

Non-linear Programming algorithms.

TEXT BOOK

Hamdy A. Taha, Operations Research, Macmillan Publishing Company, 4th Edition.
Unit I Chapter 8 § 8.1 – 8.5
Unit II Chapter 9 § 9.1 – 9.5
Unit III Chapter 11 § 11.1 – 11.4
Unit IV Chapter 13 § 13.1 – 13.4
Unit V Chapter 19 § 19.1, 19.2

REFERENCES

1. Non Linear Programming, O.L. Mangasarian, McGraw Hill, New York .
2. Non Linear Programming, Theory and Algorithms, Mokther S. Bazaraa and C.M. Shetty,Willy, New York .
3. Operations Research-An Introduction, Prem Kumar Gupta and D.S. Hira, S. Chand

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ELECTIVE IV (3)

COMBINATORICS

Objectives:

1. To introduce the notion of different types of distributions of objects and generating functions.
2. To study the Polya's enumeration theorems.

UNIT I

Permutations and combinations - distributions of distinct objects ~ distributions of non distinct objects - Stirlings formula.

UNIT II

Generating functions. - generating function for combinations - enumerators for permutations - distributions of distinct objects into non-distinct cells - partitions of integers – the Ferrer's graphs - elementary relations.

UNIT III

Recurrence relation - linear recurrence relations with constant coefficients solutions by the technique of generating functions - a special class of nonlinear difference equations - recurrence relations with two indices.

UNIT IV

The principle of inclusion and exclusion - general formula - permutations with restriction on relative positions - derangements - the rook polynomials - permutations with forbidden positions.

UNIT V

Polya's theory of counting - equivalence classes under a permutation group Burnside theorem - equivalence classes of functions - weights and inventories of functions - Polya' s fundamental theorem – generation of Polya's theorem.

TEXT BOOK

Introduction of Combinatorial Mathematics, C.L. Liu, McGraw Hill,1968. Chapters 1 to 5.

REFERENCES

1. Combinatorial Theory, Marshall Hall Jr.,John Wiley & Sons, second edition.
2. Combinatorial Mathematics, H.J. Rayser, Carus Mathematical Monograph, No.14.

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CORE COURSE XII

FUNCTIONAL ANALYSIS

Objectives

1. To study the three structure theorems of Functional Analysis viz., Hahn-Banach theorem, Open mapping theorem and Uniform boundedness principle.
2. To introduce Hilbert spaces and operator theory leading to the spectral theory of operators on a Hilbert space.

UNIT I

Algebraic Systems: Groups – Rings – The structure of rings – Linear spaces – The dimension of a linear space – Linear transformations – Algebras – Banach Spaces : The definition and some examples – Continuous linear transformations – The Hahn-Banach theorem – The natural imbedding of N in N^{**} - The open mapping theorem – The conjugate of an operator

UNIT II

Hilbert Spaces: The definition and some simple properties – Orthogonal complements – Orthonormal sets - The conjugate space H^* - The adjoint of an operator – Self-adjoint operators – Normal and unitary operators – Projections

UNIT III

Finite-Dimensional Spectral Theory: Matrices – Determinants and the spectrum of an operator – The spectral theorem – A survey of the situation

UNIT IV

General Preliminaries on Banach Algebras: The definition and some examples – Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the spectral radius – The radical and semi-simplicity

UNIT V

The Structure of Commutative Banach Algebras : The Gelfand mapping – Applications of the formula $r(x) = \lim || x^n ||^{1/n}$ - Involutions in Banach Algebras – The Gelfand-Neumark theorem.

TEXT BOOK

G.F.Simmons,Introduction to Topology and Modern Analysis, McGraw-Hill International Ed. 1963.
UNIT – I   Chapters 8 and 9
UNIT – II   Chapter 10
UNIT – III   Chapter 11
UNIT – IV   Chapter 12
UNIT – V   Chapter 13

REFERENCES

1   Walter Rudin, Functional Analysis, TMH Edition, 1974.
2   B.V. Limaye, Functional Analysis, Wiley Eastern Limited, Bombay, Second Print, 1985.
3   K.Yosida, Functional Analysis, Springer-Verlag, 1974.
4   Laurent Schwarz, Functional Analysis, Courant Institute of Mathematical Sciences, New York University, 1964.

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CORE COURSE XIII

DIFFERENTIAL GEOMETRY

Objectives

1. To introduce the notion of surfaces and their properties.
2. To study geodesics and differential geometry of surfaces.

UNIT I   SPACE CURVES:

Definition of a space curve - Arc length - tangent - normal and binormal - curvature and torsion - contact between curves and surfaces- tangent surface- involutes and evolutes- Intrinsic equations - Fundamental Existence Theorem for space curves- Helics.

UNIT II   INTRINSIC PROPERTIES OF A SURFACE:

Definition of a surface - curves on a surface - Surface of revolution - Helicoids - Metric- Direction coefficients - families of curves- Isometric correspondence- Intrinsic properties.

UNIT III   GEODESICS:

Geodesics - Canonical geodesic equations - Normal property of geodesics- Existence Theorems - Geodesic parallels - Geodesics curvature- Gauss- Bonnet Theorem - Gaussian curvature- surface of constant curvature.

UNIT IV   NON INTRINSIC PROPERTIES OF A SURFACE:

The second fundamental form- Principal curvature - Lines of curvature - Developable – Developable associated with space curves and with curves on surface - Minimal surfaces - Ruled surfaces.

UNIT V   DIFFERENTIAL GEOMETRY OF SURFACES:

Compact surfaces whose points are umblics- Hilbert's lemma - Compact surface of constant curvature - Complete surface and their characterization - Hilbert's Theorem - Conjugate points on geodesics.

TEXT BOOK

T.J. Willmore, An Introduction to Differential Geometry, Oxford University Press,(17th Impression) New Delhi 2002. (Indian Print).
UNIT – I   Chapter I : Sections 1 to 9.
UNIT – II   Chapter II: Sections 1 to 9.
UNIT – III   Chapter II: Sections 10 to 18.
UNIT – IV   Chapter III: Sections 1 to 8.
UNIT – V   Chapter IV : Sections 1 to 8

REFERENCES

1. Struik, D.T. Lectures on Classical Differential Geometry, Addison - Wesley, Mass. 1950.
2. Kobayashi S. and Nomizu. K. Foundations of Differential Geometry, Interscience Publishers, 1963.
3. Wihelm Klingenberg: A course in Differential Geometry, Graduate Texts in Mathematics, Springer Verlag, 1978.
4. J.A. Thorpe Elementary topics in Differential Geometry, Under - graduate Texts in Mathematics, Springer - Verlag 1979.

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CORE COURSE XIV

ADVANCED NUMERICAL ANALYSIS

Objectives.

1. To know the theory behind various numerical methods.
2. To apply these methods to solve mathematical problems.

Unit I

Transcendental and polynomial equations:Rate of convergence – Secant Method, Regula Falsi Method, Newton Raphson Method, Muller Method and Chebyshev Method. Polynomial equations: Descartes' Rule of Signs - Iterative Methods: Birge-Vieta method, Bairstow's method Direct Method: Graeffe's root squaring method.

Unit II

System of Linear Algebraic equations and Eigen Value Problems: Error Analysis of Direct methods – Operational count of Gauss elimination, Vector norm, Matrix norm, Error Estimate. Iteration methods - Jacobi iteration method, Gauss Seidel Iteration method, Successive Over Relaxation method - Convergence analysis of iterative methods, Optimal Relaxation parameter for the SOR method. Finding eigen values and eigen vectors – Jacobi method for symmetric matrices and Power methods only.

Unit III

Interpolation and Approximation:- Hermite Interpolations, Piecewise and Spline Interpolation – piecewise linear interpolation, piecewise quadratic interpolation, piecewise cubic interpolation, spline interpolation-cubic Spline interpolation. Bivariate Interpolation- Lagrange Bivariate interpolation. Least square approximation.

Unit IV

Differentiation and Integration: Numerical Differentiation – Optimum choice of Step length – Extrapolation methods – Partial Differentiation. Numerical Integration: Methods based on undetermined coefficients - Gauss Legendre Integration method and Lobatto Integration Methods only.

Unit V

Ordinary differential equations – Singlestep Methods: Local truncation error or Discretization Error, Order of a method, Taylor Series method, Runge-Kutta methods: Explicit Runge–Kutta methods– Minimization of Local Truncation Error, System of Equations, Implicit Runge-Kutta methods. Stability analysis of single step methods (RK methods only).

TEXT BOOKS

M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International (p) Limited Publishers, New Delhi, Sixth Edition 2012.
Unit I Chapter 2 § 2.5 (Pages 41-52), 2.9 (Pages 83-99)
Unit II Chapter 3 § 3.3(Pages 134-140), 3.4(Pages 146-164), 3.5(Pages 170-173),
3.7 (Pages179-185) and 3.11 (Pages 196-198)
Unit III Chapter 4 § 4.5 - 4.7 & 4.9 (Pages 284-290)
Unit IV Chapter 5 § 5.2 - 5.5(Pages 320-345) and 5.8(pages 361 – 365 and 380-386)
Unit V Chapter 6 §6.4(Pages 434-459) and 6.5(Pages 468-475)

REFERENCES

1. Kendall E. Atkinson, An Introduction to Numerical Analysis, II Edn., John Wiley & Sons, 1988.
2. M.K. Jain, Numerical Solution of Differential Equations, II Edn., New Age International Pvt Ltd., 1983.
3. Samuel. D. Conte, Carl. De Boor, Elementary Numerical Analysis, Mc Graw-Hill International Edn., 1983.

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ELECTIVE V (1)
(Any one)

ALGEBRAIC TOPOLOGY
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Objectives:

1. To introduce the notion of homotopy and covering spaces.
2. To study the Jordan curve theorem.

UNIT I

Homotopy of Paths-The Fundamental Group-Covering spaces.

UNIT II

The Fundamental group of the circle – The Fundamental group of the punctured plane- The Fundamental group of S^n.

UNIT III

Fundamental groups of surfaces- Essential and Inessential maps-The Fundamental theorem of algebra.

UNIT IV

Homotopy type – The Jordan separation theorem.

UNIT V

The Jordan Curve Theorem.

TEXTBOOK

Topology – A first course by James R.Munkres, Prentice-Hall of India Pvt Ltd, Third print.

REFERENCE BOOKS

1. A basic course in Algebraic Topology by William S Massey,Springer , First Edition.
2. Lecture notes on Elementary Topology and Geometry(Under graduate Texts in Mathematics) by I.M.Singer and John A Thorpe,Springer-Verlag,New York.
3. Elements of Algebraic Topology by James R. Munkres ,Addition-Wesley Publishing Company-1984
4. Allen Hatcher,Algebraic Topology,Cambridge University Press ,2002.

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ELECTIVE V (2)

FLUID DYNAMICS

Objectives

1. To give the students an introduction to the behaviour of fluids in motion.
2. To give the students a feel of the applications of Complex Analysis in the analysis of the flow of liquids.

UNIT I

Real Fluids and Ideal Fluids - Velocity of a Fluid at a point – Streamlines and Path lines: Steady and Unsteady Flows – The Velocity potential – The Vorticity vector – Local and Particle Rates of Change – The Equation of continuity – Worked examples – Acceleration of a Fluid – Conditions at a rigid boundary – General analysis of fluid motion – Pressure at a point in a Fluid at Rest – Pressure at a point in Moving Fluid – Conditions at a Boundary of Two Inviscid Immiscible Fluids – Euler's equation of motion – Bernoulli's equation – Worked examples.

UNIT II

Discussions of a case of steady motion under conservative body forces – Some potential theorems – Some Flows Involving Axial Symmetry – Some special two-Dimensional Flows-Impulsive Motion.Some three- dimensional Flows: Introduction – Sources, Sinks and Doublets – Images in a Rigid infinite Plane – Axi-Symmetric Flows; Stokes stream function.

UNIT III

Some Two- Dimensional Flows: Meaning of a Two- Dimensional Flow – Use of cylindrical polar co-ordinates – The stream function – The Complex Potential for Two- Dimensional, Irrotational , Incompressible Flow – complex velocity potentials for Standard Two Dimensional Flows – Some worked examples – The Milne- Thomson circle theorem and applications – The theorem of Blasius.

UNIT IV

The use of conformal Transformation and Hydrodynamical Aspects – Vortex rows. Viscous flow Stress components in a real fluid - relations between cartesian components of stress - Translational Motion of Fluid element – The Rate of Strain Quadraic and Principle Stresses – Some further properties of the rate of strain quardric - Stress analysis in fluid motion – Relations between stress and rate of strain - The coefficient of viscosity and laminar flow – The Navier- Stokes equations of motion of a viscous fluid.

UNIT V

Some solvable problems in viscous flow – Steady viscous flow in tubes of uniform cross section – Diffusion of vorticity – Energy Dissipation due to viscosity – Steady Flow past a Fixed Sphere – Dimensional Analysis; Reynolds Number – Prandtl's Boundary Layer.

TEXT BOOK

Text Book of Fluid Dynamics by F.Chorlton ,CBS Publishers & Distributors, New Delhi ,1985.

UNIT I   Chapter 2 and Chapter 3: Sections 3.1 to 3.6
UNIT II   Chapter 3 : Sections 3.7 to 3.11 and chapter 4 : Sections
             4.1,4.2,4.3,4.5
UNIT II   Chapter 5 : Sections : 5.1 to 5.9 except 5.7
UNIT IV   Chapter 5 : Section 5.10, 5.12 and Chapter 8 : Sections 8.1 to 8.9
UNIT V   Chapter 8 : Sections 8.10 to 8.16.

REFERENCE

1. Computational Fluid Dynamics: An Introduction, J.F. Wendt J.D. Anderson, G. Degrez and E. Dick, Springer – Verlag, 1996.
2. Computational Fluid Dynamics,The Basics with Applicatios, J. D. Anderson, McGraw Hill, 1995.
3. An Introduction to Fluid Mechanics, Foundation Books, G. K. Batchelor, New Delhi, 1984.
4. A Mathematical Introduction to Fluid Dynamics, A. J. Chorin and A. Marsden, Springer- Verlag, New York, 1993.
5. Foundations of Fluid Mechanics, S. W. Yuan, Prentice Hall of India Pvt Limited, New Delhi, 1976.
6. An Introduction to Fluid Dynamics, R. K. Rathy Oxford and IBH Publishing Company, New Delhi, 1976.

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ELECTIVE V (3)

ALGEBRAIC NUMBER THEORY

Objectives

1. To expose the students to the charm, niceties and nuances in the world of numbers.
2. To highlight some of the Applications of the Theory of Numbers.

UNIT I

Introduction – Divisibility – Primes – The Binomial Theorem – Congruences – Euler's totient - Fermat's, Euler's and Wilson's Theorems – Solutions of congruences – The Chinese Remainder theorem.

UNIT II

Techniques of numerical calculations – Public key cryptography – Prime power Moduli – Primitive roots and Power Residues –Congruences of degree two.

UNIT III

Number theory from an Algebraic Viewpoint – Groups, rings and fields – Quadratic Residues- The Legendre symbol (a/r) where r is an odd prime – Quadratic Reciprocity – The Jacobi Symbol (P/q) where q is an odd positive integer.

UNIT IV

Binary Quadratic Forms – Equivalence and Reduction of Binary Quadratic Forms – Sums of three squares – Positive Definite Binary Quadratic forms – Greatest integer Function – Arithmetic Functions – The Mobius Inversion Formula – Recurrence Functions – Combinatorial number theory .

UNIT V

Diophantine Equations – The equation ax+by=c – Simultaneous Linear Diophantine Equations – Pythagorean Triangles – Assorted examples.

TEXT BOOK

Ivan Niven, Herbert S, Zuckerman and Hugh L, Montgomery, An Introduction to the Theory of Numbers, Fifth edn., John Wiley & Sons Inc, 2004.
UNIT I   Chapter 1 and Chapter 2 : Sections 2.1 to 2.3
UNIT II   Chapter 2 : Sections 2.4 to 2.9
UNIT III   Chapter 2 : Sections 2.10, 2.11 and Chapter 3: Sections 3.1 to 3.3
UNIT IV   Chapter 3 : Sections 3.4 to 3.7 and Chapter 4
UNIT V   Chapter 5: Sections 5.1 to 5.4.

REFERENCES

1. Elementary Number Theory, David M. Burton W.M.C. Brown Publishers, Dubuque, Lawa, 1989.
2. Number Theory, George Andrews, Courier Dover Publications,1994.
3. Fundamentals of Number Theory, William J. Leveque Addison-Wesley Publishing Company, Phillipines, 1977.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.
M.Sc. Microbiology   Course Structure under CBCS
(For the candidates admitted from the academic year 2016-2017 onwards)

Sem	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks Int.	Marks Ext.	Total
I	Core Course – I (CC)	Fundamentals of Biological Sciences	6	4	3	25	75	100
	Core Course – II (CC)	General Microbiology	6	4	3	25	75	100
	Core Course – III (CC)	Virology	5	4	3	25	75	100
	Core Course – IV (CC)	General Biochemistry	5	4	3	25	75	100
	Core Practical – I (CP)	Fundamentals of Biological Sciences, General Microbiology, Virology, General Biochemistry	8	4	3	40	60	100
		TOTAL	**30**	**20**				**500**
II	Core Course – V (CC)	Microbial Physiology	6	5	3	25	75	100
	Core Course – VI (CC)	Environmental and Agricultural Microbiology	6	5	3	25	75	100
	Core Practical – II (CP)	Microbial Physiology, Environmental and Agricultural Microbiology	8	4	3	40	60	100
	Elective Course – I (EC)	Any one from the list	5	5	3	25	75	100
	Elective Course – II (EC)	Any one from the list	5	5	3	25	75	100
		TOTAL	**30**	**24**				**500**
III	Core Course – VII (CC)	Molecular Biology and Microbial Genetics	6	5	3	25	75	100
	Core Course – VIII (CC)	Immunology	6	5	3	25	75	100
	Core Practical – III (CP)	Molecular Biology and Microbial Genetics, Immunology	8	4	3	40	60	100
	Elective Course – III (EC)	Any one from the list	5	5	3	25	75	100
	Elective Course – IV (EC)	Any one from the list	5	5	3	25	75	100
		TOTAL	**30**	**24**				**500**
IV	Core Course – IX (CC)	Medical Microbiology	5	5	3	25	75	100
	Core Course – X (CC)	Bioprocess Technology	5	5	3	25	75	100
	Core Practical - IV (CP)	Medical Microbiology and Bioprocess Technology	8	4	3	40	60	100
	Elective Course – V (EC)	Any one from the list	5	4	3	25	75	100
	Project		7	4	-	-	-	100
		TOTAL	**30**	**22**				**500**
		GRAND TOTAL	**120**	**90**				**2000**

Note:

Project   : 100 Marks
Dissertation   : 80 Marks
Viva Voice   : 20 Marks

Core Papers   - 10
Core Practical - 4
Elective Papers - 5
Project   - 1

Note:

1. Theory   **Internal**   **25 marks**   **External**   **75 marks**

2. Practical   **"**   **40 marks**   **"**   **60 marks**

3. Separate passing minimum is prescribed for Internal and External

    a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
    b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
    c) The passing minimum not less than 50% in the aggregate.

Reference/Text Books contain the following details:

   I.   Name of the Author
  II.   Title of the Book
 III.   Name of the Publisher
 IV.   Year

S.No	Semester	Elective papers (Any one from the list)
1.	II	Biological Techniques
2.	II	Food and Dairy Microbiology
3.	II	Molecular Taxonomy and Phylogeny
4.	II	Quality control and IPR
5.	III	Medical Laboratory Technology
6.	III	Marine Microbiology
7.	III	Bioinformatics and Biostatistics
8.	IV	Genetic Engineering
9.	IV	Microbial Biotechnology
10.	IV	Microbial Nanotechnology

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FUNDAMENTALS OF BIOLOGICAL SCIENCES

OBJECTIVE

To enable the students to understand the basic knowledge in Biological Sciences

Unit I   Algae and Fungi

Thallophytes: Algae-General characteristics- Economic importance- Types of life cycle- Outline of various classifications. Fungi: General characteristics-Classifications and Economic importance

Unit II   Plant reproduction

General characteristics- Economic importance and outline of reproduction methods in Bryophytes, Pteridophytes and Gymnosperms.

Unit III   Plants

Basics of plant cell – Monocot and dicot - Classification of plant diversity – Classes of plant kingdom- Morphology: Inflorescence types -Racemose, cymose, and Mixed –Special types, Cyathium, Hypanthodium, Verticillaster and Thyrsus. Technical description of flower and floral diagram- Microsporangium and structure of *Polygonum* type embryo sac- Taxonomy: Systems of classification, (Artificial, Phylogenetic and Natural). Outline of Bentham and Hooker's classification.

Unit IV   Invertebrates

General characteristics and outline classification upto classes in Protozoa, Porifera, Coelenterata, Platyhelminthes and Ashelminthes; Economoic importance of invertebrates. Classification of Chordata – Characteristic features - protochordata class – Pisces and Amphibia up to orders - General characters - a brief study on Star fish.

Unit V   Vertebrates and pests control

Salient features of Reptilia, Aves and Mammalia- Economic importance of Vertebrates. Bioluminescence. Insect pests of rice, sugarcane, coconut, cotton, vegetables, fruits and stored products (with an example of each). Principles of insect control: physical, mechanical, chemical, biological and integrated methods of pest control.

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GENERAL MICROBIOLOGY

OBJECTIVE

To enable the students to understand the basic knowledge in Microbiology

Unit I   Ultra structure and function

Bacteria: Morphological types; cell wall – cell walls of Gram negative, Gram positive, halophiles. L-forms and Archaebacteria, Cell wall synthesis, cell membrane, capsule type's composition and function. Structure and function of flagella, fimbriae and pili, gas vesicles, chlorosomes, carboxysomes, magnetosomes and phycobilisomes. Reserve food materials - polyhydroxybutyrate, polyphosphates, cyanophycin and sulphur inclusions. Nuclear material - bacterial chromosomes and bacterial plasmids.

Unit II   Microbial Classification

Microbial Taxonomy - Definition and systematics, Nomenclature and identification. Haeckel's three kingdom classification, Whittaker's five kingdom approach. Three domain classification; Taxon, species, strain, type culture; Major characteristics used in taxonomy – morphological, physiological, metabolic, serological and molecular. Phylogenetic relationships – Cladogram, Dendrogram; Classification and salient features of bacteria according to Bergey's Manual of Determinative Bacteriology (9th edition).

Unit III   Fungi and Viruses

Fungi: Classification of fungi based on Alexopoulos system. - characteristics of Fungi – Filamentous, non-filamentous and dimorphic fungi -Morphology, structure and life cycle of *Aspergillus niger* and *Saccharomyces cerevisiae.* Parasitism, mutualism and symbiosis with plants and animals. Industrial uses of yeast and moulds. Viruses: ICTV system of classification, General properties, Morphology and ultra-structure of virus - capsid and their arrangements, types of envelopes and their composition, viral genome (RNA, DNA); Viroids, Prions - structure and importance.

Unit IV   Algae and Protozoans

Classification of Algae based on Fritsch system – General characters of Blue-green Algae (Cyanobacteria) Macroalgae - Biological and Economic importance of algae. Protozoa –structural characteristics, classification and reproduction.

Unit V   Cultivation methods of microbes

Isolation of different types of bacteria - Fungi – Actinomycetes - Cyanobacteria - Protozoa.   Physical and Chemical requirements for growth; Pure culture methods. Anaerobic culture techniques. Preservation methods of microbes. Type culture collections. Physical and chemical methods of controlling microorganisms.

REFERENCES

1. Alcamo E. Fundamentals of Microbiology. 6th Ed., Jones and Bartlett Publishers, New Delhi. 2001.
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12. Schlegel HG. General Microbiology, Cambridge University Press, UK. 2008.

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CORE COURSE III

VIROLOGY

OBJECTIVE

The course is designed to develop the student with enough knowledge about general account of viruses, bacteriophages, plant, animal and human viral diseases. To train up the student in gaining knowledge about instrumentation relevant to virology

Unit I   General Virology

Terminologies , Discovery, nomenclature, classification and properties of viruses, Morphology and ultra structure – capsid and their arrangement, envelope - types and their composition, viral genome – types and structure. Sub viral agents- viroids, prions, virusoids and satellite viruses.

Unit II   General Methods of Diagnosis and Serology

Characterization and Cultivation of viruses- Embryonated eggs, Primary and secondary cell cultures, monolayer cell cultures- cell strains, cell lines and transgenic system. Serological methods- haemagglutination, haemagglutination inhibition, complement fixation, immunofluorescence, ELISA, RIA and assay of viruses.

Unit III   Microbial Viruses

Bacteriophages- one step growth curve, Life cycle- Lytic and Lysogenic, Classification, Morphological groups - virulent dsDNA phage, ssDNA phage, phage lambda, Temperate and Transposable phage, Phage Mu, M13, T4, P1, Bacteriophage typing, Phage therapy (bacteriophage therapy), Cyanophages, Mycoviruses (Mycophages), Rhizobiophages.

Unit IV   Animal and Human Viruses

Classification, Multiplication, Epidemiology, Pathogenesis, Diagnosis, Prevention and Treatment of animal viruses- DNA containing viruses- Papovavirus, Simian Virus – 40 (SV40), Adenoviruses, Herpes viruses, Pox viruses. RNA containing viruses- Picornavirus, Togaviruses (Arboviruses), Rhabdoviruses, Orthomyxoviruses, Reoviridae, Retroviridae, Human Immuno Deficiency virus (HIV), SARS, Influenza viruses and Emerging viruses. Viral Vaccines, Interferon and Antiviral drugs.

Unit V   Plant Viruses

History, Classification and nomenclature of plant viruses, Transmission, Multiplication, symptoms and control of plant viral diseases- Tobamo virus group, Potex virus, Poty virus, Tymo virus, Tomato spotted wilt, Cauliflower mosaic virus, Potato leaf roll virus, Rice tungro virus, Mosaic disease of sugarcane.

REFERENCES

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15. Villarreal LP. Viruses and the Evolution of Life. ASM Press, Washington DC. 2005.

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CORE COURSE IV

GENERAL BIOCHEMISTRY

OBJECTIVES

To provide basic understanding of Cell and its function, chemical nature of biological macromolecules, metabolism and mechanism of molecular recognition including control.

Unit I   Cell and its function

Composition of living matter. Biochemistry of bacterial, animal and plant cell. Specialized components of microorganisms and their structure and function.

Unit II   Enzymes

Enzymes as biocatalysts, enzyme classification, specificity, active site, unit activity, isozymes. Enzyme kinetics: Michaelis – Menton equation for simple enzymes. Enzyme inhibition.

Unit III   Types of macromolecules and their biosynthesis

Structural features and chemistry of macromolecules. Nucleic acid – properties, biosynthesis of purines and pyrimidines - Structure of DNA and RNA. Proteins – classification – aminoacids - primary-secondary-tertiary – quaternary and three dimensional structure of proteins. Carbohydrates - mono, di, oligo and polysaccharides. Lipids and biomolecules: Fatty acids, properties, -oxidation - biosynthesis of cholesterol.

Unit IV   Bioenergetics

Bioenergetics and strategy of metabolism - flow of energy through biosphere, strategy of energy production in the cell. Oxidation – reduction reactions, coupled reactions and group transfer. ATP production, structural features of biomembranes, transport, free energy and spontaneity of reaction, G, G°, G' and equilibrium. Basic concepts of acids, base, pH and buffers.

Unit V   Metabolism – basic Concepts

Cell metabolism - catabolic principles and break down of carbohydrates, lipids, proteins and nucleic acids - vitamins and their role as coenzymes.

REFERENCES

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2. David E Metzler and Carol M Metzler. Biochemistry -The chemical reactions of living cells- Vol1and2.2nd edition. Harcourt/Academic press, Newyork. 2001.
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CORE PRACTICAL I

FUNDAMENTALS OF BIOLOGICAL SCIENCES, GENERAL MICROBIOLOGY, VIROLOGY, GENERAL BIOCHEMISTRY (P)

Fundamentals of Biological Sciences

➢ Stem and root sections of a monocot and a dicot plant
➢ Demonstration of computer program- Vertebrate Dissection Guides: The Frog.

General Microbiology

➢ Principles and methods of sterilization
➢ Direct microscopic observations of bacterial shape- cocci, rods and chains; fungal spore- mycelium, yeast budding
➢ Preparation of media: Nutrient broth, Nutrient agar, plates, slants and soft agar
➢ Micrometry - counting and measurements
➢ Pure techniques - serial dilution - pour plate, spread plate, streak plate methods and stab culture techniques
➢ Bacterial Staining methods - simple, Gram's, acid fast, flagella, capsule and spore.
➢ Fungal Staining methods - Lacto-phenol cotton blue
➢ Motility of bacteria
➢ Enumeration of bacteria/ yeast cell; viable count (plate count) , total count (Haemocytometer)
➢ Isolation and purification of cyanobacteria, actinomycetes and fungi

Virology

➢ Isolation and characterization of bacteriophage and cyanophage from natural resources
➢ Phage titration – T4 phage
➢ Study of virus infected plant samples- animal tissue culture- chick embryo fibroblast culture preparation
➢ Transmission methods – mechanical

General Biochemistry

➢ Preparation of buffer (Tris, phosphate, acetate buffer)
➢ Determination of (H+)ion concentration
➢ Verification of Beer-Lambert's law using coloured solution
➢ Preparation of standard graph for the following and estimating the concentration in a microbial sample i) glucose –anthrone method, ii) bovine

serum albumin (Lowry's method) and iii) Nucleic acid – DNA (diphenylamine method), RNA (Orcinol method).
➢ Separation of aminoacids by paper chromatography and identification of aminoacid
➢ Separation of proteins by PAGE, SDS – PAGE – Demonstration.

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CORE COURSE V

MICROBIAL PHYSIOLOGY

OBJECTIVES

To understand the growth, enzymology and physiological processes of microbes

Unit I   Cell structure and function

Bacterial cell wall - Biosynthesis of peptidoglycan - outer membrane, teichoic acid – Exopolysaccharides; cytoplasmic membrane, pili, fimbriae, S-layer. Transport mechanisms – active, passive, facilitated diffusions – uni, sym, antiports. Electron carriers – artificial electron donors – inhibitors – uncouplers – energy bond – phosphorylation.

Unit II   Microbial growth

Bacterial growth - Phases of growth curve – measurement of growth – calculations of growth rate – generation time – synchronous growth – induction of synchronous growth, synchrony index – factors affecting growth – pH, temperature, substrate and osmotic condition. Survival at extreme environments – starvation – adaptative mechanisms in thermophilic, alkalophilic, osmophilic and psychrophilic.

Unit III   Microbial pigments and photosynthesis

Autotrophs - cyanobacteria - photosynthetic bacteria and green algae – heterotrophs – bacteria, fungi, myxotrophs. Brief account of photosynthetic and accessory pigments – chlorophyll – fluorescence, phosphorescence - bacteriochlorophyll – rhodopsin – carotenoids – phycobiliproteins.

Unit IV   Carbon assimilation

Carbohydrates – anabolism – autotrophy – oxygenic – anoxygenic photosynthesis – autotrophic generation of ATP; fixation of CO_2 – Calvin cycle (C3) – C4 pathways. Respiratory metabolism – Embden Mayer Hoff pathway – Entner Doudroff pathway – glyoxalate pathway – Krebs cycle – oxidative and substrate level phosphorylation – reverse TCA cycle – gluconeogenesis – Fermentation of carbohydrates – homo and heterolactic fermentations.

Unit V   Spore structure and function

Cell division – endospore – structure – properties – germination. Microbial sporulation and morphogenesis – Bacteria including cyanobacteria and actinobacteria, fungi and algae.

REFERENCES

1. Caldwell DR. Microbial Physiology and metabolism, Wm. C. Brown Publishers, USA 1995.
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CORE COURSE VI

ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

OBJECTIVES

To enable the students to get exposure on various aspects of environmental and agricultural microbiology

Unit I   Air microbiology and Biogeochemical cycles

Aerobiology- Significance of air microflora - Microbial air pollution- sources, biological indicators and effects on plants and human beings. Enumeration of bacteria from air, Air sampling devices, Outline of Airborne diseases (Bacterial, Fungal and Viral), Air sanitation. Biogeochemical cycles -Nitrogen, Carbon, Phosphorous, Sulphur, Iron and their importance.

Unit II   Aquatic microbiology

Microbes in marine and fresh water environment – eutrophication – Water pollution – sources and nature of pollutants in water – sewage – treatment of liquid waste – primary, secondary and tertiary treatment – water borne diseases – Assessment of water quality – BOD and COD. Solid waste treatment – saccarification and pyrolysis.

Unit III   Recycling of Liquid and Solid wastes

Recycling of Liquid and Solid wastes-Composting-Biogas, Mushroom and SCP production from waste. Biodegradation of complex polymers (Cellulose, Hemicellulose, Lignin, Chitin and Pectin), Bioremediation (*In-situ, Ex-situ*, Intrinsic), Bioaugmentation and Biostimulation. Bioleaching (Copper and Uranium) -Xenobiotics degradation (Heavy metals). A brief note on panchakavya.

Unit IV   Soil Microbiology

Microbial association with plants - Phyllosphere, Rhizosphere, Mycorrhizae, nitrogen fixing organism – symbiosis, asymbiosis, associate symbiosis – phosphate solubilizers – application of biofertilizers in agriculture. Biology of nitrogen fixation – genes and regulations in *Rhizobium.*

Unit V   Plant diseases and its control

Bacterial, viral and fungal plant pathogens. Morphological, physiological changes with reference to disease establishment in plants – plant protection – phenolics – phytoalexins and related compounds. Disadvantages of chemical pesticides. Microbial pesticides- types, mechanisms, advantages and limitations.

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CORE PRACTICAL II

MICROBIAL PHYSIOLOGY, ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY (P)

Microbial Physiology

- Bacterial growth curve – Turbidity method
- Effect of temperature, pH and salinity on bacterial growth
- Starch, casein, gelatin and lipid hydrolysis tests
- Biochemical tests: IMViC, TSI, Urease, Catalase, Oxidase, Hydrogen sulphide, coagulase, nitrate reduction tests
- Carbohydrate fermentation test

Environmental and Agricultural Microbiology

- Enumeration of Microbial population from rhizosphere and Non-rhizosphere soil
- Localization of Arbuscular Mycorrhizae (AM)
- Isolation of *Azospirillum* and *Azotobacter* from soil
- Isolation of *Rhizobium* sp. from root nodules of legumes
- Isolation of phosphate solubilizing bacteria from soil
- Isolation of Cyanobacteria from agricultural soil and water
- Isolation of bacterial and fungal pathogens from plants
- Isolation and identification of air-borne microbes using Andersen sampler.
- Determination of BOD and COD of polluted and pond water.
- Assessment of water quality by MPN technique
- Demonstration of the plant diseases: a) Tobacco mosaic; b) Bacterial blight of paddy; c)Downy mildew of bajra; d) Powdery mildew of cucurbits; e) Head smut of sorghum; f)Red rot of sugar cane.

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BIOLOGICAL TECHNIQUES

OBJECTIVES

To educate the students with the basic principles of biological techniques so as to develop their research aptitude and career prospects.

Unit I   Microscopic techniques

Components of microscopes - Basic principles and methods of Bright field, Dark field, Phase contrast, Fluorescence, Polarization and confocal microscopes. Electron Microscopy – Principle, Techniques and applications of Transmission Electron microscope (TEM), Scanning Electron Microscope (SEM) and Atomic Force Microscope (AFM). Microtomy – Basic and Freezing microtome – specimen preparation.

Unit II   Analytical Techniques Spectroscopic methods

UV- Visible, Atomic Absorption Spectrophotometer, Atomic Emission Spectroscopy. Centrifugation – Principle, types and applications. Electro-analytical methods- Potentiometric, Conductimetric, Coulometric and Voltametric analyses. Biosensors. Principles of radioactivity, GM and LS counter.

Unit III   Chromatographic Techniques

Chromatography - Paper, Thin layer, Ion exchange, affinity and gel permeation - Principle, preparation of columns, adsorption and elution. GC, GC - MS and HPLC - principle and their applications.

Unit IV   Electrophoresis and its Applications

Electrophoresis – Principle and applications of Agarose and Pulse field gel electrophoresis, counter current and rocket immuno electrophoresis, SDS-PAGE and 2D gel electrophoresis.

Unit V   Molecular Techniques

Isolation and quantification of nucleic acid – DNA, RNA and Plasmids. Amplification of DNA - Polymerase chain reaction and Real time and reverse transcriptase PCR. Gene cloning techniques – Restriction digestion and phosphatase treatment of cloning vectors. Gene transfer mechanisms – chemical and electroporation. Method of detection of clones –colony hybridization, Blue - White selection and immunochemical detection

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FOOD AND DAIRY MICROBIOLOGY

OBJECTIVES

To make the students to learn about microbial illness in foods and importance of microbial fermented foods.

Unit I   Food and microbes

Types of microorganisms in food – Bacteria, molds, yeast and protozoa. Source of contamination- Factors influencing microbial growth in food.

Unit II   Food fermentation

Food fermentations: methods of fermentations and organisms used -Cheese, bread, wine, beer. Fermented vegetables.   Food and enzymes from microorganisms - single cell protein and mushrooms. Prebiotics, Probiotics and synbiotics. Advantages of probiotics.

Unit III   Fermented food products

Contamination, spoilage and preservation of cereals and cereals products, sugar and sugar products, vegetables, fruits, meat and meat products, Fish and other sea foods, egg and poultry, dairy and fermentative products (ice cream).

Unit IV   Food preservation method

Food preservations: principles- methods of preservations- Physical and chemical methods. Canning: classification of can, structure of cans, canning of food items, Thermal process time calculations for canned foods.

Unit V   Food borne diseases and control

Food borne diseases and food poisoning. General principles underlying food spoilage and contamination – *Staphylococcus, Clostridium, Escherichia coli* and *Salmonella* infections, Hepatitis, Amoebiosis and Mycotoxins. Spoilage in canned foods. Food sanitation and control measures, HACCP, GMP, GLP.

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MOLECULAR TAXONOMY AND PHYLOGENY

OBJECTIVES

To gain knowledge about microbial taxonomy and molecular phylogeny

Unit I   Microbial Taxonomy

Introduction to microbial taxonomy – morphological, biochemical and molecular taxonomy. Basic concepts of numerical taxonomy. Positive and negative aspects of each taxonomical methods. Morphological phylogeny.

UNIT II   Biochemical and molecular taxonomy

Chemotaxonomy - fatty acid, protein finger printing, Isozyme typing, pigments andpolyamines. Biochemical phylogeny. Molecular taxonomy - G +C content, DNA –DNA hybridization, Plasmid profiles, RFLP, RAPD, STRR and LTRR, REP –PCR, rRNA based DNA finger printing methods

Unit III   16S rRNA based finger printing

Types of rRNA - 23s rRNA, 16S rRNA and 5S rRNA. Isolation of DNA, amplification of 16S rDNA using PCR technique. Sequencing of 23s rRNA, 16S rRNA and 5S rRNA. Importance of 16S rRNA in identification of prokaryotes. Methods of 16S rRNA / rDNA fingerprinting.

UNIT IV   Sequence analysis

Submission of rDNA sequences in GenBank – Bankit and Sequin guidelines. NCBI, EMBL and DDBJ – retrieving sequences. RNA structure prediction, Restriction enzyme patterns. Ribosomal Database Project - Designing primers and probes. Sequence comparison, alignment and data base searching – ClastalW, FASTA and BLAST. DNA barcoding.

UNIT V   Molecular phylogeny

Introduction to Molecular phylogeny – tree terminology, software programs for making phylogenetic trees – MEGA, Phylib, RAPDistance. Cladogram, additive trees and ultrametric trees, rooted, unrooted trees and tree shapes.

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QUALITY CONTROL AND IPR

OBJECTIVES

To gain knowledge about intellectual property rights, copyrights, trademarks and geographical limitation. Explain various concepts of biotechnological inventions and their commercialisation. Ethics of biological Goods manufacturing practice, usage of animals, plants and their biosafety assessment.

Unit I   Bioethics

Legality, Morality and Ethics, the principles of bioethics, autonomy, human rights, beneficience, privacy, justice and equality.

Unit II   Biosafety

Concept and issues, rational vs subjective, perceptions of risk and benefits of Biosafety. Biosafety concern levels – Individual, institution, society, region, country and world- Lab associated Infections.

Unit III   Biosafety Assessment (BSA)

BSA of biotechnology and pharmaceutical products such as drugs, vaccines and biomolecules.

Unit IV   Quality Control

Quality control in food process technology- WHO Standards- Quality Control in Dairy product technology- Quality control in portable water.

Unit V   IPR

GATT and IPR, IPR in India, WTO Act, Convention on Biodiversity (CBD), patent cooperation treaty (PCT), forms of patents and patentability, process of patenting, Indian and international agencies involved in IPR and patenting, Global scenario of patents and India's position, patenting of biological material, GLP and GMP.

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CORE COURSE VII

MOLECULAR BIOLOGY AND MICROBIAL GENETICS

OBJECTIVES

In addition to the most essential fundamentals of the subject, the paper aims to impart the current updated knowledge on molecular genetics of prokaryotes. It also endeavours to provide the required fundamental details on eukaryotic molecular genetics.

Unit I   Genetic material, DNA replication and repair

Identification of genetic material (Griffith, Avery and Hershey and Chase experiments). Organization of genetic material: Bacteria – Eukaryotes: nucleus and nucleosomes, lamp brush and giant chromosomes. DNA replication - Meselson – Stahl experiment, Molecular mechanisms of DNA Replication – bidirectional and rolling circle replication. Differences between prokaryotic and eukaryotic replication. Plasmids – types, structure and replication. Inhibitors of DNA replication - DNA repair – mechanism of excision repair, SOS repair and mismatch repair.

Unit II   Transcription and translation

Process of transcription – initiation, elongation – termination. Synthesis of mRNA in prokaryotes and eukaryotes. RNA splicing. Synthesis of rRNA and tRNA. RNA processing – capping and polyadenylation. Inhibitors of transcription. Genetic code, process of translation – initiation, elongation and termination. Signal sequences and protein transport. Inhibitors of translation.

Unit III   Regulation of gene expression

Organization of Genes in Prokaryotes and Eukaryotes - Introduction - Operon concept, *lac, trp,* arabinose operons, promoters and repressors. Regulation of gene expression – Transcriptional control – promoters, terminators, attenuators and anti terminators; Induction and repression; Translational control – ribosome binding, codon usage, antisense RNA; post-transcriptional gene silencing – RNAi.

Unit IV   Gene transfer and genetic recombination mechanisms

Transformation – competence cells, regulation, general process; Transduction – general and specialized; Conjugation – Discovery, mechanism of F^+ *v/s* F^-, Hfr^+ *v/s* F^-, F' *v/s* F^-, triparental mating, self transmissible and mobilizable plasmids, pili. Linkage and genetic maps – genetic mapping of T4 phage. C-value paradox. Hardy Weinberg Equilibrium.

Unit V   Mutation and transposable elements

Types and molecular basis of mutation– Agents of mutation - Importance of mutations in evolution of species. Discovery of insertion sequences, complex and compound transposons – T10, T5, and retroposon – Nomenclature-Insertion sequences – Mechanism – Transposons of *E. coli,* Bacteriophage and Yeast. Importance of transposable elements in horizontal transfer of genes and evolution.

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CORE COURSE VIII

IMMUNOLOGY

OBJECTIVES

The aim of the course is to teach the types of immunity, immune system, antigen, antigen - antibody reaction, T and B cell activation, lymphokines and cytokines, hyper sensitivity reaction, immune deficiency disorders, immunohematology and transplantation of immunity.

Unit I   Immune system

History of Immunology, Types of immunity- innate and acquired. Humoral and cell mediated immunity. Central and peripheral lymphoid organs- Thymus, bone marrow, spleen, lymph nodes and other peripheral lymphoid tissues GALT. Haematopoiesis, Cells of the immune system- lymphocytes, mononuclear phagocytes- dendritic cells, granulocytes. NK cells and mast cells, cytokines.

Unit II   T and B cell, Antigen –antibody reactions

T and B-cell receptors, Antigen recognition- processing and presentation to T-cells. Interaction of T and B cells. Antigen and antibody – properties, types and functions. Antigen –antibody reactions - Precipitation, agglutination, complement fixation, RIA, ELISA, Western blotting and immunofluorescence.

Unit III   T and B cell activation

B cell receptor complex, B cell maturation, antibody diversity, understanding self – non self discrimination, T_H cell subpopulation, organization of T cell receptor, cell mediated effectors responses. Complement system: Basics of complement protein - different pathways of complement activation - classical and alternative.

Unit IV   MHC, Cytokines and Lymphokines

Structure of MHC molecules- Human Leucocyte Antigen- Functions of MHC. Cytokine and lymphokines structure and their receptors. Hypersensitivity reaction and their types. Auto immune disorders, transplantation and cancer immunology.

Unit V   Immunotechnology and its applications

Production of polyclonal, monoclonal antibodies and phage display - techniques and applications. Immunization practices- active and passive

immunization. Vaccines- killed and attenuated, recombinant vaccines, DNA and peptide vaccines. Applications of immunotechniques – Flow cytometry, Immunoelectron microscopy, Immunohistochemistry and Bioplex array.

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CORE PRACTICAL III

MOLECULAR BIOLOGY AND MICROBIAL GENETICS, IMMUNOLOGY (P)

Microbial Genetics and Molecular Biology

- Isolation of antibiotic resistant microbes
- Isolation of mutants by spontaneous mutation – Gradient plate technique
- Isolation of auxotrophic and antibiotic resistant mutants by physical and chemical mutagens
- Competent cell preparation and Bacterial transformation
- Generalized transduction in *E. coli.*
- Isolation of microbial genomic DNA
- Isolation of plasmids from *E.coli* (mini preparation).
- Characterization of plasmid DNA by agarose gel electrophoresis.
- Restriction digestion and Ligation of DNA
- Polymerase Chain Reaction
- Blotting techniques (Southern, Northern, Western and Dot blottings)

Immunology

- Collection of venous blood from human and separation, preservation and storage of serum/plasma
- Identification and enumeration of RBC, WBC and total cell count.
- Estimation of Haemoglobulin content
- Agglutination reactions - blood grouping and WIDAL (slide and tube tests)
- Immunoelectrophoresis – Graber and William's technique.
- Counter- current immuno electrophoresis
- Précipitation reaction – Ouchterlony's Double Immuno Diffusion technique.
- Serum electrophoresis
- Enzyme Linked Immunosorbent Assay (ELISA)
- Handling of Laboratory animals and raising antibodies.
- Dissection of primary and secondary lymphoid organs in a selected laboratory animal

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ELECTIVE COURSE

MEDICAL LABORATORY TECHNOLOGY

OBJECTIVES

- To train students to work as laboratory technicians and assist pathologist.
- To encourage and prepare the graduates to improve their standard in medical sectors.

UNIT I   Laboratory

Professional conduct, code of behaviour, staff health, safety and immunization, Reception, Labeling and Disposal of specimen and culture. Laboratory hazards and safety, First aid, Quality control in laboratory works.

UNIT II   Clinical pathology

Urine analysis: Physical, chemical and microscopic examination, specific gravity, Test for albumin, acetone, bile salt and pigments, phosphate, urobilinogen, occult blood and urine deposits. Stool and Sputum analysis: Physical, chemical and microscopic examination (protozoa, helminthes). Examination of body fluids-CS, acidic and plural, hydatid fluids.

UNIT III   Hematology

Anaemia - definition, types and investigation. Enumeration and investigation of RBCs, WBCs and Platelets. Blood coagulation and disorder, ESR determination.

UNIT IV   Blood banking and Serology

Blood and Rh grouping, blood and plasma collection, screening and storage, safe transfusion of blood cross matching, Quality control, blood donation program, donor motivation and screening. Serology - WIDAL, RPR and ELISA tests.

UNIT V   Clinical Microbiology and Biochemistry

Isolation and identification of microbes from clinical specimens - typhoid and bacillary dysentery, Antibiotic sensitivity test. Estimation of sugar from blood and urine. GCT. Estimation of Proteins and Cholesterol from blood.

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ELECTIVE COURSE

MARINE MICROBIOLOGY

OBJECTIVES

This subject aims to introduce the students to understand microbial diversity, significance, dynamics of marine environment, Marine food borne pathogens, and marine microbial products.

Unit I   Marine Microbial Habitats and Diversity

Marine environment–properties of seawater , chemical and physical factors of marine environment-Ecology of coastal, shallow and deep sea microorganism - significance of marine microflora. Diversity of microorganism - Archaea, bacteria, actinobacteria, cyanobacteria, algae, fungi, viruses and protozoa in the mangroves and coral environments - Microbial endosymbionts – epiphytes - coral-microbial association, sponge-microbial association.

Unit II   Cultivation of Marine microbes and Nutrient cycling.

Methods of studying marine microorganisms- sample collection- isolation and identification: Cultural, Morphological, physiological, biochemical and Molecular characteristics- Preservation methods of marine microbes. Role of microorganisms in carbon, nitrogen, phosphorous and sulphur cycles in the sea under different environments and mangroves.

Unit III   Marine extremophiles and Bioremediation

Survival at extreme environments – starvation – adaptive mechanisms in thermophilic, alkalophilic, osmophilic and barophilic, psychrophilic microorganisms – hyperthermophiles, halophiles and their importance. Microbial consortia and genetically engineered microbes in bioremediation of polluted marine sites - heavy metals and crude oil. Biofouling and their control.

Unit IV   Seafood microbiology

Pathogenic microorganisms, distribution, indicator organisms, prevention and control of water pollution, quality standards, International and National standards. Microbiology of processed finfish and shellfish products. Rapid diagnosis of contamination in seafoods and aquaculture products.

Unit V   Marine microbial products

Marine microbial products – Carrageenan, agar-agar, sea weed fertilizers – Astaxanthin, β carotene – enzyme – antibiotics – antitumour agents-

polysaccharide – biosurfactants and pigments. Preservation methods of sea foods. Quality control and regulations for microbial quality of fishes, shellfish and Marine living resources used for food and drugs

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ELECTIVE COURSE

BIOINFORMATICS AND BIOSTATISTICS

OBJECTIVE

- To gain insight about computer based technology for the study of biological molecules.
- To equip statistical skills to solve biological problems.

Unit I   Biology and computer

Basics of computers –types, servers, operating systems, UNIX, Linux. Finding scientific articles - Pubmed.

Unit II   Genomics

Biological databases NCBI, EMBL, DDBJ – sequencing genomes - pairwise sequence comparison - BLAST and FASTA. Multiple sequence alignments, Phylogenetic alignment - Phylip.

Unit III   Proteomics

Protein Data Bank, Swiss- prot – PIR, SCOP, CATH - secondary structure prediction – Chou Fassman, GOR method -predicting 3 D structure - protein modeling, abinitio - visualization tool RASMOL.

Unit IV   Biostatistics I

Introduction – Population and sample – Variables – Collection and presentation of data – Descriptive statistics - Measures of Central tendency – Mean (arithmetic, harmonic and geometric) Median and Mode – Measures of dispersion – range, mean deviation, variance and standard deviation.

Unit V   Biostatistics II

Inferential statistics – Probability and distributions – Poisson, Binomial and Normal distribution – Chi-square test – Hypothesis test - Student's t-test – Correlation and Regression – ANOVA.

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CORE COURSE IX

MEDICAL MICROBIOLOGY

OBJECTIVES

To impart and explain the students with the advanced knowledge on the characteristics of medically important human microbial pathogens with focus on the diseases caused by them, disease pathogenesis, lab diagnosis, prophylaxis, control etc.

UNIT I   Introduction to Medical Microbiology

Significance of Microbiology in Medicine, Classification of medically important microbes, Normal microbial flora of the human body: normal flora of skin, eye, throat, gastrointestinal tract and urogenital tract - Infections- Sources, types – opportunistic, nosocomial and community acquired infections - Mode of transmission, carriers and their types – investigation of epidemic diseases.

Unit II   Medical Bacteriology

Morphological, cultural and biochemical characteristics of and epidemiology, mechanism of bacterial pathogenesis, lab diagnosis, prophylaxis and control of medically important diseases caused by*: Staphylococcus aureus,* Group A Streptococci, *Corynebacterium diphtheriae, Clostridium tetani, Bacillus anthracis, Leptospira interrogans, Treponema pallidum, Mycobacterium tuberculosis, Escherichia coli, Vibrio cholerae, Niesserriae, Haemophilus influenza, Helicobacter pylori, Pseudomonas* and *Salmonella.* Brief note on Chlamydia, Rickettsia Mycoplasama, anaerobic bacterial infections, Atypical Mycobacterium, Zoonotic bacterial pathogens, Antibiotic susceptibility test: Kirby – Bauer disk diffusion method.

Unit III   Medical Mycology

Morphological and cultural characteristics of and epidemiology, mechanism of fungal pathogenesis, lab diagnosis and treatment of medically important diseases caused by*:* Superficial mycosis – *Tinea versicolor.* Cutaneous mycoses: *Microsporum, Trichophyton, Epidermophyton.* Subcutaneous mycoses: Sporotrichosis, Chromoblastomycosis, Zygomycosis. Systemic Mycoses – *Histoplasma capsulatum, Blastomyces dermatitidis, Cryptococcus neoformans, Coccidioides immitis, Paracoccidioides brasiliensis.* Opportunistic mycoses: Candidiasis, Cryptococcosis and Aspergillosis. Antifungal susceptibility testing.

Unit IV   Medical Virology
General properties of and epidemiology, pathogenesis, lab diagnosis and treatment of medically important viral diseases caused by: Influenza viruses, Measles, Mumps, Rubella, Chicken Pox, Hepatitis A,B,C, Dand E, Poliomyelitis, HIV, Human Papilloma Virus, Rabies, Yellow fever, Dengue and Japanese Encephalitis viruses. Brief note on oncogenic viruses.

Unit V   Medical Parasitology and emergence of antibiotic resistant pathogens

Morphology of, and pathogenesis, laboratory diagnosis and treatment of medically important protozoan diseases caused by: *Entomoeba histolytica, Giardia lamblia, Trichmonas vaginalis, Plasmodium vivax, Leishmania donovani, Taenia solium, Ascaris lumbricoides, Ancyclostoma duodenale* and *Wuchereria bancrofti.* Brief note on the emergence of MDR bacterial, fungal pathogens, extremely drug resistant (XDR) pathogens and superbugs.

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6. Ananthanarayanan R and Jeyaram Panicker CK. Medical Microbiology, Orient Publications, New Delhi.1990.
7. Ananthanarayanan R and Jeyaram Panicker CK. Textbook of Medical Parasitology. 5th Ed. Jay Pee brothers Medical publisher, Pvt Ltd., New Delhi. 2004.
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9. Monica Cheesbrough. District Laboratory Practice in Tropical Country. Part 1 and 2. Low price Ed., Cambridge University Press. 2003.
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13. John P. Harley Microbiology Lab Manual, 7th edition McGraw Hill Medical Publication division. 2007.
14. Prescott, Harley and Klein's. Microbiology, 7th edition McGraw Hill Medical Publication division. 2007.
15. Rajan S. Medical Microbiology, MJP Publishers Chennai. 2007.
16. Topley and Wilsons. Principles of Bacteriology, Virology and Immunology. Edward Arnold, London. 1995.

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CORE COURSE X

BIOPROCESS TECHNOLOGY

OBJECTIVES

To learn the process involved in the industrial production of microbial products. Understand the strategies of strain selection and improvement. Understand the process of fermentation. Familiarize with types of fermentors and downstream processing. To learn the role of microbes in food preparation, preservation and spoilage. To understand the quality of food and products.

Unit I   Industrially important microbes and their improvement

Screening methods for industrial microbes – detection and assay of fermentation products– classification of fermentation types – strain selection and improvement. Mutation and recombinant DNA techniques for strain improvement. Preservation of cultures after strain improvement.

Unit II   Fermenter – types and function

Fermenters – Basic functions, design and components – asepsis and containment requirements – body construction and temperature control – aeration and agitation systems – sterilization of fermenter, air supply, and medium; aseptic inoculation methods – sampling methods, valve systems – a brief idea on monitoring and control devices and types of fermenters. Photobioreactors.

Unit III   Fermentation process

Growth of cultures in the fermenter. Importance of media in fermentation, media formulation and modification. Kinetics of growth in batch and continuous culture, specific growth rate, steady state in a chemostat, fed-batch fermentation, yield of biomass, product, calculation for productivity, substrate utilization kinetics. Fermentation process: Inoculum development. Storage of cultures for repeated fermentations, scaling up of process from shake flask to industrial fermentation.

Unit IV   Food microbiology

Microbiology of fermented milk – starter cultures, butter milk, cream, yoghurt, kafir, kumiss, acidophilus milk and cheese. Microbes as sources of food (*Spirulina, Saccharomyces cerviceae, Rhizopus* sp.). Food intoxications: *Staphylococcus aureus, Clostridium botulinum* and mycotoxins; Food infections: *Bacillus cereus, Vibrio parahaemolyticus, Escherichia coli,* Salmonellosis, Shigellosis and *Campylobacter jejuni* – spoilage of canned foods – Detection of

spoilage and characterization. Food sanitation in food manufacture and in the retail trade; Food control agencies and their regulations.

Unit V   Legal protection and IPR

GATT and IPR, forms of IPR, IPR in India, WTO, TRIPS Convention on Biodiversity (CBD), Patent Co-operation Treaty (PCT), forms of patents and patentability, process of patenting, Indian and international agencies involved in IPR and patenting, Global scenario of patents and India's position, patenting of biological materials.

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3. Banwart GJ. Basic Food Microbiology. 2nd edition, CBS Publishers and Distributors, New Delhi. 2004.
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6. Frazier WC and Westhoff DC. Food Microbiology 4th edition, Tata McGraw – Hill Publishing Company Limited – New Delhi. 1997.
7. Kalaichelvan PT and Arul Pandi. Bioprocess Technology, MJP Publishers, Chennai .2007.
8. Patel AH. Industrial Microbiology. Published by Macmillan India Ltd., New Delhi. 2005.
9. Peppler HJ and Perlman D. Microbial Technology – Fermentation Technology. 2nd edition, Published by Academic Press (An imprint of Elsevier). Volume I and II. 2004.
10. Sivakumar PK, Joe MM and Sukesh K. An introduction to Industrial Microbiology. First edition, S. Chand and Company Ltd, New Delhi. 2010.
11. Stanbury PF, Whitaker A and Hall SJ. Principles of Fermentation Technology, 2nd edition, Aditya Book (p) Ltd., New Delhi. 1999.
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CORE PRACTICAL IV

MEDICAL MICROBIOLOGY AND BIOPROCESS TECHNOLOGY (P)

MEDICAL MICROBIOLOGY

- Collection, coding and transport of clinical specimens for microbiological examinations
- Isolation and identification of upper respiratory tract bacterial pathogen – *Streptococcus pyogenes*
- Isolation and identification of *Staphylococcus aureus* from clinical specimen
- Isolation and identification of lower respiratory tract bacterial pathogen – *Pseudomonas aeuroginosa*
- Isolation and identification of gastrointestinal bacterial pathogens – *Salmonella, Shigella* and *Vibrio*
- Isolation and identification of urinary tract pathogens – *E. coli and Klebsiella pnemoniae*
- Isolation and identification of bacterial pathogen causing enteric fever – *Salmonella typhi, S. paratyphi* A and B
- Isolation and identification of clinically important yeast and molds - *Candida albicans, Cryptococcus neoformans, Fusarium spp. and Aspergillus spp.*
- Antibiotic susceptibility test – Disc diffusion method (Kirby –Bauer)
- Determination of MIC of any one antibiotic against any one bacterial species.
- Examination of blood smears for *Plasmodium spp.*
- Examination of faeces for parasites

BIOPROCESS TECHNOLOGY

Production, quantification, extraction and characterization of the following
- Alcohol - Wine
- Organic acid – Citric acid – Solid state and submerged fermentation.
- Amino acid– Glutamic acid.
- Extra cellular enzymes – Protease by submerged fermentation and Cellulase by solid state fermentation.

REFERENCES

1. Monica Cheesbrough. District Laboratory Practice in Tropical Countries - Part I and II 2nd edition. Cambridge University Press, New Delhi. 2006.
2. Rajan S. Manual for Medical Laboratory Technology. Anajanaa Book House, Chennai. 2012.
3. Betty A Forbes, Daniel F Sahm and Alice S Weissfeld. Bailey and Scott's Diagnostic Microbiology, Mosby Elsevier. 12th edition. 2007.
4. Mackie and McCartney. Practical Medical Microbiology, South Asia Edition. 14th edition. 2006.
5. Rajan S and Selvi Christy R. Experimental Procedures in Life Sciences. Anajanaa Book House, Chennai. 2011.

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GENETIC ENGINEERING

OBJECTIVES

To impart the learners with the advanced knowledge and growing significance of genetic and protein engineering/ DNA cloning. To educate the students with the advanced tools, techniques and methods employed in DNA/ gene cloning and expression as well as in protein engineering strategies.

UNIT I   Introduction to gene cloning strategies

Gene cloning: Steps - Isolation and purification of nucleic acids (genomic DNA, RNA and Plasmids) – Methods of handling and quantification of DNA and RNA. Analyses of DNA/ RNA and proteins: Agarose Gel and SDS – PAGE - Blotting – types of blotting – Southern, Northern and Western Blotting. Chromosome walking.

UNIT II   Tools and methods in gene cloning

Restriction endonucleases – nomenclature, classification and characteristics - DNA methylases – DNA polymerases - Ligases – Adapters, Linkers and Homopolymer tailing – Gene transfer techniques: electroporation, microinjection, protoplast fusion and microparticle bombardment – Screening for recombinants: Direct: Insertional inactivation, plaque phenotype and indirect methods: Immunochemical detection, nucleic acid hybridization, Dot and Colony Blotting. Methods of DNA cloning. Construction and applications of Genomic DNA and cDNA libraries.

UNIT III   Gene cloning vectors for prokaryotes and eukaryotes

Cloning Vectors – properties - types of vectors – plasmids – host range and incompatibility – plasmids vectors for cloning in *E. coli* (pBR322 and derivatives, pUC vectors and pGEM3Z) - Vectors constructed based on bacteriophages (M13 and Lambda), cosmids, phasmids, phagemids and BACs - Eukaryotic vectors - Yeast vectors – animal and plant vectors – expression vectors: *E. coli lac* and T7 phage promoter based vectors - shuttle vectors - Expression of foreign genes in bacteria, animal, plant, algae and fungi – merits and demerits.

UNIT IV   Techniques in genetic engineering

Characterization of cloned DNA: Restriction mapping - restriction fragment length polymorphism (RFLP) - Polymerase chain reaction (PCR) – Principles,

types and their applications. DNA sequencing: Primer walking, Chemical method: Maxam and Gilbert method, Sanger's method: traditional (dideoxy) and automated sequencing methods. Pyrosequencing – DNA chips and micro array.

UNIT V   Protein engineering and techniques

Site directed mutagenesis – methods - Design and construction of novel proteins and enzymes, Basic concepts in enzyme engineering, engineering for kinetic properties of enzymes. protein folding, protein sequencing, protein crystallization. Data analysis - Mass spectrometry based methods for protein identification, MALDI-TOF, 2D gel electrophoresis – Applications of protein engineering: Examples of engineered proteins.

REFERENCES

1. Old RW and Primrose SB. Principles of gene manipulations – An introduction to genetic engineering, 5 ed. University of California Press, 1995.
2. Winnacker EL. From Genes to Clones. – Introduction to gene technology. Wiley-Blackwell. 1987.
3. Nicholl DST. An introduction to genetic engineering. Cambridge University Press.1994.
4. Brown TA. Gene Cloning. London; New York: Chapman and Hall.1995.
5. Pinler A.   Genetic engineering of microorganisms. Protein Structure, Stability and Folding by Kenneth P. Murphy. Published by Humana Press Inc. 2001.
6. Jeffrey L, Cleland and Charles S Craik. Protein Engineering Principles and Practice Published by Wiley-Liss Inc. 1996.
7. Paul R Carey. Protein Engineering and Design, Published by Academic Press Inc. 1996.
8. Glick BR. Molecular Biotechnology – Principles and applications of recombinant DNA. 3rd edition, ASM Press, Washington, DC. 2003.
9. Old RW and Primrose SB. Principles of Gene Manipulation - An Introduction to Genetic Engineering. 5th edition. Blackwell Scientific Publications, London. 2003.
10. Winnacker EL. From Genes to Clones – Introduction to Gene Cloning, 1st edition. Indian reprint, Panima publishing Corporation, New Delhi. 2003.
11. Nicholl D. An introduction to genetic engineering. 3rd Cambridge University Press, Cambridge. 2008.
12. Brown TA. Genomes. 2nd Ed, John Wiley and sons. 2012.
13. Brown TA. Gene Cloning and DNA analysis introduction. 4th Ed. Blackwell Science Ltd., London. 2001.

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ELECTIVE COURSE

MICROBIAL BIOTECHNOLOGY

OBJECTIVES

To impart the potential applications of microbial and molecular biotechnology in medicine, agriculture and various other current industrial processes.

UNIT I   Microbial production of therapeutic agents and vaccines

History – Microbial vs molecular biotechnology and Commercialization – concerns and consequences - Pharmaceuticals - interferons and growth hormones, enzymes: DNase I and alginate lyase, Monoclonal antibodies - HIV therapeutic agents. Subunit vaccines: Herpes simplex virus, Foot and mouth disease virus, TB, Peptide vaccines – genetic immunization – vector vaccines.

UNIT II   Microbial production of commercial products

Microbial production of restriction endonucleases: *Pst*I, Dye: Indigo, Antibiotics: Synthesis of Novel antibiotics. Biopolymers: Xanthan gum and PHA. Microbial production of alcohol, lactic acid, streptomycin, L- glutamic acid, lipase and riboflavin.

UNIT III   Production of PGPR, biofertilizers and biocontrol agents

Plant growth promoting bacteria (PGPR) – genetic engineering of nitrogenase gene cluster, hydrogenase and Nodulation. Mass cultivation of microbial biofertilizers: Cyanobacteria (*Sprirulina*), *Azolla* and other nitrogen fixers (*Rhizobia, Azospirillum, Azotobacter* and VAM) Biocontrol of pathogens: Siderophores, antibiotics and enzymes. Release of genetically engineered organisms - Ice nucleation and anti-freeze proteins. Microbial herbicides. Microbial insecticides (*Pseudomonas* and *Bacillus thrungiensis*): - genetic engineering of Bt strains – Bt cotton – viral insecticides – entomopathogenic fungi.

UNIT IV   Plant and algal biotechnology and bioremediation

Ti plasmid derived vector systems - Development of insect, virus and herbicide resistant plants, stress and senescence tolerant plants, modification of flower nutritional content, sweetening by genetic engineering. Plant as bioreactors. Production of food, colourant and fuel from microalgae.

UNIT V   Animal biotechnology and IPR

Transgenic animals: methods of creating transgenic mice, cattle and sheep. Human gene therapy – *in vivo* and *ex vivo* gene therapy. Molecular diagnostics for genetic diseases. Biosafety and Bioethics. Intellectual Property Rights: Patents - copy right and neighboring rights, patents for invention, - Drafting and filing a patent application, exploitation of patented invention. Indian patent laws.

REFERENCES

1. GIick BR and Pasternak JJ. Molecular Biotechnology – Principles and Applications of Recombinant DNA. ASM Press, Washington DC. 2003.
2. Winnacker EL. From Genes to Clones – Introduction to Gene Technology. First Indian reprint, PANIAMA publishing Co-operation, New Delhi. 2003.
3. Old RW and Primrose SB. Principles of Gene Manipulation - An Introduction to Genetic Engineering 5th Ed. Blackwell Scientific Publications, London. 1995.
4. Brown TA. Gene cloning and DNA analysis introduction. 4th Ed. Blackwell Science Ltd., London. 2001.
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6. Raledge C and Kristiansen B. Basic Biotechnology, 2nd edition, Cambridge University Press. 2001.
7. Balasubramanian D, Bryce CFA, Dharmalingam K, Green J, Jayaraman K. Concepts in Biotechnology University Press, India. 1996.
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9. Alan T Bull. Microbial Diversity and Bioprospecting. ASM press. Washington, D.C. 2004.
10. Gerbardt P, Murray RG, Wood WA, Kreig NR. Methods for General and Molecular Bacteriology – American Society for Microbiology Washington D.C. 1994.
11. Glazer AN, Nikaido H. Microbial Biotechnology – Fundamentals of Applied Microbiology WH Freeman and Company, New York. 1994.
12. Pnolella P. Introduction to Molecular Biology, WCB Mc Graw Hill, Boston, Massacheutts. 1998.
13. Walsh G and Headon DR. Protein Biotechnology, John Wiley and Sons, New York. 1994.

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MICROBIAL NANOTECHNOLOGY

OBJECTIVE

To make the students realized the role of microbes and other eukaryotic systems in the synthesis of nanoparticles. To provide the knowledge of advanced methods of synthesis and designing of nano particles as well as to educate them the potential applications of nano particles/ materials in a variety of areas.

Unit I   Introduction to bionanotechnology

Milestones in History – bionanotechnology – concept and future prospects – application in Life Sciences. Terminologies – nanotechnology, bionanotechnology, nanobiomaterials, biocompatibility, nanomedicine, nanowires, quantum Dots, nanocomposite, nanoparticles, nanosensors. Biotechnology to bionanotechnology, natural bionanomachines. Current status of bionanotechnology.

Unit II   Synthesis of nanoparticles

Molecular nanotechnology – nanomachines – collagen. Uses of nanoparticles – cancer therapy – manipulation of cell and biomolecules. Cytoskeleton and cell organelles. Types of nanoparticles production – physical, chemical and biological. Microbial synthesis (bacteria, fungi and yeast) of nanoparticles – mechanism of synthesis.

Unit III   Types of nanoparticles and methods of characterization

Nanoparticles – types, functions – Silver, Gold and Titanium. Physical and chemical properties of nanoparticles. Characterization of nanoparticles – UV-Vis spectroscopy, particle size analyzer, Electron Microscopy – HRTEM, SEM, AFM, EDS, XRD. Other tools and techniques required for bionanotechnology: rDNA technology, site directed mutagenesis, fusion proteins, X- Ray crystallography, NMR. Bioinformatics: molecular modeling, docking, computer assisted molecular design.

Unit IV   Applications of bionanotechnology

Drug and gene delivery – protein mediated and nanoparticle mediated. Uses of nanoparticles in MRI, DNA and Protein Microarrays. Nanotechnology in health sectors. Nanomedicines, Antibacterial activities of nanoparticles. Nanotechnology in agriculture. Toxicology in nanoparticles – Dosimetry.

Unit V   Merits and demerits of nanoparticles

Advantages of nanoparticles – drug targeting, protein detection, MRI, development of green chemistry – commercial viability of nanoparticles. Disadvantages – pollution and health risks associated with nanoparticles.

REFERENCES

1. Parthasarathy BK. Introduction to Nanotechnology, Isha Publication. 2007.
2. Elisabeth Papazoglou and Aravind Parthasarathy. Bionanotechnology. Morgan and Claypool Publishers. 2007.
3. Bernd Rehm. Microbial Bionanotechnology: Biological Self-assembly Systems and Biopolymer-based Nanostructures. Horizon Scientific Press. 2006.
4. David E Reisner and Joseph D Bronzino. Bionanotechnology: Global Prospects. CRC Press. 2008.
5. Ehud Gazit. Plenty of Room for Biology at the Bottom: An Introduction to Bionanotechnology. Imperial College Press. 2006.
6. Kamali Kannangara. Nanotechnology: Basic science and emerging technologies- Mick Wilson, Overseas Press. 2005.
7. Mark A Ratner and Bandyopadhyay AK. Nano Materials. Nanotechnology: A gentle introduction to the Next Big Idea, New Age Publishers. 2002.
8. Pradeep T. Nano Essentials understanding nanoscience and Nanotechnology. 1st edition. TMH publications. 2007.
9. Parag Diwan and Asish Bharadwaj. Nanomedicines, Pentagan Press. 2006.
10. Vladimir P Torchilin. Nanoparticles as Drug Carriers. Imperial College Press, North Eastern University, USA. 2006.
11. Rao CNR, Muller A, Cheetham AK, The Chemistry of Nanomaterials Synthesis, Properties and Applications. 2004.
12. Pradeep T, Nano: The Essentials Tata Mgraw Hill, New Delhi. 2007.
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15. Claudio Nicolini. Nanobiotechnology and Nanobiosciences Pan Stanford Publishing Pte. Ltd. 2009.
16. David Goodsell S. Bionanotechnology, Lessons from Nature, Wiley-Liss, Inc. 2004.
17. Bhushan B. Handbook of Nanotechnology by, Springer, Heidelberg. 2004.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.
M.Sc. Physics   **Course Structure under CBCS**

(For the candidates admitted from the academic year 2016-2017 onwards)

Sem	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks Int.	Marks Ext	Total
I	Core Course – I (CC)	Mathematical Physics	6	4	3	25	75	100
	Core Course – II (CC)	Classical Dynamics and Relativity	6	4	3	25	75	100
	Core Course – III (CC)	Electronics	5	4	3	25	75	100
	Core Course – IV (CC)	Methods of Spectroscopy	5	4	3	25	75	100
	Core Practical – I (CP)	Physics Practical – I (General and Electronics)	8	4	3	40	60	100
	TOTAL		**30**	**20**				**500**
II	Core Course – V (CC)	Electromagnetic Theory	6	5	3	25	75	100
	Core Course – VI (CC)	Quantum Mechanics	6	5	3	25	75	100
	Core Practical – II (CP)	Physics Practical – II (Microprocessor and Programming)	8	4	3	40	60	100
	Elective Course – I (EC)	Microprocessor and Microcontroller	5	5	3	25	75	100
	Elective Course – II (EC)	Numerical Methods and C++ Programming	5	5	3	25	75	100
	TOTAL		**30**	**24**				**500**
III	Core Course – VII (CC)	Statistical Mechanics	6	5	3	25	75	100
	Core Course – VIII (CC)	Solid State Physics	6	5	3	25	75	100
	Core Practical – III (CP)	Physics Practical – III (General and Electronics)	8	4	3	40	60	100
	Elective Course – III (EC)	Crystal Growth and Thin Film Physics	5	5	3	25	75	100
	Elective Course – IV (EC)	Nonlinear Optics	5	5	3	25	75	100
	TOTAL		**30**	**24**				**500**
IV	Core Course – IX (CC)	Nuclear and Particle Physics	5	5	3	25	75	100
	Core Course – X (CC)	Advanced Physics	5	5	3	25	75	100
	Core Practical - IV (CP)	Physics Practical – IV (Electronics)	8	4	3	40	60	100
	Elective Course – V (EC)	Nanophysics	5	4	3	25	75	100
	Project		7	4	-	-	-	100
	TOTAL		**30**	**22**				**500**
	GRAND TOTAL		**120**	**90**				**2000**

Project   : 100 Marks
Dissertation: 80 Marks
Viva Voice : 20 Marks

Core Papers   - 10
Core Practical   -   4
Elective Papers -   5
Project   -   1

Note:

1. Theory   Internal   25 marks   External   75 marks

2. Practical   ”   40 marks   ”   60 marks

3. Separate passing minimum is prescribed for Internal and External

   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The passing minimum not less than 50% in the aggregate.

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CORE COURSE I

MATHEMATICAL PHYSICS

OBJECTIVE

- To learn various mathematical concepts and techniques in vector space, groups and functions of special types to solve physical problems.

Unit I   Vector Analysis

Concept of vector and scalar fields – Gradient, divergence, curl and Laplacian – Vector identities – Line integral, surface integral and volume integral – Gauss theorem, Green's theorem, Stoke's theorem and their applications – Definitions in linear independence of vectors – Schmidt's orthogonalisation process – Schwartz inequality.

Unit II   Matrix Theory and Tensors

Matrix Theory: Characteristic equation of a matrix – Eigenvalues and eigenvectors – Cayley–Hamilton theorem -Reduction of a matrix to diagonal form – Jacobi method – Sylvester's theorem.
Tensors: Contravariant, covariant and mixed tensors – Rank of a tensor – Symmetric and antisymmetric tensors – Contraction of tensor – Quotient law.

Unit III   Group Theory

Basic definitions – Multiplication table – Subgroups, cosets and classes – Point and space groups – Homomorphism and isomorphism – Reducible and irreducible representations – Schur's lemma -- The great orthogonality theorem (qualitative treatment without proof) – Formation of character table of C_{2v} and C_{3v} -- Elementary ideas of rotation groups.

Unit IV   Complex Analysis

Cauchy-Riemann conditions – Complex integration – Cauchy's integral theorem and integral formula – Taylor's and Laurent's series – Residues and singularities - Cauchy's residue theorem – Evaluation of definite integrals.

Unit V   Special Functions

Basic properties of gamma and beta functions -- Legendre, Bessel, Laugerre and Hermite differential equation: Series solution, Rodriguez formula, generating function, recurrence relations and orthogonality relations.

Books for Study (Relevant chapters from)

1. B.D. Gupta, *Mathematical Physics* (Vikas Pub., Noida, 2015) 4th edition.
2. A.K. Sexena, *Mathematical Physics* (Narosa, New Delhi, 2015).
3. A.W. Joshi, *Matrices and Tensors in Physics* (New Age, New Delhi, 2006).
4. G. Aruldhas, *Molecular Structure and Spectroscopy* (PHI, New Delhi, 2009).
5. H.K. Dass and Rama Verma, *Mathematical Physics* (S. Chand, New Delhi ,2008).

Books for Reference

1. L.A. Pipes and L.R. Harvill, *Applied Mathematics for Engineers and Physicists* (McGraw Hill, Singapore, 1967).
2. B.V. Ramana*, Higher Engineering Mathematics* (MaGraw Hill, New Delhi, 2013).

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CLASSICAL DYNAMICS AND RELATIVITY

OBJECTIVE

- To learn various mathematical techniques of classical mechanics and their applications to physical systems and introduce relativistic dynamics.

Unit I   Fundamental Principles and Lagrangian Formulation

Mechanics of a particle and a system of particles – Conservation laws – Constraints – Generalized coordinates – D'Alembert's principle and Lagrange's equation – Hamilton's principle – Lagrange's equations of motion – Conservation theorems and symmetry properties – Applications to linear harmonic oscillator, pendulum, compound pendulum, charged particles in an electromagnetic field and Atwood's machine.

Unit II   Motion Under Central Force

Conservation of energy and angular momentum – Inverse square law – Kepler's problem – Virial theorem – Scattering in a central force field – Artificial satellites – Geo stationary satellites – Eccentricity of orbit of satellites – Escape velocity.

Unit III   Rigid Body Dynamics and Oscillatory Motion

Euler's angles – Moments and products of inertia – Euler's equations - Symmetrical top – Theory of small oscillations – Normal modes and frequencies – Linear triatomic molecule – Wave equation and motion – Phase velocity – Group velocity -- Dispersion.

Unit IV   Hamilton's Formulation

Hamilton's canonical equations of motion – Hamilton's equations from variational principle – Principle of least action – Canonical transformations – Poission bracket – Hamilton--Jacobi method – Action and angle variables – Kepler's problem in action-angle variables – Applications of Hamilton's equations of motion to linear harmonic oscillator, pendulum, compound pendulum and charged particles in an electromagnetic field.

Unit V   Relativistic Mechanics

Reviews of basic ideas of special relativity – Energy momentum four -vector – Minkowski's four-dimensional space – Lorentz transformation as rotation in Minkowski's space – Composition of Lorentz transformation about two orthogonal directions – Thomas precession – Elements of general theory of relativity.

Books for Study

1. H. Goldstein, C.P. Poole and J.L. Safko, *Classical Mechanics* (Pearson Education and Dorling Kindersley, New Delhi, 2007).
2. S.L. Gupta, V. Kumar and H.V. Sharma, *Classical Mechanics* (Pragati Prakashan, Meerut, 2001).
3. N.C. Rana and P.S. Joag, *Classical Mechanics* (Tata McGraw-Hill, New Delhi, 1991).

Books for Reference

1. V.B. Bhatia, *Classical Mechanics* (Narosa, New Delhi, 1997).
2. T.L. Chow, *Classical Mechanics* (John-Wiley, New York, 1995).

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CORE COURSE III

ELECTRONICS

OBJECTIVE

- To understand the working of advanced semiconductor devices and digital circuits and the utility of OP-AMP and learn the basics of integrated circuit fabrication, applications of timer IC-555 and building block of digital systems.

Unit I   Semiconductor Devices

Varactor, Schottky, tunnel, Gunn, optoelectronic, LASER, LED and photo diodes – Hall effect in a semiconductor -- Depletion and enhancement type MOSFFT – Characteristics of UJT and SCR – Power control DIAC and TRIAC.

Unit II   Operation Amplifier

Wien bridge and phase-shift oscillators – Triangular, saw-tooth and square-waves generators – Schmitt trigger – Voltage control oscillator – Phase-locked loops -- Weighted resistor and binary R-2R ladder digital to analog converters -- Counter type and successive approximation analog to digital converters -- Solving simultaneous and differential equations

Unit III   Digital Circuits-I

Digital comparator – Parity generator/checker – Data selector -- BCD to decimal decoder –Seven segment decoder – Encoders – RS, JK, D and JK master-slave flip-flops.

Unit IV   Digital Circuits-II

Serial-in serial-out, serial-in parallel-out and parallel-in serial-out shift registers – Synchronous, asynchronous, ring and up/down (using mod 10) counters -- Multiplexers – Demultiplexers.

Unit V   IC Fabrication and IC Timer

Basic monolithic ICs – Epitaxial growth – Masking – Etching impurity diffusion – Fabricating monolithic resistors, diodes, transistors, inductors and capacitors – Circuit layout – Contacts and inter connections – Charge coupled device – Applications of CCDs -- 555 timer: Description of the functional diagram, applications of monostable and astable operations and pulse generation.

Books for Study (Relevant chapters in)

1. T.F. Schubert, E.M. Kim, *Active and Nonlinear Electronics* (John Wiley, New York, 1996).
2. L. Floyd, *Electronic Devices* (Pearson Education, New York, 2004).
3. J. Millman, C. Halkias and C.D. Parikh, *Integrated Electronics, Analog and Digital Circuits and Systems* (TMGH, 2010).
4. D.P. Leach and A.P. Malvino, *Digital Principals and Applications* (Tata McGraw-Hill, New Delhi, 2006).
5. R.A. Gayakwad, *Op-Amps & Linear Integrated Circuits* (Printice Hall, New Delhi, 1999).

Books for Reference

1. R.L. Geiger, P.E. Allen and N.R Strader, *VLSI Design Techniques for Analog and Digital Circuits* (McGraw--Hill, Singapore, 1990).
2. D. Roy Choudhury and S.B. Jain, *Linear Integrated Circuit* (New Age International Publications, New Delhi, 2010).
3. D. Chattopadhyay and P.C. Rakshit, *Electronics Fundamentals and Applications* (New Age International Publications, New Delhi, 2010).

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CORE COURSE IV

METHODS OF SPECTROSCOPY

OBJECTIVE

* To familiarize with the basic principles of various spectroscopic techniques and their applications in the determination of atomic structure, chemical composition and physical properties of materials.

Unit I   Atomic Spectroscopy

Quantum states of an electron in atom – Hydrogen atom spectrum – Electron spin -- Stern—Gerlach experiment – Spin-orbit interaction – Two electron system -- LS-JJ coupling schemes – Spectroscopic terms and selection rules - Hyperfine structure – Zeeman and Paschen—Back effect of one and two electron systems – Selection rules – Stark effect.

Unit II   Microwave and Infrared Absorption Spectroscopies

Microwave Spectroscopy: Rotation of diatomic molecules – Rotational spectra of polyatomic molecules – Spectrum of nonrigid rotator – Experimental technique – Polyatomic molecules – Linear, symmetric top and asymmetric top molecules.

Infrared Absorption Spectroscopy: Vibrating diatomic molecule – Anharmonic oscillator – Diatomic vibrating rotator – Vibration-rotation spectrum of carbon monoxide – Influence of rotation on the spectrum of polyatomic molecules – Linear and symmetric top molecules – Influence of nuclear spin -- FT techniques.

Unit III   Raman Spectroscopy

Quantum theory of Raman effect – Classical theory of Raman effect – Pure rotational Raman spectra – Linear molecules – Symmetric top molecules – Vibration Raman spectra – Rotational fine structure – Structural determination – Raman spectra – Instrumentation – Raman effect and molecular structure – Raman activity of molecular vibrations -- Surface enhanced Raman spectroscopy.

Unit IV   Nuclear Magnetic Resonance Spectroscopy

Basic principles -- Bloch equations and solutions – Shielding and deshielding effects – Chemical shift – Spin lattice and spin-spin relaxation – Coupling constants – Experimental technique – Double coil method – Structural diagnosis and hydrogen bonding.

Unit V   UV and ESR Spectroscopies

UV: Theory and instrumentation – Types of transition in inorganic work – Change in position and intensity of absorption – Charge transfer transition – Molecular weight data.

ESR: Theory of ESR – Resonance conditions – Experimental study – ESR spectrometer – Crystalline solids and free radicals in solution – Determination of g factor.

Books for Study

1. C.N. Banwell, *Fundamentals of Molecular Spectroscopy* (McGraw Hill, New York, 1981).
2. G. Aruldhas, *Molecular Structure and Spectroscopy* (Prentice Hall, New Delhi, 2006).
3. D.N. Sathyanarayana, *Vibrational* Spectroscopy (New Age International, New Delhi, 2015).

Books for Reference

1. J. Michael Hollas, *Modern Spectroscopy* (Wiley India, New Delhi, 2004).
2. B.P. Straughan and   S. Walker, *Spectroscopy* Volumes I--III (Chapman and Hall,   New York, 1976).

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CORE PRACTICAL I

PHYSICS PRACTICAL I (GENERAL AND ELECTRONICS)

OBJECTIVE

- Experimental determination of certain physical constants and properties and verification of characteristics and applications of electronic components and devices.

Any **TWELVE** experiments (Six experiments from each part)

A. General Experiments

1. Determination of q, n, σ by elliptical fringes method
2. Determination of Stefan's constant
3. Determination of bulk modulus of a liquid by ultrasonic wave propagation
4. Determination of Rydberg's constant
5. Study of Hall effect in a semiconductor
6. Determination of dielectric constant at high frequency by Lecher wire
7. Michelson interferometer -- Determination of wavelength of monochromatic source.
8. Determination of wavelength of monochromatic source using biprism
9. Charge of an electron by spectrometer
10. Dissociation energy of iodine molecule -- Absorption spectrum
11. Spectrum photo -- Cu/Fe arc spectrum
12. Polarization of light -- Verification of Malus law and Brewster angle of glass
13. BH loop – Energy loss of a magnetic material – Anchor ring using B.G./CRO
14. Determination of e/m of an electron by magnetron method
15. Determination of dielectric loss using CRO

B. Electronics Experiments

1. Construction of dual regulated power supply
2. Astable and monostable multivibrators using IC555
3. Characteristics of UJT
4. Characteristics of SCR
5. Design and study of Wein bridge oscillator using op-amp
6. Design and study of square and triangular waves generators using op-amp
7. Solving ordinary differential equation using op-amp
8. V-I characteristics of   a solar cell
9. Up/down counter using mod 10
10. Operation of   shift register using serial-in serial-out, serial-in parallel-out and parallel-in serial-out

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CORE COURSE V

ELECTROMAGNETIC THEORY

OBJECTIVE

- To learn the theory for the fields produced by stationary and moving charge and charged systems and propagation of electromagnetic fields.

Unit I   Electrostatics and Polarization

Gauss's law – Field due to an infinite, straight, uniformly charged wire – Multipole expansion of a charge distribution -- Field inside a uniformly polarized sphere – Electric field inside a dielectric – Electric displacement and polarizability – Claussius-Mossotti relation – Polarization of polar molecules and Langevin equation and Debye relation – Electrostatic energy.

Unit II   Boundary Value Problems in Electrostatics

Boundary conditions – Potential at a point between the plates of a spherical capacitor – Potential at a point due to uniformly charged disc – Method of image charges – Point charge in the presence of a grounded conducting sphere -- Point charge in the presence of a charged, insulated conducting sphere -- Conducting sphere in a uniform electric field – Laplace equation in rectangular coordinates.

Unit III   Magnetostatics

Magnetic scalar and vector potentials – Magnetic dipole in a uniform field – Magnetization current – Magnetic intensity – Magnetic susceptibility and permeability – Hysteresis – Correspondences in electrostatics and magnetostatics.

Unit IV   Field Equations and Conservation Laws

Continuity equation – Displacement current – Maxwell's equations and their physical significance – Poynting theorem – Energy in electromagnetic fields – Electromagnetic potentials – Maxwell's equations in terms of electromagnetic potentials – Lorentz and Coulomb gauges.

Unit V   Electromagnetic Waves and Wave Propagation

Electromagnetic waves in free space – Propagation of electromagnetic waves in isotropic dielectrics and in anisotropic dielectrics – Reflection and refraction of electromagnetic waves: Kinematic and dynamic properties – TM and TE modes – Propagation in rectangular waveguides – Cavity resonator.

Books for Study

1. J.D. Jackson, *Classical Electrodynamics* (John-Wiley, New York, 1999) 3rd edition
2. K.K. Chopra and G.C. Agarwal, *Electromagnetic Theory* (K. Nath & Co., Meerut).
3. E.C. Jordan and K.G. Balmain, *Electromagnetic Waves and Radiating Systems* (PHI, New Delhi, 2015).

Books for Reference

1. D.J. Griffiths, *Introduction to Electrodynamics* (Pearson, Essex, 2014) 4th edition.
2. T.L. Chow, *Electromagnetic Theory* (Jones and Bartlett Learning, 2012).

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CORE COURSE VI

QUANTUM MECHANICS

OBJECTIVE

- To learn the fundamental concepts and certain theoretical methods of quantum mechanics and their applications to microscopic systems.

Unit I   Schrödinger Equation and General Formulation

Schrödinger equation and its plane wave solution – Physical meaning and conditions on the wave function – Expectation values – Hermitian operators and their properties – Commutator relations -- Uncertainty relation -- Bra and ket vectors -- Hilbert space – Schrödinger, Heisenberg and interaction pictures.

Unit II   Exactly Solvable Systems

Linear harmonic oscillator: Solving the one-dimensional Schrödinger equation and abstract operator method – Particle in a box -- Rectangular barrier potential – Rigid rotator – Hydrogen atom.

Unit III   Approximation Methods

Time-independent perturbation theory: Non-degenerate (first-order) and degenerate perturbation theories -- Stark effect – WKB approximation and its application to tunneling problem and quantization rules**.**
Time-dependent perturbation theory: Constant and harmonic perturbations -- Transition probability – Sudden approximation.

Unit IV   Scattering Theory and Angular Momentum

Scattering theory: Scattering amplitude and cross-section – Green's function approach -- Born approximation and its application to square-well and screened-Coulomb potentials.
Angular momentum: Components of orbital angular momentum – Properties of **L** and **L²** -- Eigenpairs of **L²** and L_z – Spin angular momentum.

Unit V   Relativistic Quantum Mechanics

Klein--Gordon equation for a free particle and its solution – Dirac equation for a free particle and Dirac matrices -- Charge and current densities – Plane wave solution – Negative energy states – Zitterbewegung – Spin of a Dirac particle – Spin-orbit coupling.

Books for Study

1. L. Schiff, *Quantum Mechanics* (Tata McGraw Hill, New Delhi, 2014) 4th edition.
2. P. M. Mathews and K. Venkatesan, *A Text Book of Quantum Mechanics* (Tata McGraw Hill, New Delhi, 1987).
3. S. Rajasekar and R. Velusamy, *Quantum Mechanics I: The Fundamentals* (CRC Press, Boca Raton, 2015).

Books for Reference

1. R. Shankar, *Principles of Quantum Mechanics* (Springer, New Delhi, 2007).
2. A.K. Ghatak and S. Lokanathan, *Quantum Mechanics: Theory & Applications* (Macmillan, Chennai, 2004) 5th edition.

CORE PRACTICAL II

PHYSICS PRACTICAL II

(MICRPROCESSOR AND PROGRAMMING)

OBJECTIVE

- To develop programming skills of microprocessor and C++ programming in solving some mathematical problems and their applications.

Any **FIFTEEN** experiments (At least SIX experiments from each part)

A. Microprocessor (8085)

1. Finding the largest and smallest numbers in a data array
2. Arranging a set of numbers in ascending and descending orders
3. Study of multibyte decimal addition
4. Study of multibyte decimal subtraction
5. Interfacing hexa key board (IC 8212)
6. Study of seven segment display
7. Study of DAC interfacing (DAC 0900)
8. Study of ADC interfacing (ADC 0809)
9. Study of timer interfacing (IC 8253)
10. Study of programmable interrupt controller (IC 8259)
11. Traffic control system
12. Digital clock
13. Generation of square and sine waves using DAC 0800
14. Digital thermometer (temperature controller)
15. Control of stepper motor using microprocessor

B. C++ Programming

1. Least-squares curve fitting – Straight-line fit
2. Least-squares curve fitting – Exponential fit
3. Real roots of one-dimensional nonlinear equations -- Newton Raphson method
4. Complex roots of one-dimensional nonlinear equations -- Newton-- Raphson method
5. Interpolation – Lagrange method
6. Numerical integration – Composite trapezoidal rule
7. Numerical integration – Composite Simpson's 1/3 rule
8. Solution of a second-order ODE – Euler method
9. Solution of a first-order ODE – Fourth-order Runge--Kutta method
10. Uniform random number generation – Park and Miller method
11. Gaussian random number generation – Box and Muller method
12. Evaluation of definite integrals – Monte Carlo method
13. Calculation of mean and standard deviation of a set of uniform random numbers
14. Computation of eigenvalues of linear harmonic oscillator by numerically solving Schrödinger equation
15. Monte Carlo simulation of electronic distribution of hydrogen atom

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ELECTIVE COURSE I
MICROPROCESSOR AND MICROCONTROLLER

OBJECTIVE

- To learn basic principles of architecture and functioning of microprocessor and microcontroller and programming and interfacing aspects of them.

Unit I   Microprocessor Architecture and Interfacing

Intel 8085 microprocessor architecture – Pin configuration – Instruction cycle – Timing diagram – Instruction and data formats – Addressing modes -- Memory mapping and I/O mapping I/O scheme -- Memory mapping I/O interfacing -- Data transfer schemes -- Synchronous and asynchronous data transfer – Interrupt driven data transfer - Interrupts of Intel 8085.

Unit II   Assembly Language Programs (8085 only)

BCD arithmetic -- Addition and subtraction two 8-bit and 16-bit numbers -- Largest and smallest numbers in a data set – Ascending order and descending order – Sum of a series of a 8-bit numbers – Sum of a series of multibyte decimal numbers – Square root of a number – Block movement of data -- Time delay – Square-wave generator.

Unit III   Peripheral Devices and Microprocessor Applications

Generation of control signals for memory and I/O devices -- I/O ports -- Programmable peripheral interface -- Architecture of 8255A -- Control word -- Programmable interrupt controller (8259) -- Programmable counter -- Intel 8253 -- Architecture, control word and operation – Block diagram and interfacing of analog to digital converter (ADC 0800) – Digital to analog converter (DAC 0800) – Stepper motor – Traffic control.

Unit IV   Microcontroller 8051

Features of 8051 – Architecture – Pin configuration – Memory organization -- External data and program memory -- Counters and timers – Serial data input/output – Interrupt structure – External interrupts – Addressing modes -- Comparison between microprocessor and microcontroller.

Unit V   8051 Instruction Set and Programming

Instruction set – Data transfer, arithmetic and logical instructions – Boolean variable manipulation instructions – Program and machine control instructions – Simple programs – Addition and subtraction of two 8-bit and 16-bit numbers – Division – Multiplication -- Largest number in a set – Sum of a set of numbers.

Books for Study

1. B. Ram, *Fundamentals of Microprocessor and Microcomputers* (Dhanpat Rai Pub., New Delhi, 2006).
2. M.A. Mazidi, J.G. Mazidi and R.D. Mckinlay, *The 8051 Microcontroller and Embbeded Systems using Assembly and C* (Dorling Kindersley, New Delhi, 2013).
3. A.P. Godse and D.A. Godse, *Microprocessors and Microcontrollers* (Technical Pub., Pune, 2008).

Books for Reference

1. R. Gaonkar, *Microprocessor Architecture, Programming and Applications with 8085* (Penram International Publishing, Mumbai, 2006) 5th edition.
2. K. Ayala, *The Microcontroller* (Cengage Learning India, New Delhi, 2013) 3rd edition.

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NUMERICAL METHODS AND C++ PROGRAMMING

OBJECTIVE

- To learn numerical methods of computing certain mathematical quantities, construction and evaluation of a function and solution of an ordinary differential equation and C++ computer programming necessary for numerical simulation of physical problems.

Unit I   Programming in C++

Constants and variables -- I/O operators and statements -- Header files -- Main function – Conditional statements -- Switch statement -- Void function -- Function program -- For, while and do-while statements -- Break, continue and goto statements -- Arrays.

Unit II   Curve Fitting and Interpolation

Curve fitting: Method of least-squares - Straight-line fit -- Exponential and power-law fits.

Interpolation: Newton interpolation polynomial: Linear interpolation, Higher-order polynomials and first-order divided differences – Gregory--Newton interpolation polynomials – Lagrange interpolation.

Unit III   Solutions of Linear and Nonlinear Equations

Simultaneous linear equations: Upper triangular form and back substitution – Augmented matrix -- Gauss elimination method -- Jordan's modification -- Inverse of a matrix by Gauss--Jordan method.

Roots of nonlinear equations: Newton--Raphson method -- Termination criteria -- Pitfalls – Order of convergence.

Unit IV   Numerical Integration and Differentiation

Numerical integration: Trapezoidal and Simpson's 1/3 rules -- Errors in the formulae -- Composite trapezoidal and Simpson's 1/3 rules -- Errors in the formulae.

Numerical differentiation: Two- and four-point formulae for first-order derivative -- Three- and five-point formulae for second-order derivative.

Unit V   Numerical Solution of Ordinary Differential Equations

First-order equations: Euler and improved Euler methods – Local and global truncation errors -- Fourth-order Runge--Kutta method -- Geometric description of the formula.

Second-order equations: Euler methods and fourth-order Runge--Kutta method.

Books for Study (Relevant chapters in)

1. J. R. Hubbard, *Programming with C++* (McGraw-Hill, New Delhi, 2006).
2. J.H. Mathews, *Numerical Methods for Mathematics, Science and Engineering* (Prentice-Hall of India, New Delhi, 1998).
3. P.B. Patil and U.P. Verma, *Numerical Computational Methods* (Narosa, New Delhi, 2013).

Books for Reference

1. E. Balagurusamy, *Objected Oriented Programming in C++* (McGraw Hill, New Delhi, 2013) 6th edition.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, *Numerical Methods for Scientific and Engineering Computation* (New Age International, New Delhi, 1993).

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STATISTICAL MECHANICS

OBJECTIVES

- To learn the basics of classical and quantum statistical mechanics and to understand some of their applications.

Unit I   Thermodynamics

Thermodynamical laws and their consequences – Entropy -- Changes in entropy in reversible processes -- Principle of increase of entropy -- Thermodynamic functions -- Enthalpy, Helmholtz and Gibbs functions -- Phase transitions -- Clausius-Clayperon equation -- van der Wall equation of state.

Unit II   Kinetic Theory

Boltzmann transport equation and its validity -- Boltzmann's H-theorem -- Relation between H-function and entropy -- Maxwell--Boltzmann distribution -- Mean free path – Conservation laws -- Transport phenomena – Viscosity of gases -- Thermal conductivity -- Diffusion process.

Unit III   Classical Statistical Mechanics

Review of probability theory -- Macro and micro states – Phase space -- Statistical ensembles -- Density function -- Liouville's theorem -- Maxwell--Boltzmann distribution law -- Micro canonical ensemble – Ideal gas – Entropy – Partition function – Equipartition theorem -- Canonical and grand canonical ensembles.

Unit IV   Quantum Statistical Mechanics

Basic concepts -- Ideal quantum gas – Bose--Einstein statistics -- Photon statistics -- Fermi--Dirac statistics -- Sackur-Tetrode equation – Equation of state -- Bose--Einstein condensation -- Comparison of classical and quantum statistics.

Unit V   Applications of Quantum statistical Mechanics

Ideal Bose System: Photons – Black body and Planck radiation – Specific heat of solids – Liquid helium.
Ideal Fermi System: Properties – Degeneracy – Electron gas -- Pauli paramagnetism.
Ferromagnetism: Ising and Heisenberg models.

Books for Study

1. S.K. Sinha, *Introduction to Statistical Mechanics* (Narosa, New Delhi, 2007).
2. F. Reif, *Fundamentals of Statistical and Thermal Physics* (McGraw Hill, Singapore, 1985).
3. K. Huang, *Statistical Mechanics* (Wiley Eastern Limited, New Delhi, 1963).

Books for Reference

1. Singhal, Agarwal, Prakash, *Thermodynamics and Statistical Physics* (Prakashan, Meerut, 2003).
2. W. Greiner, L. Neise and H. Stocker, *Thermodynamics and Statistical Mechanics* (Springer, New York, 1995).

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CORE COURSE VIII

SOLID STATE PHYSICS

OBJECTIVE

- *To learn the basics of crystal structure and underlying theoretical development for the description of certain properties and phenomena of solid states.*

Unit I   Crystal Structure

Basics of crystal systems – Bravias lattices – Defects and Dislocations – Bonding of Solids – Reciprocal lattice – Ewald's sphere construction – Bragg's law – Atomic scattering factor – Diffraction – Structure factor – Experimental techniques – Laue, Powder, Rotation methods – Translational and orientational orders - Kinds of liquid crystalline order and quasicrystals.

Unit II   Lattice Vibrations and Thermal Properties

Vibration of monoatomic lattices – Lattices with two atoms per primitive cell – Quantization of lattice vibrations – Phonon momentum – Inelastic scattering of neutrons by phonons – Lattice heat capacity – Einstein model – Density of modes in one-dimension and three dimension – Debye model of the lattice heat capacity – Thermal conductivity – Umklapp process.

Unit III   Free Electron Theory, Energy Bands and Semiconductor Crystals

Energy levels and density of orbitals – Fermi-Dirac distribution – Free electron gas in 3D – Heat capacity of   electron gas – Electrical conductivity – Motion in magnetic fields – Hall effect – Thermal conductivity – Nearly conductivity of metals – Nearly free electron model – Electron in a periodic potential – Semiconductors – Band gap – Effective mass – Intrinsic carrier concentration.

Unit IV   Dia, Para, Ferro and Antiferro-Magnetisms

Langevin classical theory of dia- and para-magnetisms – Weiss theory – Quantum theory of   paramagnetism – Paramagnetic susceptibility of conduction electrons – Hund's rules – Ferroelectric order – Curie point and the   exchange   integral   –   Temperature   dependence   of   saturation magnetization – Magnons – Ferromagnetic order -- Antiferromagnetic order -- Ferromagnetic   domains – Origin of domains – Coercive   force   and hysteresis.

Unit V Ferroelectricity and Superconductivity

General properties and classification of ferroelectric materials – Dipole theory of ferroelectricity – Ferroelectric domains – Occurrence of superconductivity – Meissner effect – Thermodynamics of superconducting transition – London equation – Coherence length – BCS theory – Flux quantization – Type-I and type-II superconductors – Josephson superconductor tunneling – DC and AC Josephson effect – SQUID – Applications of superconductors.

Books for Study

1. C. Kittel, *Introduction to Solid State Physics* (Wiley Eastern, New Delhi, 2007) 7th edition.
2. S.O. Pillai, *Solid State Physics* (New Age International, New Delhi, 2005) 6th edition.
3. H.C. Gupta, *Solid State Physics* (Vikas Publishing House, Noida, 2001) 2nd edition.

Books for Reference

1. N.W, Ashcroft and N.D. Mermin, *Solid State Physics* (Holt, Rinehart and Winston, Philadelphia, 1976).
2. Rita John, *Solid State Physics* (McGraw Hill, New Delhi, 2014).
3. A.J. Dekker, *Solid State Physics* (McMillan, Chennai, 1971).

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CORE PRACTICAL III

PHYSICS PRACTICAL III

(GENERAL AND ELECTRONICS)

OBJECTIVE

- Experimental determination of certain physical constants and properties and verification of characteristics and applications of electronic components and devices.

Any **FIFTEEN** experiments (At least SIX experiments from each part)

A. General Experiments

1. Determination of q, n, σ by hyperbolic fringes method
2. Determination of thermal conductivity of a good conductor – Forbe's method
3. Determination of bulk modulus of a liquid using ultrasonic interferometer
4. Planck's constant - Photoelectric cell
5. Band gap energy of a semiconductor -- Four-probe method
6. Determination of L of a coil by Anderson's method
7. Determination of e/m of an electron by Thomson's method
8. Determinations of wavelength of a laser source using plane diffraction grating and
    thickness of a wire
9. Polarizability of liquids by finding the refractive indices at different wavelengths
10. Study of a fiber optic cable -- Numerical aperture and other parameters
11. Magnetic susceptibility of a paramagnetic solution using Quincke's tube method
12. Determination of specific rotator power of a liquid using polarimeter
13. Four-probe method – Determination of resistivities of powdered samples
14. Determination of magnetic susceptibility of liquid by Guoy method
15. Determination of coefficient of coupling by AC bridge method

B. Electronics Experiments

1. Characteristics of LED and photo diodes
2. Characteristics of laser diode and tunnel diode
3. Digital to analog converters using op-amp
4. Study of phase-shift oscillator using op-amp
5. Design and study of Schmitt trigger using op-amp
6. Flip-flops -- - RS, JK and D
7. Decoder and encoder
8. Temperature coefficient using 555 timer
9. Design of pre-emphasis and de-emphasis circuits
10. Pulse-width and pulse-position modulations

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ELECTIVE COURSE III

CRYSTAL GROWTH AND THIN FILM PHYSICS

OBJECTIVE

- To understand the theoretical concepts involved in crystal growth and thin film sciences and to learn the basic characterizing techniques of materials.

Unit I   Basic Concepts, Nucleation and Kinetics of Growth

Ambient phase equilibrium – Super saturation – Equilibrium of finite phases - Equation of Thomson-Gibbs – Types of nucleation – Formation of critical nucleus – Classical theory of nucleation – Homo and heterogeneous formation of 3D nuclei – Rate of nucleation – Growth from vapor phase, solutions and melts – Epitaxial growth – Growth mechanism and classification – Kinetics of growth of epitaxial films – Mechanisms and controls for nanostructures in 0 and 1 dimensions.

Unit II   Crystallization Principles and Growth Techniques

Classes of crystal system – Crystal symmetry – Solvents and solutions – Solubility diagram – Super solubility – Expression for super saturation – Metastable zone and induction period – Miers TC diagram – Solution growth – Low and high temperatures solution growth – Slow cooling and solvent evaporation methods – Constant temperature bath as a crystallizer.

Unit III   Gel, Melt and Vapor Growth Techniques

Principle of gel technique – Various types of gel -- Structure and importance of gel – Methods of gel growth and advantages -- Melt technique – Czochralski growth – Floating zone – Bridgeman method – Horizontal gradient freeze – Flux growth – Hydrothermal growth – Vapor-phase growth – Physical vapor deposition – Chemical vapor deposition – Stoichiometry.

Unit IV   Thin Film Deposition Techniques

Vacuum evaporation -- Hertz-Knudsen equation -- Evaporation from a source and film thickness uniformity -- E-beam, pulsed laser and ion beam evaporations -- Glow discharge and plasmas -- Mechanisms and yield of sputtering processes – DC, rf, magnetically enhanced, reactive sputterings – Spray pyrolysis – Electro deposition – Sol-gel technique.

Unit V   Characterization Techniques

X–ray diffraction – Powder and single crystal – Fourier transform infrared analysis – Elemental dispersive X-ray analysis – Transmission and scanning electron microscopy – UV-vis-NIR spectrometer – Chemical etching –

Vickers micro hardness – Basic principles and operations of AFM and STM -- X-ray photoelectron spectroscopy for chemical analysis -- Ultraviolet photoemission spectroscopy analysis for work function of the material -- Photoluminescence – Thermoluminescence.

Books for Study (Relevant chapters in)

1. I.V. Markov, *Crystal Growth for Beginners: Fundamentals of Nucleation, Crystal Growth and Epitaxy* (2004) 2nd edition.
2. P. Santhanaragavan and P. Ramasamy, *Crystal Growth Process and Methods* (KRU Publications, Kumbakonam, 2001).
3. A. Goswami, *Thin Film Fundamentals* (New Age, New Delhi, 2008).
4. H.H. Willard, L.L. Meritt, J.A. Dean, F.A. Sette, *Instrumental Methods of Analysis* (CBS Publishers, New Delhi, 1986).
5. S. Zhang, L. Li and A. Kumar, *Materials Characterization Techniques* (CRC Press, Bota Racon, 2009).

Books for Reference

1. J.C. Brice, *Crystal Growth Process* (John Wiley, New York, 1986).
2. M. Ohring, *Materials Science of Thin Films* (Academic Press, Boston, 2002) 2nd edition.
3. E. N. Kaufmann, *Characterization of Materials, Volume-I* (John Wiley, New Jersey, 2012).

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ELECTIVE COURSE IV

NONLINEAR OPTICS

OBJECTIVE

- To learn the basic principles and working of lasers, basic processes and features of nonlinear optical materials and fiber optics.

Unit I   Lasers

Gas lasers – He-Ne, Ar^+ ion lasers – Solid state lasers – Ruby – Nd:YAG, Ti sapphire – Organic dye laser – Rhodamine – Semiconductor lasers – Diode laser, p-n-junction laser and GaAs laser.

Unit II   Basics of Nonlinear Optics

Wave propagation in an anisotropic crystal – Polarization response of materials to light –Harmonic generation – Second harmonic generation – Sum and difference frequency generation– Phase matching – Third harmonic generation – Terahertz -- Bistability – Self-focusing.

Unit III   Multiphoton Processes

Two photon process – Theory and experiment – Three photon process - Parametric generation of light – Oscillator – Amplifier – Stimulated Raman scattering – Intensity dependent refractive index -- Optical Kerr effect -- Foucault effect – Photorefractive, electronic and optic effects.

Unit IV   Nonlinear Optical Materials

Basic requirements – Inorganics – Borates – Organics – Urea, Nitroaniline – Semiorganics – Thoreau complex – Laser induced surface damage threshold.

Unit V   Fiber Optics

Step – Graded index fibers – Wave propagation – Fiber modes – Single and multimode fibers –Numerical aperture – Dispersion – Fiber bandwidth – Fiber losses -- Scattering, absorption, bending, leaky mode and mode coupling losses -- Attenuation coefficient -- Material absorption.

Books for Study

1. K.R. Nambiar, *Lasers: Principles, Types and Applications* (New Age Inter-national Publishers Ltd, New Delhi, 2014).
2. B.B. Laud, *Lasers and Nonlinear Optics*, 3rd Edn. (New Age, New Delhi, 2011).
3. R.W. Boyd, *Nonlinear Optics*, 2nd Edn. (Academic Press, New York, 2003).
4. G.P. Agarwal, *Fiber-Optics Communication Systems*, 3rd Edn. (John Wiley, Singapore, 2003).

Books for Reference

1. W.T. Silvast, *Laser Fundamentals* (Cambridge University Press, Cambridge, 2003).
2. D.L. Mills, *Nonlinear Optics – Basic Concepts* (Springer, Berlin, 1998).

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CORE COURSE IX

NUCLEAR AND PARTICLE PHYSICS

OBJECTIVE

- To learn the various aspects of nucleus and its behavior under various conditions.

Unit I   Nuclear Properties

Nuclear energy levels - Nuclear angular momentum, parity, isospin – Nuclear magnetic dipole moment – Nuclear electric quadropole moment - Ground state of deuteron – Magnetic dipole moment of deuteron – Proton-neutron scattering at low energies – Scattering length, phase shift – Nature and properties of nuclear forces – Spin dependence – Charge symmetry – Charge independence – Repulsion at short distances – Exchange forces – Meson theory.

Unit II   Radioactive Decays

Alpha emission – Geiger-Nuttal law – Gamow theory – Neutrino hypothesis – Fermi theory of beta decay – Selection rules – Nonconservation of parity – Gamma emission – Selection rules -- Nuclear   isomerism -- Gamma ray spectroscopy – Mossbauer effect -- Interaction of charged particles and X-rays with matter – Types and basic principles of particle detectors.

Unit III   Nuclear Reactions and Nuclear Models

Reciprocity theorem – Breit-Wigner formula – Resonance   theory – Liquid drop model – Shell model -- Evidences for shell model -- Magic numbers -- Harmonic oscillator – Square-well potential -- Spin-orbit interaction   – Collective model of a nucleus.

Unit IV   Fission and Fusion Reactors

Characteristics of fission – Mass distribution of fragments – Radioactive decay processes – Fission cross-section – Energy in fission – Bohr-Wheeler's theory of nuclear fission – Fission reactors – Thermal reactors – Homogeneous reactors – Heterogeneous reactors – Basic fusion processes -- Characteristics of fusion – Solar fusion – Controlled fusion reactors.

Unit V   Particle Physics

Nucleons, leptons, mesons, baryons, hyperons, hadrons, strange particles - Classification of fundamental   forces   and elementary particles – Basic conservation   laws – Additional conservation laws: Baryonic, leptonic, strangeness and isospin charges/quantum numbers – Gell-mann--Nishijima

formula - Invariance under charge conjugation (C), parity (P) and time reversal (T) – CPT theorem -- Parity nonconservation in weak interactions – CP violation – Eight-fold way and supermultiplets – SU(3) symmetry and quark model.

Books for Study (Relevant chapters in)

1. K. S. Krane, *Introductory of Nuclear Physics* (John-Wiley, New York, 1987).
2. S. B. Patel, *Nuclear Physics: An Introduction* (New Age, New Delhi, 2009).
3. D. C. Cheng and G. K. O'Neill, *Elementary Particle Physics: An Introduction* (Addison-Wesley, New York, 1979).
4. D.C. Tayal, *Nuclear Physics* (Himalaya Pub. House, New Delhi, 2011).
5. S.L. Kakani and S. Kakani, *Nuclear and Particle Physics* (Anshan Publ., New Delhi, 2009).

Books for Reference

1. R.C. Sharma, *Nuclear Physics* (K. Nath and Co, Meerut, 2004).
2. B. L. Cohen, *Concepts of Nuclear Physics* (Tata McGraw Hill, New Delhi, 1988).

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CORE COURSE X

ADVANCED PHYSICS

OBJECTIVE

- To learn the basics and the advanced applications of physics in the fields of astrophysics, space physics, biomedical science and wireless communication.

Unit I   Astrophysics and Radio Astronomy

Astrophysics: Physical properties of stars - Life cycle of a star - End products of stellar evolution – Structure of milky way - Expanding universe - Future prospects.
Radio Astronomy (RA): Radio telescopes - Synchrotron radiation - Spectral lines in RA - Major discoveries in RA - RA in India - Hot big bang cosmology.

Unit II   India's Space Programme

Overview - Methodological issues in cost beneficial analysis of space programme - The INSAT system - Broadcasting - Telecommunication - Meteorology - Indian remote sensing programme – Geoinformatics (basic idea only) - The launching programme

Unit III   Biomedical Instruments

Ear and hearing Aids: Basic measurements of ear function - Air and bone conduction - Masking - Middle ear impedance audiometry - Oto-acoustic emission - Types of hearing aids and Cochlear implants - Sensory substitution aids - Electrophysiology: Source of biological potentials - Signal size and electrodes - Functions - Features of ECG, EEG and EMG. Cardiac and blood related devices: Pacemakers - Electromagnetic compatibility – Defibrillators - Artificial heart valves - Cardiopulmonary bypass - Haemodialysis.

Unit IV   Wireless Communication Technology-I

Cellular Radio: IMTS, AMPS control system - Security and privacy - Cellular telephone specifications and operations - Cell site equipments - Fax and data communication using cellular phones and CDPD - Digital cellular systems. Personal Communication Systems (PCS): Differences between CS and PCS, IS-1 36 TDMA PCS, GSM, IS-95 CDMA PCS - Comparison of modulation schemes - Data communication with PCS.

Unit V   Wireless Communication Technology – II

Satellite orbits – Satellites for communication - Satellites and transponders - Signal and noise calculations - InMARST, MSAT system using low - and medium-earth orbit stations. Paging (one-way and two-ways) and messaging system - Voice paging - LAN topologies - Ethernet bridges - Wireless LANs - Radio LANs - Bluetooth - Wireless bridges - Connections using infrared wireless modems - Wireless packet data services.

Books for Study (Relevant chapters in)

1. A.W. Joshi, *Horizons of Physics* (Wiley Eastern Ltd, New Delhi, 2000).
2. R.D. Begamure (Ed.), *Scientific Truths About Our Universe: Know Your Universe: Part I & II* (Pune, 2002).
3. U. Shankar, *The Economics of India's Space Programme – An Exploratory Analysis* (Oxford University Press, Delhi, 2007) 2nd reprint.
4. Mohan Sundar Rajan, Space Today (National Book Trust India, New Delhi, 2012) 5th revised reprint.
5. B.H. Brown, *et a*l, *Medical Physics and Biomedical Engineering* (Overseas Press, New Delhi, 2005).
6. R. Blake, *Wireless Communication Technology* (DELMAR, New Delhi, 2001).

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CORE PRACTICAL IV

PHYSICS PRACTICAL IV

(ELECTRONICS)

OBJECTIVE

- V*erification of characteristics and applications of electronic components and devices.*

Any **FIFTEEN** experiments

1. Characteristics of LVDT
2. Characteristics of LDR
3. Characteristics of strain guage
4. Characteristics of   load cell
5. Characteristics of   torque transducer
6. Calibration of thermistor
7. Digital to analog converter -- R-2R and weighted method
8. Study of frequency multiplexer using PLL
9. Digital comparator using XOR and NAND gates
10. Study of Hall effect
11. Four bit binary up and down counter using IC 7473
12. BCD to 7 segment display
13. Study of RAM
14. Study of A/D converter -- Counter ramp type method
15. Study of Arithmetic Logic Unit (ALU) -- IC 74181
16. Construction and study of characteristics of Chua's diode
17. Study of nonlinear dynamics of Chua's circuit
18. Construction of memristor
19. Pulse code modulation and demodulation
20. Voltage controlled oscillator using IC 555
21. Microwave IC – Filter Characteristics
22. Characteristics of a voltage dependent resistor (VDR)
23. Transmission characteristics of optical fiber link
24. Design of AC/DC voltage regulator using SCR
25. Characteristics of Gunn diode oscillator

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ELECTIVE COURSE V

NANOPHYSICS

OBJECTIVES

- To learn the structures, properties, characterization and applications of nanomaterials.

Unit I   Introduction to Nano and Types of Nanomaterials

Need and origin of nano -- Nano and energetic – Top-down and bottom-up approaches – Introductory ideas of 1D, 2D and 3D nanostructured materials -- Quantum dots -- Quantum wire – Quantum well -- Exciton confinement in quantum dots.

Unit II   Carbon Nanostructures

Carbon molecules and carbon bond -- C_{60}: Discovery and structure of C_{60} and its crystal -- Superconductivity in C_{60} -- Carbon nanotubes: Fabrication – Structure – Electrical properties – Vibrational properties – Mechanical properties -- Applications (fuel cells, chemical sensors, catalysts).

Unit III   Fabrication of Nanomaterials

Synthesis of oxide nanoparticles by sol-gel method -- Electrochemical deposition method – Electrospinning method – Lithography -- Atomic layer deposition -- Langmuir--Blodgett films -- Zeolite cages -- Core shell structures – Organic and inorganic hybrids.

Unit IV   Characterization of Nanomaterials

Principles, experimental set-up, procedure and utility of scanning electron microscopy (SEM), transmission electron microscopy (TEM), scanning tunneling microscope (STM) and scanning probe microscopy (SPM).

Unit V   Applications

Molecular electronics and nanoelectronics – Nanorobots -- Biological applications of nanoparticles -- Catalysis by gold nanoparticles – Band-gap engineered quantum devices -- Nanomechanics -- CNT emitters – Photoelectrochemical cells -- Photonic crystals – Plasmon waveguides.

Books for Study

1. T.Pradeep et al., *A Textbook of Nanoscience and Nanotechnology* (Tata McGraw Hill, New Delhi, 2012).
2. R.W. Kelsall, I.W. Hamley and M. Geoghegan, *Nanoscale Science and Nanotechnology* (John-Wiley & Sons, Chichester, 2005).
3. G. Cao, *Nanostructures and Nanomaterials* (Imperial College Press, London, 2004).
4. C.P. Poole and F.J. Owens, *Introduction to Nanotechnology* (Wiley, New Delhi, 2003).

Books for References

1. H.S. Nalwa, *Nanostructured Materials and Nanotechnology* (Academic Press, San Diego, 2002).
2. M. Wilson, K. Kannangara, G. Smith, M. Simmons, B. Raguse, *Nanotechnology: Basic Science and Emerging Technologies* (Overseas Press, New Delhi, 2005).

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BHARATHIDASAN UNIVERSITY,   **TIRUCHIRAPPALLI – 620 024.**
M.Sc. ZOOLOGY   **Course Structure under CBCS**
(For the candidates admitted from the academic year 2016-2017 onwards)

Sem.	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks Int.	Marks Ext.	Total
I	Core Course – I (CC)	Animal Taxonomy, Phylogeny and Biodiversity	6	4	3	25	75	100
	Core Course – II (CC)	Cell and Molecular Biology	6	4	3	25	75	100
	Core Course – III (CC)	Molecular Genetics and Evolution	5	4	3	25	75	100
	Core Course – IV (CC)	Developmental Biology	5	4	3	25	75	100
	Core Practical – I (CP)	Animal Taxonomy, Phylogeny and Biodiversity, Cell and Molecular Biology, Molecular Genetics and Evolution & Developmental Biology (P)	4+4	4	3	40	60	100
	TOTAL		**30**	**20**				**500**
II	Core Course – V (CC)	Animal Physiology	6	5	3	25	75	100
	Core Course – VI (CC)	Biochemistry & Biophysics	6	5	3	25	75	100
	Core Practical – II (CP)	Animal Physiology & Biochemistry & Biophysics	4+4	4	3	40	60	100
	Elective Course – I (EC)	Applied Biotechnology / Endocrinology	5	5	3	25	75	100
	Elective Course – II (EC)	Coastal geomorphology / Poultry Farming	5	5	3	25	75	100
	TOTAL		**30**	**24**				**500**
III	Core Course – VII (CC)	Microbiology	6	5	3	25	75	100
	Core Course – VIII (CC)	Biostatistics and Computer Applications	6	5	3	25	75	100
	Core Practical – III (CP)	Microbiology & Biostatistics and Computer Applications (P)	4+4	4	3	40	60	100
	Elective Course – III (EC)	Research Methodology and Biotechniques / Applied Entomology	5	5	3	25	75	100
	Elective Course – IV (EC)	Fishery biology / Bioinformatics	5	5	3	25	75	100
	TOTAL		**30**	**24**				**500**
IV	Core Course – IX (CC)	Environmental Biology	5	5	3	25	75	100
	Core Course – X (CC)	Immunology	5	5	3	25	75	100
	Core Practical - IV (CP)	Environmental Biology & Immunology (P)	4+4	4	3	40	60	100
	Elective Course – V (EC)	Sericulture / Aquaculture	5	4	3	25	75	100
	Project	Project	7	4	-	-	-	100
	TOTAL		**30**	**22**				**500**
	GRAND TOTAL		**120**	**90**				**2000**

Note:

Project	:100 Marks
Dissertation	: 80 Marks
Viva Voice	: 20 Marks

Core Papers	- 10
Core Practical	- 4
Elective Papers	- 5
Project	- 1

Note:

1. Theory   **Internal**   **25 marks**   **External**   **75 marks**

2. Practical   **"**   **40 marks**   **"**   **60 marks**

3. Separate passing minimum is prescribed for Internal and External

    a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
    b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
    c) The passing minimum not less than 50% in the aggregate.

Reference/Text Books contain the following details:

Name of the Author

Title of the Book

Name of the Publisher

Year

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CORE COURSE I

ANIMAL TAXONOMY, PHYLOGENY AND BIODIVERSITY

Objectives:

Animal diversity which is an essential topic for biologists to know the distribution, taxonomy and phylogeny of animal. To enlighten the primitive forms of invertebrates and vertebrates distribution. To help our students to understand the status and mode of living of different forms of animals.

UNIT I

Introduction to Taxonomy – Stages in taxonomy – importance of taxonomy – Aims and tasks of a Taxonomist – identification using taxonomic keys. Zoological classification: kinds of classification – Phyletic lineages – Linnean Hierarchy – Concepts of species – Typological, Nominalistic, Biological, Evolutionary, Recognition species concepts – other kinds of species – polytypic species – subspecies – super species.

UNIT II

Zoological Nomenclature: History of Nomenclature – Nature of scientific names – Synonyms and Homonyms _ Meanings of Authors in Brackets – Types: Holotypes, Paratype, Lectotype, Syntype, Neotype and Allotype – Publications on Taxonomy Research – ICZN and its rules – Ethics in Taxonomy Research.

UNIT III

Phylogeny of Invertebrates: Protozoa – Phylogenetic origin and evolution of the class Metazoa. Theories and origin of metazoan. Bilateria – theories and origin. Coelomata - Coelom and its origin. Trilobites – structure and significance. Mollusca – origin and evolution. Molluscan fossils and their significance. Echinoderm fossils.

UNIT IV

Phylogeny of Vertebrates: Jawless vertebrates - characteristic features of lampreys. earliest vertebrates: Ostracoderms – characteristic features and classification. Evolutionary position of Ostracoderms. Primitive jawed vertebrates – origin of jaws. Origin of Reptiles, Dinosaurs. Amphibian and reptilian features of seymouria, mammal like reptiles, aquatic reptiles, flying reptiles, rise and fall of dinosaurs. Fossil Birds- Archeopteryx. Origin of primates – adaptive radiation of lemuroids, Tarsius – new world monkeys, old world monkeys and apes, Australopithecus.

UNIT V

Biodiversity: definition – types – genetic, species and ecosystem diversity. Values and uses of biodiversity. Biodiversity measurements, Mega diversity centres. Loss of biodiversity. Conservation of biodiversity : *in situ* (afforestation, social forestry, agro forestry, Biosphere reserves, national parks and sanctuaries), *ex situ* (Cryopreservation, gene banks, sperm banks, DNA banks, tissue culture and biotechnological strategies). Biodiversity laws of India. Wild life protection Acts.

Text Books:

1. Simpson, G.G.1987, Principles of Animal Taxonomy, Oxford IBH Publishing Co., Pvt., New Delhi.
2. Devasahayan J.K., and N. Inbamani, 1887, Animal Phylogeny, R.V. Publications, Virudhunagar.
3. Agrawal K.C. 1996 Biodiversity, Agro Botanical Publishers, New Delhi

Reference Books:

1. Barnes R. D. 1982. Invertebrates Zoology 6th endn. Toppan International Co.,
2. Barrington, E. J. W. 1969. Invertebrate Structure and functions. English Language. Book Society.
3. Borradile, L.A. 1955. The Invertebrata.2nd endn. Cambridge University Press.
4. Carter, G. S. A. (1946) General Zoology of Invertebrates 2nd endn. (Wick and Jackson Ltd., London).
5. Clark, R.B and A.L. Panchen. 1971. Synopsis of animal classification. Chapman and Hall Publications, London.
6. Gardinar, M. S. 1972. Biology of the invertebrates, Mc Graw Hill Book Co., New York.
7. Hyman L.H. 1940 - 1959. The Invertebrata, Vol. I to VI.
8. Jolie, M. 1968. Chordate Morphology. East West Press.
9. Kapoor, V.C. 2010 Theory and Practice of Animal Taxonomy, Oxford and IBH Publishing Co., Pvt., New Delhi.
10. Kapoor, V.C. 1991. Theory and Practice of Animal Taxonomy. Oxford and IBH Publishing Co., Pvt. Ltd. New Delhi.
11. Kotpal, R.L. 1982. Protozoa, Porifera, Coelenterata, Helminthes, Annelida, Arthropoda, Mollusca, Echinodermata and Minor Phyla. Rastogi Publications Mayer, E. Elements of Taxonomy.
12. Narendran, T.C. 2009. An Introduction to Taxonomy, Zoological Survey of India, Kolkatta.
13. Newman, H.H. 1987. The Phylum Chordata. Sathis book Enterprise Publishers.
14. Simpson, G.G. 1987. Principles of animal taxonomy. Oxford IBH Publishing Co.
15. Solbrig, O.T., Van Emden, H.M. and Van Oordt, P.G.W.J. 1995, Biodiversity and Global change, CAB International, Wallingford. U.K.
16. Waterman, AJ. 1971. Chordate Structure and Function. Macmillan Co. London.
17. Young, J.Z. 1950. Life of Vertebrates. Clarendon Press Oxford.

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CELL AND MOLECULAR BIOLOGY

Objectives:

This course facilitates to understand the structure at molecular level and function of prokaryote and eukaryote cell. To enlighten our students about the cellular organelles and its functions. The knowledge in Cell communications and signaling pathways.

UNIT I

Cell Membrane : Molecular organization – molecular models – cell permeability – cell surface differentiations and cell – cell communication – membrane receptors and signal transduction pathways. Cytoskeleton and Cell Motility: Microtubules, microfilaments and intermediate filaments – role in cell organization, division and motility. Methods of Cell Study: Micrometry – cell culture methods – cell fractionation technique – cytochemical staining methods – cytophotometry – immunocytochemistry and autoradiography.

UNIT II

Mitochondria and Energy Transduction: Molecular organization of mitochondria and their role in oxidative phosphorylation. Golgi bodies, Lysosomes, Endoplasmic reticulum- structure and functions. Nucleus and Chromosomes: Nuclear envelope – Nuclear pore – Nuclear proteins – Nucleosome – Structure and function of chromatin**,** euchromatin and heterochromatin. Giant chromosomes - Polytene and Lamp brush chromosome.

UNIT III

Nucleic Acids and Their Functions: DNA and RNA – chemical composition, types and functions. Exons – introns – extra chromosomal DNA- overlapping genes - Transposable elements. Gene amplifications. Replication of DNA, DNA repair mechanism. Mechanism of RNA splicing in eukaryotes. Cell division - Mitosis and meiosis. Cell Cycle: Phases of cell cycle - Molecular organization and functional significance of mitotic apparatus.

UNIT IV

Ribosomes: Morphology, ultra structure, biochemistry and functions. Protein Synthesis**:** Mechanism of transcription – role of transcription factors – transcription regulators – Processing of mRNA – translation – post translational modifications and control mechanism. Protein sorting and targeting. Protein Transport: Intracellular compartments and protein sorting. Vesicular traffic in secretary and endocytic pathways, transport from ER through Golgi to lysosome, endosome.

UNIT V

Cell communications: General principles of cell communication- signaling pathways. - signaling through G-protein linked cell surface receptors - signaling through enzyme-linked cell surface receptors - Biology of Cancer Cells: Characteristics of Cancer Cells, types of tumours. Apoptosis and its relevance in cancer biology. Oncogenes – Environmental factors inducing cancer.

Text Books:

1. Powar, C.B. (1983), Cell Biology, Himalaya Publishing House, Bombay
2. David Freifelder (1998), Molecular Biology, Ii Ed., Narosa Publishing House, New Delhi.
3. De Robertis, E.D.P., and De Robertis, Jr. E.M.F. 2001. Cell and molecular biology. Williams & Wilkins, USA.

Reference Books:

1. Alberts, B., Johnson, A., Lewis, J, Raff, M., Roberts, K and Walter, P. 2002. Molecular biology of the Cell. Garland science, New York.
2. Bolsover, S.R, Hyams, J.S, Shephard, E.A, White, H.A and Wiedemann, C.G. 2004. Cell Biology. John Wiley & sons, Inc. Publication, New Jersey.
3. De Robertis, E.D.P. And De Robertis, E.M.F. (1987), Cell and Molecular Biology, Viii Ed., Lea And Febiger, Philadelphia.
4. Hartl, D.L. and Jones, E.W. 2005. Genetics analysis of genes and genomes. Jones and Barlett. UK.
5. Klug, W.S and Cummings, M.R. 2005. Concepts of Genetics. Pearson Education P (Ltd), Singapore.
6. Lewin, B. 2000. Genes VII. Oxford University Press Inc. New York.
7. Lewis, Keleinsmith And Valeris M. Kish (1988), Principles Of Cell Biology, Harper And Row Publications, New York.
8. Lewis, R. 2005. Human genetics – concepts and applications. McGraw-Hill. New Delhi.
9. Lodish, H., Berk A., Matsudaira, P., Kaiser, C.A., Krieger, M., Scott, M.P., Zipursky, S.L.And Darnell, J. 2004. Molecular Cell Biology. W.H. Freeman & Co., New York.
10. Watson Et Al., (1987), Molecular Biology Of The Gene, The Benjamin Cummings Publishing Co., Inc., California.
11. Watson, J.D, Baker, T.A, Bell, S.P., Gann, A., Levine, M and Losick, R. 2004. Molecular biology of the gene. Pearson Education P(ltd), Singapore

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CORE COURSE III

MOLECULAR GENETICS AND EVOLUTION

Objectives:

To enlighten our students about the DNA and its functions. The knowledge in the molecular biology and genetics will provide diagnosis of genetic disorders and treatment at molecular level. It provides basic information of molecular phylogenies and evolution

UNIT I

Structure and functions of genetic materials: Nuclear and mitochondrial genome organization, Structures of DNA and RNA, Stereochemistry of bases and secondary structures. Genetic structure analyses of eukaryotic genomes. Chromatin structure and nucleosome concept, Organization and function of genetic material, Gene paradox, Repetitive DNA, Satellite DNA, Overlapping genes, Split genes, Pseudogenes.

UNIT II

Identification of genetic material **-** Fine structure of gene – Cistron, muton, recon, exon, intron. Multigene families – types – simple and complex multigenes. Regulation of gene expression in prokaryotes – *Lac* and tryptophan operon of bacteria. Regulation of gene expression in eukaryotes - Gene clustering, Mechanism of positive and negative control of gene expression. Genetic code – Decoding of gene control – alphabets of the code, coding dictionary. Translational and transcriptional control of gene expression, Environmental effects on gene regulation. Epigenetics.

UNIT III

Mutation –point mutations, spontaneous and inducible mutations, reversible and suppressor mutations, lethal mutations, biochemical mutations, phenotypic effects of mutation, molecular basis of mutation, mutagens – physical, chemical and biological. Human Genetics: Inborn errors of metabolism: disorders of amino acid metabolism – PKU, alkaptonuria and albinism, Haemoglobin disorders – Sickle cell anaemia and thalassemia. Carcinogens – Genetic basis of cancer –Role of oncogenes and tumour suppressor genes – RB genes and P_{53}.

UNIT IV

Origin of life on Earth - Theory of Chemical Evolution. Primitive Earth Conditions - anoxic reductive atmosphere, relatively high temperature, volcanic eruption, radioactivity, high frequency UV radiation. Molecular evolution : Abiotic formation of sugars, amino acids, organic acids, purines, pyrimidines, glycerol and nucleotides and their polymerization to RNA on reactive surfaces, polymerization of amino acids to Polypeptides and Proteins. Ribozymes and RNA World. Formation of DNA, Formation of nucleoproteins, Prions, Natural selection of self-replicating polymers**.**

UNIT V

Molecular phylogenies and evolution: History of molecular phylogenetics - amino acid sequences, DNA sequences – DNA and its repetitive sequences. Nucleic acid phylogeny based on - DNA– DNA hybridization, restriction enzymes and nucleotide sequences.

Combined nucleic acid – amino acid phylogenies. Rate of molecular change, molecular clock, regulatory genes and evolution. Gene evolution - evolution of gene families, molecular drive, assessment of molecular variation.

Text Books:

1. Ursula Goodenough (1984), Genetics, Saunders College Publishing Co., London.
2. Kavita B. Ahluwalia 1991 'Genetics' Wiley Eastern Ltd., New Delhi. 2.
3. Monroe.W.Strickberger, Evolution Third Edition. Jones and Bartlett publishers International, London, UK.

Reference Books:

Genetics

1. Benjamin Levin (2005) Genes VIII, Oxford University Press, New York.
2. Daniel L. Hartl (1996) Genetics, III Ed., Jones Bartlett Publishers. Boston.
3. David Friefelder (1998) Microbial Genetics, Narosa Publishing House, New Delhi.
4. Gardner, E. J. et.al. (1991). Principles of Genetics. John Wiley & Sons. New York.
5. Gurbachan S.Miglani-2003 "Advanced Genetics". Narosa Publishing House, New Delhi.
6. Jenkins, J. B. (1983) Human Genetics, The Benjamin Cummings Publishing Co.,
7. John D. Hawkins (1996) Gene Structure and Expression, III Ed. Cambridge University Press.
8. Munroe.W. Also, Curt Stern, 1983 'The Principle of Human Genetics'. W.H. Freeman & Co., San. Francisco.
9. Robert H. Tamarin (1996) Principles of Genetics, WCB Publishers.
10. Robert. H Tamarin 2004 'Principles of Genetics' Tata Mc. Graw-Hill Publishing Company Ltd. New Delhi.
11. Strickberger Monnroe, W. (1996) Genetics, Prentice Hall of India Pvt. Ltd., New

Evolution

1. Moody, P.A. 1978. Introduction to Evolution. Harper International.
2. Dodson. 1990. Evolution, Reinhold, New York.
3. Barton, N. H., Briggs, D. E.G., Eisen, J. A., Goldstein, A. E., Patel, N. H., Cold. Evolution, Spring Harbor Laboratory Press, New York, USA
4. Evolution, Hall, B. K. and Hallgrimsson, B., Jones and Bartlett Publisher, Sudbury, USA.
5. Futuyma, D. J.,Evolution, Sinauer Associates, Inc., Sunderland, USA

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CORE COURSE IV

DEVELOPMENTAL BIOLOGY

Objectives:

This course provides the process of early embryonic development and review the current development in the field of embryology. The formation of embryo and embryological disorders and treatment methodology. Precaution and health care during pregnancy and gestation.

UNIT I

Introduction to developmental biology. Gametogenesis – Spermatogenesis – Cells in seminiferous tubules, spermiogenesis, structure and types of sperm. Oogenesis – origin and growth of oocyte, maturation of egg, egg envelops, vitellogenesis, and organization of egg cytoplasm. Types of eggs. Egg cortex - polarity and symmetry of egg. Fertilization : Events of fertilization- acrosome reaction in sperm – cortical reaction in egg - recognition of egg and sperm, gamete fusion, activation of egg metabolism, physiological changes in the organization of egg cytoplasm, theories of fertilization.

UNIT II

Cellular differentiation- cytodifferentiation and chemodifferentiation. Stem cells- totipotency and pleuripotency. Embryonic Stem cells and their applications. Cleavage – Patterns of cleavage – radial, spiral and bilateral; Types – meroblastic, holoblastic and superficial, factors affecting cleavage. Blastulation – Types of blastula. Fate maps. Presumptive organ forming areas in frog and chick. Morphogenetic movements and gastrulation in frog and chick.

UNIT III

Organogenesis – Ectodermal derivatives: formation of central nervous system- development of brain eye in frog. Mesodermal derivatives: heart and kidney in frog. Endodermal derivative: intestine in frog. Organogenesis in Chick – development of heart. Extra embryonic membranes in Chicks – Placentation – its types and physiology in mammals.

UNIT IV

Polarity and gradient: dorsal and ventral polarity – homeo box concept. Organiser concept - embryonic induction - mechanism of induction. Regeneration: Types of regeneration- amphibian limb regeneration- stimulus and suppression of regeneration. Metamorphosis- types- amphibian metamorphosis- events and hormonal control. Insect metamorphosis: moulting, growth and hormonal control.

UNIT V

Precaution and health care during pregnancy and gestation. Impotency: Causes of Impotency and sterility male and infertility in female – Concept of test-tube baby - Artificial Insemination in humans - In Vitro Fertilization (IVF) and Gamete-Intra-Fallopian Transfer (GIFT) – Advantages and disadvantages. Teratogenesis- Developmental mechanism of teratogenesis. Contributions of teratology to developmental biology. Teratogens and induced birth defects.

Text Books:

1. Veer balarastogi, Developmental biology, Kedarnath Ram nath publishers, meerut.
2. Arumugam.N. 1998. Developmental Biology, Saras Publications,
3. Balinsky, B.I. 1981. An Introduction to Embryology. W.B. Saunders Company. Philadelphia.

Reference Books:

1. Berry.A.K.2007. An Introduction To Embryology, Emkay Publications, New Delhi-51.
2. Beril., N.J..1986. Developmental Biology. Tata Mcgraw-Hill Publishing Ltd. New Delhi.
3. Banerjee. S , Development Biology, Dominant Publishers, New Delhi
4. Browder, L.N. (1980) Developmental Biology, Saunders College, Philadelphia.
5. Deuchar, E.M. (1976) Cellular Interaction In Animal Development, Chapman And Hall, London.
6. Verma, P.S. And Agarwal V.K. 2005. Chordate Embryology (Developmental Biology) S. Chand& Company Ltd., New Delhi.

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CORE PRACTICAL I

ANIMAL TAXONOMY, PHYLOGENY AND BIODIVERSITY, CELL AND MOLECULAR BIOLOGY, MOLECULAR GENETICS AND EVOLUTION & DEVELOPMENTAL BIOLOGY (P)

Objectives:

To obtain knowledge about the identification and classification of animals. To get the information of animal population - the phylogeny and fossil forms in the title of animal diversity. To impart the knowledge and concepts of Cell and Molecular Biology, Molecular Genetics and Evolution, Developmental Biology

ANIMAL TAXONOMY: A list of at least 50 representative animals belonging to major classes of nine invertebrate phyla and major orders of 5 classes of vertebrates can be shown as spotters to the students. A student has to identify and describe the salient features and assign them to the order, class and phylum to which they belong.

PHYLOGENY: Invertebrate larval forms - Trochophore, Nauplius, Bipinnaria, Tornaria
Fossils – Ammonoids, Belemnoids, Nautiloids , Echinoderm fossils, Dinosaurs and Archaeopteryx.

BIODIVERSITY

1. Marking of important Biodiversity regions, countries and centres in World and Indian map.
2. Collection of endemic animals photos with information from websites, journals, newspapers.

Dissections

Video clipping dissection of earthworm, cockroach, shark, frog, calotes and rat can be shown to the students. A student can make use of material available in any search web site for online dissection using Apple quick time software.

CELL AND MOLECULAR BIOLOGY

Micrometry
Human Buccal Smear
Blood Smear – Cockroach/ Man.

MOLECULAR GENETICS AND EVOLUTION

Drosophila culture – Identifications of Normal, mutants & sexes.
Blood groups ABO & Rh their genetic significance.
Pedigree analysis.

Human karyotyping & Chromosomal abnormalities.

DEVELOPMENTAL BIOLOGY

Preparation of sperm suspension in frog/bull and observation of the spermatozoa.
Observation of live spermatozoa and study of rate of motility of sperm in frog /bull semen.
Developmental stages in chick embryo.
Vaginal smear preparation in rat / mouse to study the stages of oestrous cycle.

Record of Laboratory work shall be submitted at the time of practical examination.

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CORE COURSE V

ANIMAL PHYSIOLOGY

Objectives:

Animal Physiology helps the students in understanding how the body functions adapts with respect to its external and internal environment, related to nervous integration, sensation, metabolism and reproduction.

UNIT I

Definition of digestion and types of digestion – extra and intracellular. Nutrition-Food requirements, Physiology of ingestion. Digestion in mouth, cardiac stomach, pyloric stomach, small intestine. Digestive enzymes and their role in the digestion of carbohydrates, proteins and lipids. Absorption and assimilation of digested food materials. Balanced diet, BMR and BMI. Homeostatic mechanisms: Osmo-ionic regulation in crustaceans and fishes – temperature and pH regulations in animals. Light – photobiological processes – pressure – acclimatization to high altitudes – Hydrostatic pressure – Buoyancy.

UNIT II

Respiration- Structure of mammalian lungs and gaseous exchange- Transport of oxygen–formation of oxyhaemoglobin and affinity of haemoglobin for Oxygen, Oxygen dissociation curves-Transport of CO_2 Chloride shift, Bohr Effect. Circulation: Open and closed circulation. Structure of mammalian heart and its working mechanism – Heartbeat and cardiac cycle. Myogenic and neurogenic hearts. Properties and Functions of blood – factors contributing to heart problems.

UNIT III

Excretion – Forms of nitrogenous waste material and their formation. Organization of mammalian excretory system-structure and function of kidney and nephron – Counter current mechanism of urine formation. Muscles – General structure and types of muscles. Sliding filament mechanism of muscle contraction. Chemical changes during muscle contraction – role of calcium, ATP utilization and its replenishment.

UNIT IV

Structure of nerve cell. Nature of nerve impulse – resting potential and action potential. Properties of nerve impulse – threshold value, refractory period, all or none response. Conduction of nerve impulse, Structure of synapse, mechanism of synaptic transmission – electrical and chemical transmissions, Neuro-transmitters. Receptors: types, Photoreceptor – structure of human eye and physiology of vision, Phonoreceptors – structure of human ear- organ of corti-

physiology of hearing. Bioluminescene – Chronobiology: Biological rhythms – rhythms in man – biological clock.

UNIT V

Endocrine glands – Relationship between hypothalamus and pituitary gland. Hormones of hypothalamus. Hormones of Adenohypophysis and Neurohypophsis. Hormones of pineal gland, thyroid gland, parathyroid, thymus, adrenal and pancreas. Endocrine control of mammalian reproduction – Male and female hormones – Hormonal control of menstrual cycle in humans. Hormones of insects.

Text Books :

1. <u>Sambasivaiah</u>, Kamalakararao and Augustine Chellappa 1990. A Text book of Animal Physiology and Ecology, S. Chand & Co., Ltd., New Delhi – 110 055.
2. Parameswaran, Anantakrishnan and Ananta Subramananiam, 1975. Outlines of Animal Physiology, S. Viswanathan [Printers & Publishers] Pvt. Ltd.,
3. William S. Hoar, 1976. General and Comparative Physiology, Prentice Hall of India Pvt. Ltd., New Delhi – 110 001.

Reference Books :

1. Baldwin, E. (1964) An Introduction To Comparative Biochemistry, Cup, London.
2. Beck, W.S. (1971). Human Design, Harcourt Brace Joranorich Inc.,
3. Dawson, H. (1964) General Physiology, Little Brown Co., Boston.
4. Echert, R. And Randall, D. (1987) Animal Physiology, Cbs Publishers And Distributors
5. F.N. (1971) Animal Function, Principles And Adaptation, Macmillan Co., London.
6. Giese, A.C. (1979) Cell Physiology And Biochemistry, Prentice Hall
7. Gordon, M.S., Bartholomew, G.A., Grilnell, A.D., Jorgensen, C.B., And White.
8. Prosser, C.L. Brown 1985. Comparative Animal Physiology, Satish Book Enterprise, Agra – 282 003.
9. Turner, C.D. And Bagnara, J.T. (1976) General Endocrinology, 6th edn., Wb Saunders Co., Philadelphia.
10. Wilson, J.A. (1979) Principles Of Animal Physiology
11. Wood, D.W., 1983. Principles Of Animal Physiology 3rd Ed., 5.

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CORE COURSE VI

BIOCHEMISTRY AND BIOPHYSICS

Objectives:

This paper gives information about the biochemical and biophysical aspects related to living organisms. The life supporting molecules, their metabolism, biological oxidation and its relevance. Biophysical aspects and their properties.

BIOCHEMISTRY

UNIT I

Introduction to Biochemistry: – Physical and chemical processes of living systems – Water and it functions – Dissolved gases and their properties – pH and buffer. *Proteins:* Classification - Structure and functions. *Carbohydrates:* Classification – Structure, properties and functions. *Lipids:* Classification, structure, properties and functions. *Amino Acids:* Structure and classification – Ketogenic and glucogenic amino acids – Prostaglandins – their classes, functions and Pharmacological uses. *Vitamins:* Structure of water soluble and fat soluble vitamins and Deficiency symptoms.

UNIT II

Metabolism of *Carbohydrate*: Glycolysis, TCA cycle, HMP shunt pathway, Glycogenesis and glycogenolysis. *Protein:* General pathway of amino acid metabolism – deamination, transamination and decarboxylation. Urea cycle. Catabolism of Tyrosine, Tryptophan, Glycine and phenylalanine. *Lipid*: Beta-oxidation, biosynthesis of saturated fatty acids- Palmitic acid, Nucleic acids:-metabolism of purine and pyrimidine nucleotides. High energy phosphates and their role in redox reaction. Phosphagens-ATP as an energy molecule. Synthesis of ATP.

UNIT III

Respiratory pigments: Structure of Haemoglobin and Cytochrome. *Biological Oxidation:* Nucleotides, Flavoproteins, Cytochromes – Redox potential – Oxidative phosphorylation. *Enzymes:* Classification – Properties – 3D structure of an enzyme – Enzyme kinetics – Mechanism of action of enzymes - active site, Lock and Key model, induced fit hypothesis. Mechanism of enzyme catalysis, enzyme-substrate complex formation, Allosteric enzymes. Co-enzymes and its properties. *Hormones*: Mechanism of hormone action – Peptide hormone – Adenylatecyclase – Cyclic AMP mechanism – Ca^{++} - Phosphoinositol, steroid hormone and transcriptional control. Receptors of hormones- G-protein.

BIOPHYSICS

UNIT IV

Scope of Biophysics in Biology- structure and properties of atoms and molecules- chemical bonds – types – molecular interactions- atomic and molecular orbitals – X-ray diffraction – Polymerization of organic molecules– Colloids- description, and properties. Thermodynamic principles – Membrane biophysics – diffusion, active transport. Tyndall effect, Surface tension, Brownian movement, filtration, osmosis, dialysis.

UNIT V

Properties of natural light. Photoelectric effect – Photodynamic sensitization – Effect of UV light and ionizing radiations – Detection – Disintegration – Measurement of radio activity – Gieger Muller counter – Isotopes as tracers - Free energy from electromagnetic waves - Natural radiations. Principles and application of chromatography – Paper – Thin layer – Column – Ion – exchange – filtration – Gas liquid – HPLC and Affinity. Principles and applications of electrophoresis – Agarose gel electrophoresis – PAGE – SDS-PAGE.

Text Books:

1. Lehninger L. Albert, David. L. Nelson, Michael M. Cox. (1993), Principles Of Biochemistry, Cbs Publishers And Distributors, Delhi.
2. Ramamurthy, V and S. Raveendran. 2010. Fundamentals of Biochemistry. Aruma   Publications, Koradacherry.

Reference Books:

1. Frunton J.S. & S. Simmonds, G.General and R.H.Dol. 1987. Outlines of Biochemistry, John Wiley & Sons.
2. Baldwin, E. 1964. An introduction to comparative Biochemistry, CUP, London.
3. Jain, J.L. 2003. Fundamentals of Biochemistry, S. Chand & Compnay Ltd. New Delhi.
4. Freifelder, D. 1993. Physical Biochemistry. W.H. freeman and company. New york.
5. Mallikarjuna Rao. 2006. Medical biochemistry. New Age International publishers, New Delhi.
6. Voet. G. 1989. Biochemistry. John Wiely and Sons, lnc.
7. Dubay, G. 1989. Biochemistry. Mac Millan publishing company, New York.
8. STRYER, L. (1988), Biochemistry, W.H. Freeman and Company, New York.
9. COOPER, T.G. (1977), The Tools of Biochemistry, Wiley Interscience Publication, John Wiley and Sons, New York.

Text Book: **BIO PHYSICS**

1. Casey, E.J.(1962), Biophysics Concepts and Mechanisms, East West Press Pvt. Ltd., Delhi.
2. Arora, M.P. 2004. Biophysics. Himalaya Publishing House, Mumbai. P 378.
3. P.Narayanan (1999) 'Introductory Biophysics' New Age Publishing Co., Mumbai, India.

Reference Books:

1. Ackerman, E., Ellis, L.B. and Williams, L.E. 1979. Biophysical Science. Prentice hall of India, New Jerssey, USA.
2. Daniel, M. 1989. Basis biophysics for biologists. Agro – Botanical publishers, India.
3. Pattabhi, V. and Gautham, N. 2003. Biophysics. Narosa publishing House, New Delhi.
4. Skoog, A., Douglas, J and Leary, J.J. 1992. Principles of Instrumental analysis. Sauders Golden Sunberst Series. Philadelphia.
5. Zubey. 1994. Biochemistry. The International books.
6. Bose, S. (1982) Elementary Biophysics. Jyoth Books.
7. Casey, E. J. (1962) Biophysics concepts and Mechanism. Affiliated East – West Press Pvt. Ltd., New Delhi.
8. Epstein, H. T. (1963) Elementary Biophysics selected topics. Addisson – Wesley Publishing Company Inc London.
9. Vasantha Pattabhi and N.Gautham (2001) 'Biophysics' Narosa Publishing Company, New Delhi.

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CORE PRACTICAL II

ANIMAL PHYSIOLOGY & BIOCHEMISTRY AND BIOPHYSICS (P)

Objectives:

To obtain knowledge about the physiological mechanism from animal models on respiration, excretion and some blood parameters. To identify the endocrine glands and their secretions.

Animal physiology:

1. Estimation of R_Q in fish with reference to light and temperature.
2. O_2 consumption in aquatic animal (fish).
3. Blood analysis: Total WBC count, PCV, MCV.
4. Differential Counts
5. Total RBC count
6. Blood grouping and coagulation.
7. Hemoglobin estimation.
8. Estimation of blood glucose level in human (GOD kit).
9. Estimation of ammonia, uric acid and urea from samples

Spotters:

Slides **:** T.S of pineal gland, thyroid gland, parathyroid, thymus, adrenal and pancreas, T.S of Ovary, T.S of Testes, Muscles (striated, non-striated and cardiac), Nerve call.
Models: Structure of mammalian eye, organ of Carti,

Biochemistry and Biophysics

1. Preparation of solution- molar, millimolar, micromolar and nanomolar; solutions of normality and percentage.
2. Determination of different pH using pH meter.
3. Preparation of standard graph using Spectrophotometer.
4. Chromatographic techniques:
   a. Paper Chromatographic technique to separate amino acids.
   b. Thin layer chromatographic technique to separate lipids.
5. Quantitative estimation of amino acid, protein, carbohydrate and lipid in animal tissues.
6. Quantitative estimation of DNA/ RNA
7. To isolate the Casein from milk.
8. To verify Beer Lambert's law
9. Fractionation of proteins using PAGE electrophoresis
10. **Spotters:** Thin layer, column, paper chromatography, Centrifuge, Kymograph, Spectrophotometer / Colorimeter, Sphygmomanometer, ECG, EEG.

Record of Laboratory work shall be submitted at the time of practical examination.

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ELECTIVE COURSE I (A)

APPLIED BIOTECHNOLOGY

Objectives:

This paper deals with the applied aspects of biotechnology in medical, agricultural, industrial, microbial and environmental fields. The uses of the recombinant techniques and its application for the betterment of mankind.

UNIT I

Medical Biotechnology – Applications of r-DNA technology in human health - Recombinant DNA proteins and their uses: i) Interferon, ii) Interleukin, iii) Factor VIII, iv) Urokinase and v) Tissue plasminogen activator – Recombinant vaccines: Hepatitis-B, Rabies and FMD Vaccine - Commercial production of penicillin – DNA finger printing and its use in Forensic science

UNIT II

Hybridoma technology: Production and Application of monoclonal and polyclonal antibodies – Gene Therapy — Cell bank – Animal bioreactor and molecular pharming. Transgenic animals – transgenic animal model development – Transgenic mouse – embryonic stem cell method and pronucleus method – Transgenic fish and sheep. Bioethics in animal genetic engineering.

UNIT III

Agricultural Biotechnology: Genetically Modified Microorganisms – Phytoremediation. Bacterial Biofertilizers –Rhizobium, Acetobacter, Azospirillum inoculants – Nitrogen, Phosphate and sulphate fixing mechanisms, Green manuring – Cyanobacterial inoculants – VAM fungi. Benefits of biofertilizers - Biopesticides in pest management.

UNIT IV

Industrial and Microbial Biotechnology – Fermentation technology: Fermentors, Selection of microbes, Fermentation medium – Production of Penicillin, Vitamin B^{12}, Amino acids and Proteases – Production of organic compounds by microbial fermentation – Ethanol and acetone production - Antibiotics – microbes used – commercial production of antibiotics – Single Cell Protein (SCP) production and their advantages.

UNIT V

Environmental Biotechnology – Bioremediation – *In-situ*, and *Ex-situ* Bioremediation – Use of genetically engineered bacterial strains – Bioremediation of dyes – Bioremediation in paper and pulp industry.

Immobilized culture – Bioremediation of heavy metals: Mechanism of metal removal – Bioremediation of coal waste through VAM fungi – Bioremediation of xenobiotics – Recycling of waste water through Microbes.

Text book :

1. Dubey, R.C. A Textbook of Biotechnology (Edition, 2006) S. Chand & Co. Ltd. Ram Nagar, New Delhi, India.
2. Gupta, P.K. Biotechnology and genomics (Edition, 2009) Rastogi Publication, Meerut, India

Reference Books:

1. Chopra, V.L and Nanin, A. 1992. Genetic Engineering and Biotechnology. Oxford and IBH Publishing Company, New Delhi.
2. Copping, G and Rodgers, P. 1986. Biotechnology. Oxford and IBH Publishing Company, New Delhi.
3. Das, H.K. Textbook of Biotechnology (Edition, 2006) Wiley Dream Tech, India Pvt. Ltd. New Delhi, India
4. Gustafon,J.P. 1984. Gene Manipulation in Plant Improvement. Plenum Press, New Yerk.
5. Ignacimuthu, S. 1996. Basic Biotechnology, Tata McGraw- Hill Publishing Company Limited, New Delhi.
6. Lewin, B. 1990. Gene IV. Oxford University Press. Oxford. Marx, J.L., 1989. Revaluation in Biotechnology. Cambridge University Press, Cambridge.
7. Old R.W. and Primrose, S.B. 1985. Principles of gene manipulation. An Introduction to Genetic Engineering. Oxford Blackwell Publishers, London.
8. Ramawat, K.G and Shaily Goyal. Comprehensive Biotechnology (Edition, 2009), S. Chand & Co. Ltd. Ram Nagar, New Delhi, India.

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ELECTIVE COURSE I (B)
ENDOCRINOLOGY

Objectives:

This paper provides knowledge about whole body control mechanism by hormones and also provides diseases caused due to hypo and hyper secretion of hormones and treatment options for imbalanced hormonal functions.

UNIT I

Scope of Endocrinology: Introduction, Objectives, aims and scope of endocrinology - Nature, function and classification of hormones – Hormones as messengers - Feedback control of hormone secretion- General principles of hormonal action – Experimental methods of hormone research.

UNIT II

Invertebrate and Crustacean Endocrinology: Concepts of neurosecretion and neuroendocrine system in invertebrate and crustacean groups – Neuroendocrine system in insects – hormonal control of reproduction, metamorphosis and moulting in insects.

UNIT III

Vertebrate Reproductive Endocrinology: Structure of mammalian testis and ovary – hormones of testis and ovary – Reproductive cycles (oestrus cycle and menstrual cycle) – Foeto-placental unit as an endocrine entry – hormonal regulation of pregnancy – parturition and lactation. Disorders of male and female reproductive systems, Assisted reproductive technology (ART) – MART – FART.

UNIT IV

Pituitary and Thyroid gland: Pituitary gland- structural organization – secretions, biosynthesis and their functions – hypothalamic control. Thyroid gland – structural organization - function and biosynthesis of thyroid hormone – metabolic effects of thyroid hormone – Effects of thyroid hormone on growth and reproduction – Parathyroid gland – structural organization – secretions, biosynthesis and Parathyroid hormone functions.

UNIT V

Pancreatic Islets and Adrenal Glands: Structure of pancreatic Islets – functions of insulin and glucagon – Diabetes. Adrenal gland – structural organization, functions of adrenal hormones. Biosynthesis and regulations.

Text Book

1. Turner, C.D. 1966. General Endocrinology. W.B. Saunders Co., London

References:

1. Barrinton, E.J.W. 1968. An introduction to general and comparative endocrinology. Academic press, New Delhi.
2. Bantley, P.J. 1985. Comparative vertebrate endocrinology. S.Chand and Co., New Delhi.
3. Mac Hadley, 1994. Endocrinology. Prentice Hall of India. New Delhi.
4. Michael, P. 1968. Endocrinology and human behavior. Oxford University press, New Delhi.

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ELECTIVE COURSE II (A)
COASTAL GEOMORPHOLOGY

Objectives:

The main aim is to prepare the students for self-employment in the opened areas like costal geomorphology in fishery biology. The relevant knowledge in costal morphology, diversity and ecosystems and their impacts.

UNIT I

Definition and scope of coastal geomorphology- Coastal ecosystems- geomorphic classification of coastal systems –Diversity of Coastal Ecosystems- unconsolidated and consolidated coastal materials-Factors influencing coastal morphology and processes.

UNIT II

Physical basis of coastal environment – tides- tidal range-tidal currents- effects of tides on tidal flats- physical basis of wave movement-effects of waves- Tsunamis.

UNIT III

Processes in coastal ecosystem- bars- beach drift - beach forms- Beach and near shore sediments and morphology- Beach rock- Abrasion Platforms and cliffs- estuaries meandering.

UNIT IV

Salt marsh and mangrove ecosystems- Conservation and management of salt marshes and Mangroves- Corals and reef formation-Impacts of disturbance on coral reefs- sea grasses- swamps-coastal islands, forms, types and processes.

UNIT V

Coastal ecosystem impacts: Greenhouse effect and sea level rise- Effects of a changing climate -Effects on cliffs and shore platforms - Effects on beaches, spits and barriers - Effects on coastal dunes -Effects on intertidal wetlands -Effects on estuaries and lagoons - Effects on deltaic coasts - Effects on coral and algal reefs- protection of Marine Biosphere resources-impacts of coastal mining.

Text Books:

1. Ahnert, F.1998 Introduction to Geomorphology Arnold Publisher, London,
2. Eric Bird, 2007.Coastal geomorphology : an introduction, Wiley Publishers, England.

Reference books :

1. Oldale, R.1980 A geologic history of carp cod, U.S. Geological Survey, Washington.
2. Reed Wicander& James S.Monroe, 1999 Essentials of Geology Wadsworth Publishing Company, Tokyo 447 pp.
3. Sent, P.K. and Prasad, N.2002 Introduction to Geomorphology of India. Allied publishers private limited Mumbai 378 pp.
4. Robin Davidson-Arnott, 2010. An Introduction to Coastal Processes and Geomorphology, United States of America by Cambridge University Press, New York.
5. Amsath. A. and Maharajan. A. 2016. Coastal Geomorphology, Hari-Krish Publication, Nagercoil

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ELECTIVE COURSE II (B)

POULTRY FARMING

Objectives:

The main aim is to give information about the poultry and its importance.. It gives an idea for the self- employment opportunities to the students. The role of different research organizations and funding agencies to promote aquaculture.

UNIT I

Introduction to poultry science –Origin and history of poultry species: Chicken, turkey, duck and quail – Important qualitative traits in poultry. Economic traits of egg-type chicken and their standardization – Economic traits of meat – type chicken and their standardization. Nomenclature of breeds of fowl, classification of fowls, selection of breeds. Housing and equipment – General principles of building poultry sheds, deep litter system, laying cages.

UNIT II

Brooding and rearing – Natural and artificial brooding - Methods of brooding brood temperature, space and duration; fed, water and space allowance, debeaking – vaccination. Management of growers, layers, broilers – lighting of chicks, growers and layers. Summer and winter management, debeaking and culling. Poultry manure – volume, composition, value and disposal.

UNIT III

Feed additives – Names, allowance and usage of Food additive – the impact on human health. Food stuffs for poultry in relation to protein, amino acids, minerals (Ca and P), vitamins and fibre content. Feed formulations for chicks, growers, phase I to phase III layers and broilers. Nutritive value of egg, factors affecting egg size, storage and preservation of egg, marketing, incubation and hatching of eggs. Annual egg production in India.

UNIT IV

Symptoms, prevention, control and treatment of viral, bacterial, fungal, protozoan and worm infection, ticks, mites and lice affecting fowl.

UNIT V

Processing, Preservation, grading, storage and marketing of eggs and meat Economics of Poultry production – problems in poultry production. Economics of poultry production units to examine first hand rearing and business operation status.

Text Book:

1. Sunil Kumar Das (1994) – Poultry production, CBC Publishers and Distributors, Delhi.
2. Babu, M. and Lurthu Reetha, T. 2011. A Handbook on Poultry farming. Tamilnadu Veterinary and Animal Sciences University and Nehru Memorial College, Tiruchy.

Reference Books:

1. Ahsan, J. and Sinha, S.P. 2003. A Hand book on Economic Zoology. S. Chand & Company Ltd., New Delhi.
2. Arumugam, N., Murugan, T., Johnson Rajeshwar, J. and Ram Prabhu, R. 2009. Applied Zoology. Saras Publication, Nagercoil.
3. Banerjee G.C. (1992) A textbook of animal husbandary, Oxford and IBM Publishing Co., New Delhi.
4. Crawford RD.1990. Poultry Breeding and Genetics.
5. Elsevier. Hutt FB. 2003. Genetics of Fowl. Norton Greek Press.
6. Gupta,S.B.,Indian Poultry Industry year book 1975 –C-34, New Bactak Road, New Delhi
7. Intensive Poultry Management for egg production. Bulletin NO. 152, London.
8. Shukula, G.S. and Upadhyay V.B. (1997) Economic Zoology, Rakesh Rastogi Meerut.
9. Singh RP & KumarJ. 1994. Biometrical Methods in Poultry Breeding. Kalyani.
10. Tomar, B.S. and Singh, N. 2007. A Text Book of Applied Zoology. Emkay Publications, Delhi.

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CORE COURSE VII

MICROBIOLOGY

Objectives:

This paper instruct the students the History and Scope of microbiology, Microbial Technology, Microorganisms and Environment, food microbiology, microbial diseases and treatment.

UNIT I

History and Scope of microbiology- Classification of microbes. Structure of *a bacterium.* Bacterial respiration and reproduction – economic importance of bacteria. Classification of viruses- physical and chemical structures of viruses - DNA and RNA viruses. Concept of Sterilization - Physical and Chemical methods of sterilization**.** Stains and staining techniques. Bacterial nutrition and Growth- Nutritional types. Growth factors, Types of culture - culture media- Isolation of pure culture –Colony morphology and growth- Growth curve and Growth kinetics.

UNIT II

Microbial Technology: Genetic engineering of food and additives – Single Cell Protein (SCP) production – Production of organic acids (acetic acid), ethanol – Antibiotics – Microbial toxins – Fermentation products. Microbial Genetics**:** Recombination in Bacteria – Transformation – conjugation – Sex duction; Recombination in Bacteriophage – Transduction – Lytic and Lysogenic cycle. Genetic applications of bacteria and viruses.

UNIT III

Microorganisms and Environment: Microorganism of different soils - interactions with the atmosphere. Microorganisms in Aquatic Habitats – Microbiological analysis - in fresh water and marine water. Microorganisms and pollution – Microorganisms in sewage. Microorganism in extreme environments- thermophilic, methanogenic and halophilic. Photosynthetic bacteria, Cyanobacteria. Archaea of cold regions and space.

UNIT IV

Food Microbiology: Microbes of milk and food, methods of detection, pasteurisation and food poisoning. Spoilage of food, fruits, vegetables, cereals, meat, poultry egg, seafood, caned products – Factors influencing spoilage – Food preservation. Food borne infections and intoxications - Clostridium, Salmonella, and Staphylococcus –microtoxins in food with reference to Aspergillus species- Quality assurance- microbiological quality standards of food, government regulatory practices and policies- FDA, EPA.

UNIT V

Microorganisms and Microbial Diseases**:** General Account of Pathogenic Bacteria – prognosis, diagnosis and treatment for diseases caused by viruses (Yellow fever, Dengue, Polio, HIV, Influenza), Bacteria (Pneumonia, Diphtheria, Tuberculosis, Typhoid, Gonorrhea) Fungi (Madura foot, Athlete's foot, Candidiasis) and Protozoa (Malaria, Amoebic dysentery, Trypanosomiasis, Leptospirosis).

Text Books:

1. Lansing M,Prescott, John. P.Harvey, Donold A, Klain. Microbiology second edition –WM.C. Brown Publications
2. R.C. Dubey, D.U. Maheshwari 2005. A Text book of Microbiology., S.Chand and company Ltd, New Delhi

Reference books:

1. Burden, K.L. and R.P. Williams (6th Ed.) 1968. Microbiology. The Macmillan Co., London P. 818.
2. Dawes, E.A. (Ed.) 1986. Energy conservation in bacterial photosynthesis. In: Microbial energetics. Blackie & Son Ltd., Glasgon, 133-144pp.
3. Doelle, H.W. (Ed.) 1969. Fermentation acetic acid bacteria and lactic acid bacteria. In: Bacterial metabolism. Academic Press. New York, London. 256 – 351 pp.
4. Gevaral .J, Tortora, Berdell R. Funne Christine L. Cara, 1994. Microbiology an Introduction- fifth edition,
5. Hay, J.M. (Ed.) 1986. Modern Food Microbiology. CBS publishers, Delhi. 622 pp.
6. Kumarasamy, P, A. Maharajan and V. Ganapiriya. 2012. Microbiology. HariKrish Publication, Nagercoil.
7. Reed, G. (4th Ed.) 1983. Prescott & Dunn's Industrial Microbiology. AVI Publishing Co., Inc. Connecticut, 883. pp.
8. Roberts, T.A. and F.A. Skinner (Eds.) 1983. Food Microbiology: Advances and Prospects, Academic Press, Inc. London, 393 pp.
9. Selle, A.J. (Ed.) 1967. Fundamental Principles of Bacteriology. Tata McGraw – Hill Publishing Company Ltd., New Delhi, 822 pp.

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CORE COURSE VIII

BIOSTATISTICS AND COMPUTER APPLICATIONS

Objectives:

The aim of this paper is to know the statistical problems in biological science which is useful for the students for their research works. A basic knowledge in computer and its applications for further research.

UNIT I

Data in biostatistics – Collection of data and its methods, Classification of data, Presentation of data – Diagrammatic presentation of data, graphical presentation of data and tabulation of the data. Sample – methods of sampling. Variables and its types. Frequency distribution.

UNIT II

Descriptive statistics: measures of central tendency – mean and other means, median and mode. Measures of Dispersion – Range, Standard deviation uses and calculation. Co-efficient of variations and standard error. Measures of Skewness and Kurtosis. Correlation analysis Pearson and Rank correlation. Regression analysis based on biological data.

UNIT III

Probability – Definition – Additional theorems and multiplication theorem of probability with simple problems related to this. Probability distribution binomial, Poisson and normal distribution and its properties. Testing the hypothesis t- test, chi square test and goodness of fit, F test and ANOVA one way and two way analysis.

UNIT IV

Statistical packages: SPSS-data editor-Creating, coding variables. Output viewer, Exploring data with SPSS-Graphics and diagrammatic representations with SPSS, Application of SPSS in biological Sciences. Simple statistics with statistical packages –SPSS.

UNIT V

History and generations of computer. Components of a computer. Input and output devices of a computer. Hardware and software of a computer. Languages and its uses in biology, operating systems –Windows, MS-office-Word Processor (MS Word) ; Data processor (MS Excel) ; Presentaion (MS power point). Internet and e-mail. World Wide Web (www), web designing. Modem-Wi-fi and its uses.

Text Books:

1. Daniel, W.W. 2000. Biostatistics - A foundation for analysis in the Health science. John Wiley and sons, New york.
2. Sokal, R.R. and Rohlf, F.J. 2000. Biometry. Freeman, San Francisco.
3. Zar, J.H. 2003. Biosatistical Analysis. Person Edition Asia, New Delhi.

Reference books:

1. Bailey, N.T.J (1997) Statistical methods in Biology, III Ed., Cam. University Press, N.Y.
2. Gupta S.P. Statistical Methods, Sultan Chand & Sons Publishers, New Delhi
3. Khan &Khanum 1994 Fundamental of Bostatistics, Ukaaz Publications, Hyderabed
4. Palanichamy S, and Manoharan M, Statistical Methods for Biologists, Palani Paramount Publications, Palani
5. Ramakrishnan 2007 Saras Publications, Periavilai, Nagaercoil
6. Snadecor, G.W. and W.G.Cochran (1967) – Statistical methods, Oxford & IBH Publishing, New Delhi.
7. Sokal, R and James, F (1973), Introduction to Biostatistics, W.H. Freeman and Company Ltd., Tokyo, Japan.
8. Zar, J.H. (1974) – Biostatistical analysis – Prentice Hall Inc., New Jersey, USA.

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CORE PRACTICAL III

Microbiology & Biostatistics and Computer applications (P)

Objectives:

To obtain practical knowledge about the microbial mechanism from experiments with growth and metabolism. To identify the problems related to biological sciences and biostatics. The use of computers in biological field.

Microbiology

1. General rules to be adopted in Microbiology laboratory.
2. Preparation of Non-selective and selective culture media.
3. Estimation of bacteria from soil and water using plate count method.
4. Observation of morphological characters of bacteria (temporary wet mount technique).
5. Preparation of smears for staining
6. Staining methods: - simple staining, gram negative staining, gram positive staining.
7. Bacterial growth curve

Biostatistics and Computer Applications

BIOSTATISTICS

Any **TWO** Problems related to Chi-square test, Student's t – test, Correlation and Regression
Graphical presentation of data histogram, pie diagram, bar diagram
SPSS package - univariate and multivariate analysis.

COMPUTER APPLICATIONS

1. Using windows OS – manipulating files – editing files
2. Demonstration of the Internet and its uses.

Spotters: Basic components of computers – Input – Mouse, keyboard, light pen, scanner Output (Printer, Monitor) devices. Modem.

A record of laboratory work shall be submitted at the time of practical examination.

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RESEARCH METHODOLOGY AND BIOTECHNIQUES

Objectives:

The main aim of this paper is (Unit I) to give information about how to write/publish a thesis and its basic steps. Other units are dealing with microtechniques, immunotechniques and tissue culture techniques. The Unit V gives information about cryotechniques.

UNIT I

Concept of Scientific research – selection of a research problem – Research design – sampling methods – Hypothesis and null Hypothesis – Data collection – Making observation and records. Preparation of index cards – Reference collection – Refereed journals, Impact factor, Citation index – H-factor and copyright.

UNIT II

Preparation of scientific paper' for publication in a journal. Preparation and presentation of research paper for Symposia, Seminar and Conferences. Technical papers and Monographs. Internet and e-journals. Preparation of thesis – components of thesis. Selection of animal models – Maintenance – CPCSEA regulations. Using computers in research – Computer aided techniques for data analysis, data interpretation and presentation.

UNIT III

Microtechniques : Permanent mounting: Narcotization and killing – fixing – washing – processing – staining – mounting – labelling. Histological preparation of tissues for SEM and TEM. Microphotography principles and applications. Detection of molecules in living cells, *in situ* localization by techniques such as FISH and GISH. Cryotechniques for microscopy. Freeze drying for physiologically active substances.

UNIT IV

Immunological techniques: Antigen and Antibody Preparation and purification, Production of monoclonal antibodies. Immunological techniques in medical diagnosis – HIV – Hepatitis A & B – cancer and pregnancy. Electrophoresis techniques – Gel electrophoresis –SDS-PAGE – Two dimensional gel electrophoresis. ELISA, Blotting Techniques, PCR, MALDI and N- terminal sequencing.

UNIT V

Animal Cell Culture Techniques: Design and functioning of tissue culture laboratory – Cell proliferation measurements – Cell viability testing – Culture media preparation. Types of culture: – Flask, Test tube, Organ and Embryo culture. Protoplast culture. Stem cell culture. Cryopreservation for cells, tissues and organisms. Germplasm storage: Cryobank – Pollen bank, sperm bank. Biosensors and biochips – Applications.

Text books:

1. Guramani. N**.** (2009). Research methodology for biological sciences. MJP publishers, Chennai.
2. Kothari CR, 2009. Second edition. Research Methodology – Methods and Techniques. Wiley Eastern,Ltd., New Delhi.

Reference Books:

1. Case C.L and Johnson TR, 1984. Laboratory Experiments in Microbiology. The Benjamin Cummings Pub. Co., London.
2. Fritschen LJ and Gay LW, 1979. Environmental Instrumentation. Springer Verlag, New York.
3. Humason GL, 1979, Freeman WH and Co.,Animal Tissue Techniques. IV Edition, San Francisco.
4. Oser BL, 1965Hawk's Physiological Chemistry, 14 th Edition, , Tata McGraw Hill Co.,
5. Osterman A, 1984Methods of Protein and Nucleic acid Research. Springer Verlag, New York.
6. Plumber D.T. 1971, An Introduction to Practical Biochemistry. Tata McGraw Hill Co.,
7. Sharma BAV, Ravindra Prasad D and Sathyanarayana P, 1989,Research Methods in Social Sciences, Sterling Pub. Pvt. Ltd.
8. Panneerselvam, R., Research methodology, prentice hall of India, New Delhi.

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ELECTIVE COURSE III (B)

APPLIED ENTOMOLOGY

Objectives:

To enlighten the students on harmful insects and their biology, nature of damage and management measures. To teach our students about various invertebrate pests which attack our crops and belongings and their management measures. To know information about useful insects.

UNIT I

Insect Pests: Definition - Classification of insect pests based on magnitude of damage, occurrence on crops – Types of damage caused by Insects on crop plants -The biological Success of Insects – Reasons for the Success of Insects – Pest Outbreak – Pest Resurgence – Insects as Phyto-pathogenic vectors.

UNIT II

Bionomics and Management of selected Insect Pests of Crops – Pests of Paddy, Cotton, Pulses, Vegetables (Brinjal and Tomato) , (Any Three to Four Major Pests for each crop) Economic Threshold Levels - Pests of stored products – External and Internal feeders (Any Three to Four Major Pests for each category) – Basic requirements for storage of food grains in Godowns -Polyphagous Insects.

UNIT III

Methods of Insect Pest Management: Types – Natural and Artificial methods – Cultural, Mechanical, Physical, Biological and Chemical methods. Pesticides – Classification, Types of formulations, mode of action, Toxicity, insecticide resistance, environmental safety.

UNIT IV

Management with Natural Enemies and other Biological Agents: Parasites and Parasitoids, Predators, Microbial agents. Conservation of Natural Enemies – Botanical Pesticides. Non-Conventional methods – Uses of IGRs, Repellents, Anti-feedants, Pheromones, Chemo-sterilants, Irradiation and Quarantine for managing insect pests.

UNIT V

Managing Insects with Resistant Plants: Insect and Host-Plant relationship – Mechanisms of Resistance – Genetic Nature of Resistance – Factors Mediating the Expression of Resistance. Integrated Pest Management: Basis for Integration - Potential components - Need for IPM and its application - Pest – Predator complex and Ecological balance. Pest resistant crops.

Text books :

1. Tembhare, D.B. 1984. Modern Entomology. Himalaya Publishing House, Mumbai.
2. Vasantharaj David, B. 2001. Elements of Economic Entomology. Popular Book Depot, Chennai, India.

Reference Books:

1. Ambrose, D.P. 2004.General Entomology. Kalyan Publishers, West Bengal.
2. Metcalf, C. V and Flint, W.P. 1979. Destructive and Useful Insects: Their Habitats and Control. Tata McGraw Hill Publications, New Delhi, India.
3. Pedigo, L.P. 2003. Entomology and Pest Management (Fourth Edition). Pearson Education (Singapore) Pte. Ltd., Delhi.
4. Vasantharaj David, B. and T. Kumaraswamy. 2002. Elements of Economic Entomology. Popular Book Depot, Chennai, India.
5. Verma, D.K. 1999. Applied Entomology. Mittal Publications, New Delhi.
6. Fenemore, P.G and A. Prakash. 2006 (Second Edition). Applied Entomology. New Age International Publishers, New Delhi.

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ELECTIVE COURSE IV (A)

FISHERY BIOLOGY

Objectives:

The main aim is to give information about the culture of fishes and crabs. It gives an idea for the self- employment opportunities to the students. The role of different research organizations and funding agencies to promote aquaculture.

UNIT I

History of Ichthyology – World and Indian fisheries. Fishes and their evolutionary history. Fish migration – Types of migratory fishes: Diadromous fishes - Anadromous, Catadramous and Amphidromous - Potomodromous and Oceanodromous fishes. Methods of migration - Factors influencing migration. Ponds and its management. Crustacean fisheries, molluscan fisheries and its economic importance.

UNIT II

Marine fisheries – Sardines, Mackerals, Sciaenids, Silver bellies, Pomfrets, Carangids and Sharks. Inland fisheries – Freshwater, riverine, reservoir, pond and cold water fisheries. Estuarine and brackish water fisheries and their economics. Deep sea fishes- Fish fauna of deep sea and their adaptive modifications.

UNIT III

Fish population studies – Assessment of fish stocks: marking and recapture method, area sampling method. Age and growth studies- length-frequency methods, scale method, otolith methods and other skeletal parts as age indicators. Length –weight relationship- condition factor.

UNIT IV

Culture fisheries – Integrated fish farming technology – rice cum common carp culture, fish cum duck culture- sewage fed fisheries- monosex culture, polyculture, ornamental fishes.

UNIT V

Fish processing and preservation- fish products and by products. Induced breeding techniques with examples. Fishing gears and crafts used in Indian fisheries. Brief account on transport and marketing. Effect of pollution of fishes. Fish pathology: Parasites – Protozoan, Fungal, Bacterial, Worms and Arthropods.

Text Books :

1. Biswas, S.P., (1993) Manual Of Methods In Fish Biology, International Book Co. Absecon Highlands, New Jersey.
2. Jhingran, V.G., (1991) Fish And Fisheries Of India. Hindustan Publishing Copr., New Delhi.

Reference Books :

1. Bose, A.N., Yang, C.T., And Misra, A. (1991) Coastal Aquaculture Engineering. Oxford And Ibh Publishing Co., Pvt. Ltd., New Delhi.
2. Chakrabarti, N.M., (1994) Diseases Of Cultivable Freshwater Fishes And Their Control. International Books And Periodicals Supply Service, New Delhi.
3. Day, F., (1986) The Fishes Of India, Vols., I & Ii. Today And Tomorrow's Book Agency, New Delhi.
4. Govindan, T.K. (1992) Fish Processing Technology, Oxford And Ibh Publishing Co., Pvt. Ltd., New Delhi.
5. Mpeda Hand Book of Aquafarming (1992) Freshwater Fishes, Marine Products Export Development Agency, Kochi.
6. New, M.B., Tacon., A.G.J., And Csavas., I. (1993) Farm – Made – Aqua Feeds. Food And Agrilculture Organization Of United Nations, Rome.
7. Santhanam, R., (1990) Fisheries Science, Daya Publishing House, New Delhi.
8. Seghal, K.K. (1992) Recent Researches In Cold Water Fisheries, Today And Tomorrow's Pbulishers And Printers, New Delhi.
9. Sinha, V.R.P. (1993) A Compendium Of Aquaculture Technologies For Developing Countries. Center For Science And Technology And Oxford And Ibh Publishing Co., Pvt., Ltd., New Delhi.
10. Pillai, T.V.R. (1993) Aquaculture : Principles And Practices. Fishing News Agency, London.
11. S. Raveendran, K. Muthukumaravel, O. Sathick And V. Ramamurthy. 2011. Estuarine Biology. Aruma Publications, Koradacherr

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ELECTIVE COURSE IV (B)

BIOINFORMATICS

Objectives:

The aim of this paper is to know the bioinformatics and its applications in biological science which is useful for the students for their research works. Through bioinformatics the various bio techniques may be obtained for further research.

UNIT I

Bioinformatics and its relation with Molecular Biology – Historical overview and Definition of Bioinformatics – Data generation through Genome sequencing, Protein sequencing, Gel electrophoresis, NMR Spectroscopy, X-Ray Diffraction, and microarray - Applications of Bioinformatics.

UNIT II

Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL) - Protein databases (Primary, Composite, and Secondary) - Specialized Genome databases: (SGD, TIGR, and ACeDB) - Structural databases (PDB, MMDB, CATH, SCOP) - Structural features of RNA: Primary, Secondary, Tertiary. Introduction to RNA Secondary structure prediction - Methods for RNA Secondary structure prediction, Limitations of RNA Secondary structure prediction.

UNIT III

Protein Structures: Primary, Secondary, Super Secondary, Domains, Tertiary, Quaternary, Ramachandran plot - Protein secondary structure prediction methods: GOR, Chou-Fasman - Protein Tertiary structure prediction methods: Homology Modeling, Protein folding, Molecular Dynamics of Protein, Molecular Docking of Protein - Motif databases and analysis tools. Domain databases (CDD, SMART, ProDom) and Analysis tools - Hidden Markov Model (HMM).

UNIT IV

Pairwise Sequence alignment (BLAST and FASTA Algorithm) and multiple sequence alignment (Clustal W algorithm) - Methods for presenting large quantities of biological data: sequence viewers (Artemis, SeqVISTA) - 3D structure viewers (Rasmol, SPDBv, Chime, Cn3D, PyMol), Anatomical visualization. Quantitative Structure Activity Relationship (2D & 3D). Combinatorial libraries & their design. High throughput screening, virtual screening, Lipinski's rule of five.

UNIT V

Genomics: Genome Annotation, Genome Assembly, Structural and Functional Genomics. System biology - Interactomics (PPI), Fluxomics, Biomics. Metagenomics - Metabolic pathway database (KEGG pathway database) - Concept of metabolome and metabolomics – Computer Aided Drug Design (CADD) – Drug Design Approaches – Target based, Structure based and *De novo* Approaches –ADME –Tox Property Prediction and Models.

Text Books:

1. Lesk, A.M. 2007. Introduction to Bioinformatics (Second edition). Oxford University press, New Delhi.
2. Murthy.C.S.V. 2004. Bioinformatics. Himalaya Publishing House. Delhi.

Reference Books:

1. Attwood, T.K., Parry-Smith, D.J. Phukan, S. 2014 (Ninth Impression). Introduction to Bioinformatics. Pearson Education, Delhi.
2. Bal, H.P. 2007. Bioinformatics Principle and applications. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Campbell, A.M and Heyer, L.J. 2004. Discovering Genomics, Proteomics and Bioinformatics. Pearson Education, Delhi.
4. Gladis HelenHepsyba, S. and Hemalatha, C.R. 2009. Basic Bioinformatics, MJP Publishers, Chennai.
5. Krane, D.E and Raymer, M.L. 2006. Fundamental Concepts of Bioinformatics. Pearson Education, USA.
6. Kumerasan, V. 2009. Biotechnology (Revised Edition), Saras Publications, Kanyakumari.U
7. Lohar, P.S. 2009. Bioinformatics, MJP Publishers, Chennai.
8. Ramawat, K.G. and Goyal, S. 2009. (Fourth Revised Edition). Comprehensive Biotechnology, S.Chand and Company Ltd, New Delhi.
9. Rastogi, S.C., Mendiratta, N. and Rastogi, P. 2011 (Third Edition). Bioinformatics Methods and Applications: Genomics, Proteomics and Drug Discovery. PHI Learning Private Limited, New Delhi.
10. Sharma, V., Munjal, A. and Shanker, A. 2011-2012. A Text Book of Bioinformatics. Rastogi Publications, Meerut, India.
11. Smith H, J, Smith & William. 1988. Introduction to the Principles of Drug Design, 2nd ed, Wright London.
12. Sundaralingam, R. and V.Kumaresan. 2008. Bioinformatics. Saras Publication. Nagercoil.
13. Sundararajan, S and Balaji, R. 2003. Introduction to Bioinformatics. Himalaya Publishing House, Delhi.
14. Thiagarajan, B. and Rajalakshmi, P.A. 2009. Computational Biology, MJP Publishers, Chennai.
15. Westhead, D.R., Parish, J.H and Twyman, R.M. 2003. Bioinformatics. Viva Books Private Ltd., New Delhi.
16. Xiong, J. 2013 (Reprint). Essential Bioinformatics. Cambridge University Press, New York, USA.

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CORE COURSE IX

ENVIRONMENTAL BIOLOGY

Objectives:

The main aim of this paper is to give information about the environment of biotic and abiotic factors, bio-geo chemical cycles, Habitat, population ecology,pollution and their control measures. The toxicant related with environment, the toxic effects in different fields and to find out the environmental pollutants.

UNIT I

Abiotic factors: Water, soil, light. Biotic factors; Intra (Aggregation, colony formation, social organizarion) and inter specific associations (Neutralism, symbiosis and antagonism). Structure and function of an ecosystem: - Autotrophic and heterotrophic producers, consumers - pyramids – primary and secondary productivity - methods of measurements -different trophic level - energy flow in an ecosystem - food chain - food web -.characteristics of different biomes. Interaction between environment and biota, Energy and nutrient flow

UNIT II

Nutrient cycles – Nitrogen, phosphorus, Carbon and sulphur in nature – role of microbes in environment. .Biotic community – Concepts – Stratification – ecological niches – ecotone and ecological succession. Population ecology and biological control. Population growth – Biotic potential Regulation of population size –Population interaction – Human population and urbanization.

UNIT III

Habitat Ecology-fresh water, marine, estuary, terrestrial, forest and desert. Biodiversity-basic concepts, types, hot spots of bio diversity. Wildlife conservations and management – International / National policies and conservation strategies of Biodiversity management. Remote sensing, Satellite images – Aerial photography – Thermal and infrared images, radar in ecological applications. Instrumentation – GPS, radio telemetry and satellite telemetry techniques used in ecological research. GIS techniques in ecological research.

UNIT IV

Environmental Pollution: Effects and control measures of Air, Water, Soil, Marine pollution. Acid rain, Ozone layer depletion. Bio accumulation – Bio magnification, BOD, COD, TDS, TSS. EIA – Steps in EIA – Methods of EIA. Acute toxicity – Chronic toxicity – Assessment of safety/risk. Natural resources - sustainable development – survey. Energy resources - environmental quality standards – soil conservation.

UNIT V

Toxicology: types of toxins - Pesticide toxicity: Pesticides and their types – Insecticides – Herbicides – fungicides – rodenticides – nematicides – fumigants. Properties and effects of pesticides on organisms – acute and chronic effects, biological monitoring and regulation. Toxicological methods: Acute, sub-acute chronic and special tests. Statistical concept of toxicity - Concentrations. Response relationship – Margin of safety, Toxicity curve, Cumulative toxicity, and toxicity of chemical mixture. Lc_{50} and L_{D50} - bioremediation of toxic substances.

Text Books:

1. Chapman, B.C and Reigs. M.J. 1997. Ecology principles and application. Cambridge University Press, U.K.
2. Clark, G.C. 1963. Elements of ecology. John Wiley and Sons Inc., New York.
3. Odum, E.P. 1996. Fundamentals of Ecology (III Ed.). Nataraj Publishers, Dehradun. P 574.

Reference Books:

1. Ahmad, Y.J and Sammy, G.K. 1985. Guidelines to Environment Impact Assessment in developing countries. Hodder and Stoughton Ltd., Londan.
2. Asthana, D.K and Asthana, M. 2001. Environment problems and solutions. S. Chand and Co., New Delhi.
3. Bhatia, H.S. 1998: A Text Book On Environmental Pollution And Control, Galgotia, New Delhi.
4. Kumar, H.D. 1997. Modern concepts of ecology. Modern Printers, New Delhi. P 478.
5. Paul Colinvaux, 1986: Ecology. John Wiley And Sons, N.Y.
6. Srivastava, R.P. and Saxena, R.C.1989. Textbook of Insect toxicity. Himansha publications, Rajasthan.
7. Trivedi, P.R and Gurdeepraj, K. 1992. Environmental biology. Akashdeep Publishing House, New Delhi.
8. Williams.R.T 1959. Detoxification mechanisms. Wiley. New York.

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CORE COURSE X

IMMUNOLOGY

Objectives:

The main aim of this paper is to obtain knowledge about immune systems, cells of immunity and its role in protection of our body .Antigen, antibody concepts, hypersensitivity, MHC and complement pathways. Different immunological techniques used in the clinical testing.

UNIT I

Introduction to immune system. Innate and Adaptive immunity – Lymphoid system: Primary and secondary lymphoid organs, tissues. Cells of immune system: lymphoid lineage, myeloid lineage. Molecules- complement, acute phase proteins, interferon, lymphokines and cytokines.

UNIT II

Antigens: Types of antigens – factors of antigenicity. T cell and B cell epitopes, haptens, adjuvants and carriers. Antibodies: Ultra structure of immunoglobulin, types, paratopes, characteristics and functions. Monoclonal and polyclonal antibodies. Antibody receptors- T cell receptors (TCR), Genes for TCR, TCR diversity. Immune response- Humoral and cell mediated immune response.

UNIT III

Hypersensitivity: Definition and classification; Types- I, II, III, IV and V. Major Histocompatibility Complex (MHC): Genomic organization, MHC molecules, peptide binding. Complement activation: Classical and Alternate pathway. Transplantation immunology: Types of grafts- Allograft rejection- Prevention of allograft rejection.

UNIT IV

Vaccination: Principle, antigen as vaccines, subunit vaccines, recombinant vaccines, anti idiotypic antibodies as vaccines, Vaccination schedule for humans. Tumour immunology: Tumour antigens- Immune response to tumours- Immunotherapy to tumours- Tumour vaccines. Autoimmune diseases. Immunodeficiency- inherited and acquired.

UNIT V

Immunotechnology: Clinical methods for detection of antigens and antibodies: Immunodiffusion: Ouchterlony analysis-Double immunodiffusion. Immunoelectrophoresis. Binder- Ligand assays: RIA, ELISA, EMIT. Histocompatibility testing: HLA typing- RFLP method, PCR method.

Autoimmune disease detection: Rheumatoid arthritis, Hepatitis – B virus test. Immune complex detection: Rossette Forming Array, Plaque Forming Array.

Text books:

1. Janis Kuby.1997.Immunology.W.H.Freeman & company, New York.

Reference Books:

1. Arumugam, N.*et al.*, 2005. Immunology and Microbiology, Saras Publications, Kanyakumari.
2. Kannan, I. 2007 Immunology, MJP Publishers, Chennai.
3. Rao,C.V.2006.Immunology. Narosa Publishing House, New Delhi.
4. Ivan M. Roitt *et al.*, Essential Immunology. XII Edition, Wiley- Blackwell Publishers.UK.
5. Shetty, N. 2006. Immunology. New Age International (P) Limited, Publishers. New Delhi.

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CORE PRACTICAL IV

ENVIRONMENTAL BIOLOGY & IMMUNOLOGY (P)

Environmental Biology

1. Report on ecological collection representing different habitats and their adaptations – sandy, muddy, rocky shores fauna
2. Animal Association: Parasitism, Symbiosis, Mutualism and Commensalism
3. Hydrological studies of water samples with special reference - Chlorides, silicates, calcium, total hardness, phosphates and nitrates – pH, dissolved oxygen and BOD, CO_2, Carbonates and Bicarbonates.
4. Quantitative and qualitative estimation of marine & freshwater plankton.
5. Estimation of primary productivity
6. Determination of LC_{50}

Immunology

1. Histology of lymphoid organs in Mouse
2. Preparation of antigen and raising of antibody – RBC and sperm proteins.
3. WIDAL test for typhoid detection
4. RPR test for Syphilis detection
5. Mancini's Single Radial immunodiffusion
6. Ouchterlony's Double immunodiffusion
7. Demonstration of Ig G by precipitation ring test
8. Demonstration for haemagglutination
9. Immuno- electrophoresis of human serum and anti-human serum (Demonstration)

Spotters:

Lymph node, Lymphocytes, Vaccine, ELISA, RIA.

A record of laboratory work shall be submitted at the time of practical examination

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ELECTIVE COURSE V (A)

SERICULTURE

Objectives:

The main aim is to give information about the culture of silkworm. It gives an idea for the self- employment opportunities to the students. The role of different research organizations and funding agencies to promote Sericulture.

UNIT I

Sericulture: Definition, history and present status; silk route. Mulberry and types of non-mulberry sericulture. Commercial varieties of mulberry plants used in Sericulture in India. Requirement for Mulberry Cultivation - Soil - Climatic conditions: Temperature, photoperiod, humidity and rainfall. Mulberry management: Land preparation- Irrigation- Manuring - Propagation of mulberry plant- Plantation methods. Profitable cultivation and Harvesting. Diseases of mulberry – fungal, bacterial, viral and Nematode diseases, Deficiency diseases and their remedial measures

UNIT II

Silkworm taxonomy and distribution. Univoltine, Bivoltine and Multivoltine races. Exotic and indigenous races in India. Life cycle of Mulberry Silkworm: Egg, larva, pupa and adult, life span. Morphology: Egg, Larvae: Mouth parts, legs, prolegs, spiracles, eyes, claspers and integumentary hair and sexual markings. Pupa: Sexual dimorphism. Adult: Mouth parts, antenna, wings and external genitalia - Silk glands: Structure, development and mechanism of silk synthesis - Hormonal control on metamorphosis, diapause, silk synthesis and reproduction.

UNIT III

Silkworm rearing: Rearing house -CSB model. Early age and late age rearing. Rearing appliances- Mountages- types of mountages and disinfectants. Seed: Collection of disease-free layings (DFLs), incubation, Hatching and Brushing- Feeding and rearing, spacing, cleaning and dusting. Mounting and cocoon production: spinning of cocoons. Harvesting, preservation, assessment, storage. Transportation: Cocoons, record maintenance, cost of cocoon production, leaf cocoon ratio.

UNIT IV

Silkworm diseases : Etiology, Structure, Symptoms, Preventive measures and control of viral diseases - Nuclear polyhydrosis virus (NPV) and Cytoplasmic, polyhydrosis virus (CPV) Infectious flacherie virus (FV) and Densonucleosis virus (DNV) Noesma bombycis (Pebrine disease). Bacterial diseases- Bacterial septicemia Bacterial gastroenteric disease Bacterial toxicosis . Fungal Diseases

-White muscardine, Green muscardine, Yellow muscardine. Silkworm pests—Tachinid Fly (Uzifly) Trycholgza bombycis, Dermistid beetles, Dermestes cadniverinus—Vertebrate and other silkworm pests and their control.

UNIT V

SILK TECHNOLOGY: Selection of Cocoon for reeling - Quality of cocoon - Physical and chemical properties of silk fibre. Raw materials for silk reeling - Cocoon processing - Cocoon drying- stifling, Cocoon sorting and preservation: deflossing. Marketing organization for Cocoon and Yarn - Raw silk manufacture - Silk by-products: Reeling waste and its utility in spun silk industry utility of pupae. Role of Central Silk Board and Directorate of Sericulture in extension programmes - Sericulture organization at state and national levels.

Text Books:

1. Ganga, G. and Sulochana Chetty, J. 2003. An Introduction to Sericulture (2nd Edition). Oxford and IBH Publishing co. Pvt-Ltd., New Delhi.
2. Ullal, S.R. and Narasimhanna, M.N. 1979. Hand book of Practical Sericulture. Central Silk Board, Bombay.
3. Taxima, Y. 1972. Hand Book of Silkworm Rearing. Fuji Publication, Tokyo.

Reference Book:

1. Handbook of silkworm Rearing: Agriculture and technical manual-1, Fuzi pub. Co. ltd., Tokyo, Japan 1972
2. Jolly,M.S. Director, CSR & TI, mysore Appropriate sericultural Techniques: Ed.
3. Krishnaswamy S.1986. Improved method of rearing young age silkworm: reprinted CSB, Bangalore.
NarasimhannaN M.N. 1988. Manual of silkworm egg production, CSB, Bangalore
4. Sengupta,K. Director , 1989.A guide for bivoltine sericulture: CSR & TI, Mysore
5. Shukla, G.S. and Upadhyay, V.B. 1997. Economic Zoology. Rastogi Publications, Meerut.
6. Tomar, B.S and N.Singh. A Text Book of Applied Zoology. 2007. Emkay publications. Delhi.
7. Wupang-chun and da-chung 1988. Silkworm rearing:, FAO, Rome.

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ELECTIVE COURSE V (B)

AQUACULTURE

Objectives:

The main aim is to give information about the culture of fishes and crabs. It gives an idea for the self- employment opportunities to the students. The role of different research organizations and funding agencies to promote aquaculture.

UNIT I

Definition- Scope of aquaculture- Aquaculture in India, Role of aquaculture on economic development, constraints in aquaculture, organization related to aquaculture and fisheries, types of aquaculture- Freshwater aquaculture, coastal aquaculture and marine aquaculture. Fresh water culturable fishes, marine water culturable fishes.

UNIT II

Fish ponds-Definition, breeding ponds, nursery ponds, rearing ponds, culture ponds (stocking ponds). Preparation of pond for fish culture, management of fish ponds, water quality management of fish ponds. Importance and composition of feeds; types of feed, wet and dry feeds, Artificial and live feeds-Artemia, Diatoms, Daphnia and Spirulina cultures.

UNIT III

Types of cultures – Extensive culture, Intensive culture and semi-intensive culture, monosex culture, monoculture, polyculture, cage culture and pen culture. Integrated fish farming – paddy cum fish culture, Animal husbandry cum fish culture, sewage fed fish culture. Culture practices : Major carps, Prawns, Lobster, Pearl Oyster, Edible Oyster Mussels and seaweeds.

UNIT IV

Fish disease management: Common bacterial, viral, fungal, protozoans and crustaceans diseases, their symptoms and treatment. Aquatic pollution – Definition, causes, ecological effects and control of water pollution. Hypophysation- Definition, principle and procedure of hypophysation – collection, preparation and injection of pituitary extract, selection of breeders, mechanism of pituitary action and advantages of hypophysation.

UNIT V

Genomic manipulation- Hybridization, Androgenesis, Gynandrogenesis and Polyploidy. Harvesting and transport of fish and its products. Fish preservation and fish processing technology – By products of fish and its uses. Marketing of

fishery products, Government organizations in Aquaculture. ICAR, CMFRI, CIFRI, CICFRI, CIFA, CIBA, CIFT & MPEDA.

Text Book :

1. Pillay, T.V.R. 1995. Aquaculture principles and practices. Fishing New Books, Blackwell Science Ltd., Oxford.
2. Shanmugam, K. 1990. Fishery biology and Aquaculture. Leo Pathipagam, Madras.
3. Santhanam, Sugumaran and Natarajan, P. 1997. A Manual of freshwater aquaculture. Oxford and IBH Pub. Co. Ltd., New Delhi.

Reference Books:

1. Arumugam.N. 2008. Aquaculture Saras Publications, Nagercoil.
2. Baradach, JE, JH Ryther and WO McLarney (1972) Aquaculture. The farming and Husbandry of Freshwater and Marine Organisms. Wiley Interscience, New York.
3. Chadar, S.L. 1980. Hypophysation of Indian major carps. Satish Book Enterprise, Agra, PP.146
4. Exporters manual and Documentation. 1999. Jain Book Agency. New Delhi.
5. Jhingran.V.C. 1991. Fish and fisheries of India, Hindustan Pub. Cord. New Delhi.
6. Kurian,C.V and Sebastin. 1992. Prawn and prawn fisheries of India, Hindustan Pub. Cord. New Delhi.
7. Rath, R.K. (2000) Freshwater Aquaculture. Scientific Publishers, (India), PO.Box.91, Jodhpur.

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BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.
M.Sc. Visual Communication   Course Structure under CBCS
(For the candidates admitted from the academic year 2016-2017 onwards)

Sem	Course	Course Title	Ins. Hrs / Week	Credit	Exam Hrs	Marks Int.	Marks Ext.	Total
I	Core Course – I (CC)	Dynamics of Visual Communication	6	4	3	25	75	100
	Core Course – II (CC)	Image and Imagination	6	4	3	25	75	100
	Core Course – III (CC)	Design Principles and Packaging	5	4	3	25	75	100
	Core Course – IV (CC)	Introduction to Film Studies	5	4	3	25	75	100
	Core Practical – I (CP)	Professional Photography (P)	8	4	3	40	60	100
		TOTAL	**30**	**20**				**500**
II	Core Course – V (CC)	Writing for the Media	6	5	3	25	75	100
	Core Course – VI (CC)	Theories of Communication and Visual Analysis	6	5	3	25	75	100
	Core Practical – II (CP)	Multimedia and Applications (P)	8	4	3	40	60	100
	Elective Course – I (EC)	Advertising and Public Relations	5	5	3	25	75	100
	Elective Course – II (EC)	Fundamentals of Sound	5	5	3	25	75	100
		TOTAL	**30**	**24**				**500**
III	Core Course – VII (CC)	Development Communication	6	5	3	25	75	100
	Core Course – VIII (CC)	Communication Research Methods	6	5	3	25	75	100
	Core Practical – III (CP)	Audio and Video Production Techniques (P)	8	4	3	40	60	100
	Elective Course – III (EC)	Audio Visual Media	5	5	3	25	75	100
	Elective Course – IV (EC)	Contemporary Media Systems	5	5	3	25	75	100
		TOTAL	**30**	**24**				**500**
IV	Core Course – IX (CC)	Media Management	5	5	3	25	75	100
	Core Course – X (CC)	Media Ethics	5	5	3	25	75	100
	Core Practical - IV (CP)	Web Designing Principles and Techniques (P)	8	4	3	40	60	100
	Elective Course – V (EC)	Culture and Communication	5	4	3	25	75	100
	Project	Dissertation & Internship	7	4	-	-	-	100
	TOTAL		**30**	**22**				**500**
	GRAND TOTAL		**120**	**90**				**2000**

Note:

Project   : 100 Marks
Dissertation   : 80 Marks
Viva Voice   : 20 Marks

Core Papers   -   10
Core Practical   -   4
Elective Papers   -   5
Project   -   1

Note:

1. Theory   Internal   25 marks   External   75 marks
2. Practical   "   40 marks   "   60 marks

Note:

1. Theory   Internal   25 marks   External   75 marks

2. Practical   "   40 marks   "   60 marks

3. Separate passing minimum is prescribed for Internal and External

   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The passing minimum not less than 50% in the aggregate.

Project

        Dissertation   60 Marks   [2 reviews – 20+20   =   40 marks
                                       Report Valuation   =   20 marks]
        Internship   20 Marks   20 marks
        Viva   20 Marks   20 marks
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CORE COURSE I

DYNAMICS OF VISUAL COMMUNICATION

Objective:

To understand principles of visual communication fundamentals to learn the Different perspectives on visual application, design, language and culture.

Unit I

Light and visual – Visualization process – Visual image – Principles of Colour: Psychology of colour, Colour theory and meanings – Sensual and perceptual theories – Attributes of visuals: Colour, Form, Depth and Movement.

Unit II

Visual language and culture – World culture, society and ethics, Understanding Popular Culture and Sub culture – Abstract thinking, Linear and lateral thinking – Holistic visual thinking.

Unit III

Visual media – Principles – Image and Imagination - Perspectives of visual images – Visual perception – Communication design, Graphic design and informational designs – Visual persuasion in various fields.

Unit IV

Introduction semiotics – Analysis - Aspects of signs and symbols – Sign and meanings – Description of signs – Denotations and connotations – Paradigmatic and syntagmatic aspects of signs – Signs and codes – reference systems – Audience interpretations - The semiotic and structuralistic approach to Visuals – Psychoanalysis and visuality; Subjectivity and unconscious – Voyeuristic gaze to the laconian gaze.

Unit V

Visual perspectives and its special features: photography, motion picture, television, computer graphics, new media, World Wide Web. Feministic approach to visual media – Postmodern and postcolonial approach to visuals – Marxixt approach to visual texts.

References:

1. Visual Communication – Images with messages 3rd Edition, Paul Martin Lester, Thomson Wadsworth, USA 2003.
2. Palmer, Frederic: Visual Elements of Art and Design, 1989, Longman.
3. Luin Annette, Power of the images, Rutledge and Kegan Paul, London 1985.
4. Nick Lacy, Images and Representation, Macmillan, London 1998.
5. John Fiske, Understanding Popular Culture, Unwin Hyman, London 1989.
6. Pradeep Manda. Visual Media Communication. Authors Press, New Delhi 2001.

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CORE COURSE II

IMAGE AND IMAGINATION

Objective:

To understand principles of design elements and develop the creative thinking by learning the basics through theories of image and imagination process.

UNIT I

Elements of Visual literacy; Image and Imagination; and Modern Image Makers. Elements of design; Principles of design: Unity, balance, rhythm, proportion, Movement; Language of design: white space, fonts, pictures, page layout and design.

UNIT II

Sensation and perception; Learning and thinking; Human Intelligence; Aptitude and personality Development; Motivation and creativity; Schools of psychology; Application of psychological concepts of visual communication.

UNIT III

Principles of perspective; Composition; Light and shade; Surface textures; Building visual vocabulary by exaggeration; Distortion, Stylization and Abstraction.

UNIT IV

The psychology of human perception; Form perception; Depth and distance perception; Binocular and monocular cues; Perceptual constancy; Illusion; Building visual vocabulary by exaggeration, distortion, stylization and abstraction; The visual and personal identity.

UNIT V

Thinking : Theories and models of thinking – Information Processing Theory, S-R theory, Cognitive theories, Simulation Models, Types of Thinking – Free Association, Imaginal Thought, Reasoning – Types, Problem Solving, Decision Making, Creative Thinking, Concept Formation, Language And Thought. Linear and lateral thinking – holistic visual thinking.

REFERENCES

1. Nick Lacy, Images and Representation, Macmillan, London 1998.
2. Stuart Price, Media Studies, Pitman, London 1993.
3. John Berger, Ways of Seeing, BBC and Penguin, London 1972.
4. Kulin Annette, Power of the Images, Rutledge and Kegan Paul, London 1985.

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CORE COURSE III

DESIGN PRINCIPLES AND PACKAGING

Objective:

To understand principles and elements of design with the various design software applications and exhibiting the nuances packaging processes.

Unit I

A brief history of graphic design – Elements of design – Principles of design – Process of Design – Functions of Design – Creativity and creative process – Traditional and modern design.

Unit II

Text and images: typography – styles and features –Colour in design – colour theory and combinations – Design and composition – Graphic design softwares – Features and applications of Coral Draw, Photoshop, Illustrator, Quark Xpress, Page Maker.

Unit III

Definition of packaging – History of packaging – The changing face of retailing – Packaging and social change – Packaging design today – Future developments – Types of packaging; basic, surprising, interactive and promotional.

Unit IV

Packaging process: Analysis of product – deciding the mode of packaging – Flexible packaging – Paper – Plastic films –Foils and specialty films – containers; Board based containers – Plastic containers –Glass containers – Metal containers – Labeling and Legislations; Nutritional and barcode labeling – Legal requirements.

Unit V

Final process of packaging: Lamination – Die cutting – Creasing – Folding – Strapping and stapling– Radio Frequency Identification tags and types.

References:

1. Bridgewater, Peter. An Introduction to Graphic Design. Quintel Publications, London 1997.
2. Gollingwood, R.G. The Principles of Art. Oxford University Press, New York 1958.
3. Nakamira, Sadao. The colour source book for Graphic Designers. Shoin Pub. Co Japan 1990.
4. Best of Graphic Design. Page One publicshing, Singapore 1993.
5. Hillman, David. Multimedia Technology Applications. Galgotia Pub. New Delhi 1998.
6. Steven Sonsino, Packaging design–Graphics materials technology, Thames & Hudson Ltd., London 1990
7. Packaging Graphics + Design by Renee Philliphs, Rockport Publishers, USA, 2001
8. The perfect Package by Catharine M. Fishel, Rockport Publishers, USA, 2000.
9. Packaging by Design Library, Rockport Publishers, USA, 1995.

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INTRODUCTION TO FILM STUDIES

Objective:

To know the background of Indian and foreign cinema and identify the techniques in film productions and film as medium of social change.

Unit I

Short History of Indian cinema – Brief history and trends of foreign cinema – Film as a medium of communication and Social change – Growth of Tamil Cinema – contributions of Tamil cinema to social and political awareness – Film Industry status – contemporary tends.

Unit II

Planning, Pre-production: Concept / story development – Scripting / Screen play writing – Budgeting – casting – locations – financing. Production: Shooting – Problems of artists – direction, cinematography. Post-Production: Editing - sound recording – dubbing – special effects – graphics and final mixing – distribution and exhibition.

Unit III

Mis-en-scene – space and time – framing – Film culture – Film genres – dividing a feature film into parts and genres (language, style, grammar, syntax), Documentary genres, Role of a cinematography, Editing dimensions of film editing – deconstruction of film, Award winning films – review – The power of sound, Foley sound, theatrical sound formats.

Unit IV

Camera Production: the shot, scene, sequence, story board, types of script, location shooting. Single camera Vs. multi camera production – rehearsal – digital intermediate – video format.

Unit V

Documentary and short films – World union of documentary film makers – cinema of reality – real life characters – real issues – story material – propaganda films and corporate films – films of expression – Indian documentary forms – National film policy.

References;

1. Ashish Rajadhyasha, Paul Wileman, Encyclopedia of Indian Cinema, Oxford Uni. Press, New Delhi 2005.
2. Proferes, Nicholas, Film Directing Fundamentals, Oxford University Press, 2001. Paul Wheeler, Digital Cinematography, Focal Press 2001
3. Monoco, James. How to read a film, Routledge, London 2001 Thoraval, Yves. The Cinema of India (1896 -2000).
4. Jag Moham, Documentary Films and Indian Awakening, Publications Division, New Delhi 1980.
5. Gaston Roberge, Another Cinema for Another society, Seagull Publications Calcutta 1985.
6. Sanjit Narwekar, Spectrum India 1994, 3rd Bombay International Film Festival for Documentary, Short and Animation Films.

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CORE PRACTICAL I

PROFESSIONAL PHOTOGRAPHY (P)

List of Practical's

Students has to choose any *ten* topics given below

1. Framing and Composition – Same elements in different positions
2. Lighting – Same subject in different lighting (Key light, Fill light, Back light & Background lighting)
3. Forms & Texture – Natural & Artificial
4. Patterns – Natural & Artificial
5. Portraits – Single & Group
6. Still Life
7. Nature (Landscape)
8. Animals
9. People
10. Travel Photograph
11. Action Photograph
12. News Photograph
13. Colour Correction & Cropping
14. Photographs & Special Effects
15. Caption & Cutline Writing

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CORE COURSE V
WRITING FOR THE MEDIA

Objective:

To know the writing style for different media with an understanding of its medium and audience characteristics for its diverse programmes.

UNIT I

Nature and characteristics of a Newspaper- Readers" perception – Information medium – Deadline – content variety – general and specialized newspapers – Editorial policy and style – language – inverted pyramid – source attribution - writing features and articles

UNIT II

General and specialized magazines – contents – target readers – language – writing style – pictures and illustrations – features and special articles – a comparative analysis – Freelancing.

UNIT III

Nature and characteristics of Radio – Radio for information, education and entertainment – Time and deadline factor – News headlines and highlights – News features – talk shows – interviews – Radio audiences – audience participation - language and style – New wave FM Radio – Radio Jockeying – target audience – content variety and style – music- competition – technological factors in writing for electronic media

UNIT IV

News writing- news angle, multiangled stories, feature openers, development of story, news formula, sign posting, accuracy and field work.

UNIT V

Internet as a medium - nature and characteristics – users profile – Newspapers online – hypertext - textual and visual limitations – language and style – multimedia support – contents online: informational, educational and entertainment – authenticity and piracy issues – regulations.

REFERENCE

1. Robert Hilliard, Writing for Television and Radio, Hasting House, New York, 1982.
2. Timothy Gerard, Writing for Multimedia: Entertainment Education, Training, Advertising and World Wide Web, Focal Press, Oxford, 1997.
3. Rosemary Horstmann, Writing for Radio, A and C Black, London, 1991.
4. Gerald Kelsey, Writing for Television, A and C Black, London, 1990.
5. J. Michael Stracynski, The Complete Book of Script writing: Television, Radio,
6. Motion Pictures, The stage Play, Writers" Digest Books, 1982.
7. David Keith Cohler, Broadcast Journalism: A Guide for the Presentation of Radio and Television News, Prentice-Hall, 1985.
8. Jill Dick, Writing for Magazines, A and C Black, London, 1996.

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THEORIES OF COMMUNICATION AND VISUAL ANALYSIS

Objective:

To understand the theoretical knowledge on communication from the normative period to the present practices with the sociological, psychological, Marxist, semiotic and feminist approach to theoretical perspective in visual medium.

Unit I

Communication Theory: Introduction – Communication concepts and theory – Media systems and theories; Authoritarian, Libertarian, Social Responsibility and communist theories – Basic communication theories – Two step flow of information – theories of selective influence.

Unit II

Defining Communication models; Aristotle"s model – Lasswell"s model – Shannon & Weaver"s mathematical model – Newcomb"s model – Osgood Schramm model – Gerbner"s model – Katz and Lazerfeld"s model – David Berlo"s model – White"s Gatekeeper"s model.

Unit III

Media uses and effects: effects theory – Uses and Gratifications theory – media dependency theory –social learning theory – cultivation analysis – agenda setting theory – diffusion of innovation – cultural studies and critical approaches.

Unit IV

Visual analysis theories: Sign and meaning making process; The semiotic and structuralistic approach to Visuals – Psychoanalysis and visuality; Subjectivity and unconscious – Voyeuristic gaze to the laconian gaze.

Unit V

Feministic approach to visual media – Postmodern and postcolonial approach to visuals – Marxixt approach to visual texts.

References

1. Mass Communication theory (6th edn) South Asia Edition, Sage, New Delhi, 2010
2. Theories of Mass Communication by Mattelart et.al, Sage, London 1998.
3. Essentials of Mass Commuiniction by Asa Berger, Sage, New Delhi 2000.
4. Understanding Media Theory by Kevin Williams, Oxford University Press, New York 2003.
5. Visual Methodologies, Gillan Rose, Sage Publications, London 2001.
6. Media Analyzing Techniques, Berger Asa, Sage Publications, New York 1998.
7. Ways of Seeing, Berger J, BBC London 1972.
8. Gender Trouble, Butler J. Routledge, London, 1990.

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CORE PRACTICAL II

MULTIMEDIA AND APPLICATIONS (P)

List of Practical's

Students has to choose any *Five* topics given below

1. Animation aspects. Color and texture.
2. Animation principles. Preparing for animation.
3. Animation for integration
4. Create a 2D animation Ad for a Product
5. Concept, Story and Scripting for 3D Feature
6. Character Designs using 3D Software
7. Design and Layouts of backgrounds using 3D Software
8. Key frame animation of characters using 3D Animation software
9. Texturing of backgrounds and characters using 3D package
10. Application of 3D titling

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ELECTIVE COURSE I

ADVERTISING AND PUBLIC RELATIONS

Objective:

To understand the advertising basics with the marketing perspective and the role of public relations as an industry and also the need for PR in media centre's itself.

Unit I

Role of Advertisement in Social and Economic Developments – Market Conditions – Perfect and Imperfect Conditions – Advertisement as a source of anti-cyclical measures. Advertising – Various Fields of Advertising – Advertising Jobs and Talents needed to fill them – Career Planning – Breaking into Advertising – Need for a successful career in Advertising.

Unit II

Psychology in advertising - Understanding the minds of the people – Exploiting the Weakness of Humanism – Family Prestige – Custom and Traditions – Individual Personality – Modeling in Advertisements.

Unit III

Kinds of Advertisements in Press Media – Selection of Media – Production of successful Advertisement – Types of Advertisements: a) Media Wise – Print, Radio, T.V, Films – b) Outdoor and Indoor – Bus Panels, Hoardings, Direct Mail, Exhibitions.

Unit IV

Advertising in India- Media wise – Audio-Visual Media – Advertisements servicing – Advertising policy in India – Advertising Agency System – Code and Ethics in Advertisement. Study of Efficiency in Advertising – Scientific Study of Advertising – Economy in Advertising – Types of advertising Research.

Unit V

Public Relations- Definition – Public Relations as an art in the system of management – Need for good Public Relations a) Information source of the concern b) Feedback c) Smooth internal / external relations for employee d) Management relations with employee. Traits of a good Public Relations Officer – Organizing a Public Relations Office – Training for efficient system of Public Relations

Need for good Public Relations arrangement in Media centers – Public Relations in Indian Press Media – Public Relations System in Radio a) Source to make the

Media effective b) Method of collecting programme through Public Relations – Public Relations System in Television Media – Public Relation System in Private Sector, Public Sector – Planning the Process for Public Relations – Types of Publicity – a) Meaning of publicity b) Publicity for Welfare Sake c) Cost Free Nature Publicity.

References:

1. Ahuja B.N and Chhabra, S.S, Advertising and Public Relations, Surjeet Publications, Delhi , 1990
2. David A.Aaker and John G Myers, Advertising Management, Prentice Hall of India Pvt. Ltd., New Delhi. 1983, 2nd Edition
3. John S.Wright and Daniel S. Warner Advertising, Mc Graw Hill Book Company Inc., New York, 1962
4. Mehta, D.S, Hand Book of Public Relations in India, Allied Publishers Limited., New Delhi, Reprinted 1991
5. Sontakki, C.N, Advertising, Kalyani Publishers, Ludhiana, 1989
6. John S Wright et al., Advertising, Mc Graw Hill Book Company, New York, 1962

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FUNDAMENTALS OF SOUND

Objective:

To have knowledge of sound from basics to the digital along studio communication set up and its functioning of various accessories associated with the sound recording.

UNIT I

Perception of sound - hearing sensitivity - frequency range- sound- wave length; the speed of sound; measuring sound; psychoacoustics - dBA and dBC concepts ; musical sounds, noise - signal dynamic range - pitch - harmonics-equalization-reverberation time, Sabine formula.

UNIT II

Sound isolation and room acoustics- means of control- treatments- studio layout – room dimensions- Basic set-up of recording system-analog, digital,- cables and connectors, interference, microphone , musical stands, equipment inter-connection – input, out meters-the essence of recording engineering.

UNIT III

The production chain and responsibilities - recording session, production charts and log, laying tracks, mono, stereo, panning, surround, filters and pad - studio communication, environment, head phones: types and uses, ambience noise, dolby A,B,C,SR,bdx. LFE.

UNIT IV

Microphones types - direction pick up pattern, phantom power, noise, choosing the right mike, technique   - Sound reproduction devices - zero level, monitors, specifications   listening test-Compression ratios -various sound file extensions-time code, synchronization   –positioning of microphones – speech-musical instrument s- standard rules,1/3 rule, care and handling - foley & sound effect creation.

UNIT V

Mixing console - Echo and reverberation - special effects units- equalizers & compressors, plug-ins - digital recording software - editing techniques. Input devices - Storage - Output devices - file transfer protocols- networking of studio -streaming - basics of broadcasting- AM, FM, mobile radio, internet radios, community radio, educational radio broadcasts, audio publishing .

REFERENCES:

1. Philip Newell, Elsivier. Recording Studio Design. Oxford: Focal press. 2005.
2. Strutt, John Williams, Baron. The Theory of Sound. Rayleigh. 1996.
3. Fahy, Frank Foundations of Engineering Acoustics. Academic Press. 2001
4. Acoustics and Psychoacoustics (2nd ed.). Oxford: Focal Press, 2001.
5. Morfey, Christopher L. Dictionary of Acoustics.. Academic press.2001.
6. Holman, Tomlinson. Surround Sound: Up and Running.. Oxford: Focal press.1999.
7. AlecNisbet. The Use of Microphones. Oxford: Focal Press, 2004.
8. Salkin, Glyn. Sound Recording and Reproduction. Oxford: Focal Press, 1996.

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CORE COURSE VII

DEVELOPMENT COMMUNICATION

Objective:

To have a comprehend understanding on communication as a tool for development from the beginning of independence to the practice of communication in the ICT era.

UNIT I

Definition and meanings of Development – Role of Communication in Development – Concepts and Theories - Communication for Development in Third World countries – Developments in different sectors in India – Communication infrastructure and new media growth-Communication as a tool for social and economic change.

UNIT II

Communication Technologies and human development – Mass media and dissemination development news – Communication networks and movements for development – Communication for literacy and empowerment- Mass media and rural development – Community media and development - Challenges and issues.

UNIT III

Information and Communication Technology in Development – Technology transfer – strategic management in developing countries – New media for socio economic growth – access and control issues – Govt. and private agencies in development campaigns –

UNIT IV

Globalisation – international political economy – IT policies – implementation of IT projects – private participation – competition – Public information and services through IT – development projects in India – Diffusion of innovation and adoption through media – cases.

UNIT V

e-Government: Concept and functioning of e-governance – system and operational control and management of e-government – public and private participation- information and services to the rural poor – egovt. policies and programmes of e governance in India – problems of access and use and challenges for the future.

REFERENCES

1. Ashwani Saith, M Vijayabaskar (2005). ICTs and Indian Economic Development, Sage, New Delhi.
2. Richard Heeks (2006). Implementing and Managing government: An International Text. Sage. New Delhi.
3. Avik Gosh (200^). Communication Technology and Human Development: Recent Experiences in the Indian Social Sector. Sage, New Delhi.
4. Srinivas R Melkote & Leslie Steeves (2001). Communication for Development in the Third Word : Theroy and Practice for empowerment. Sage, New Delhi.
5. Sumit Roy (2005). Globalisation, ICT and Developing Nations: Challenges in the Information Age. Sage, New Delhi.
6. Arvind Singhal and Everett M Rogers (2001). India‟s Communication Revolution. Sage,
7. New Delhi.
8. Subash Bhatnagar and Robert Schware (2000). Information and Communication Technology in Development: Cases from India. Sage, New Delhi.
9. Bella Mody (1991). Designing Messages for Development Communication: An audience participation based approach. Sage, New Delhi.
10. Goel Cohen (2004). Technology Transfer: Strategic Management in Developing Countries. Sage, New Delhi.
11. Kenneth Keniston & Deepak Kumar (2004). IT Experience in India. Sage, New Delhi.

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CORE COURSE VIII

COMMUNICATION RESEARCH METHODS

Objective:

To have a knowledge on research in social sciences and in the discipline of communication from the identification of research problem, execution and report writing.

UNIT I

Development of mass media research around the world –evolution of new media and the audiences Need for media analysis - Concepts and theories in Media studies.

UNIT II

Research procedure: Steps in doing research – Media Research problems – Review of media studies – sources of secondary data - Research questions and Hypothesis – Types of hypothesis - Sampling Procedure - probability and non-probability sampling techniques – merits and demerits of each – determinants of Sample size – Sampling error.

UNIT III

Primary Data: Types of data – nominal, ordinal, interval and ratio – Data collection methods and tools: Questionnaire – Types of questions – construction of a questionnaire – administration; Interview schedule and techniques – Focus group – observation techniques; Measurement of variables: Scales – Attitude scales: Procedure and application of Thurstone, Likert, Semantic Differential scales – Methods of testing Validity and Reliability of measurements.

UNIT IV

Research Design: Experimental and Non-experimental research methods and procedures – qualitative and quantitative studies – Descriptive and Analytical research- Cross sectional and Longitudinal research designs - factorial design - Content Analysis procedure and methods - Case study approach.

UNIT V

Date Analysis: Data classification, coding and tabulation – Graphic representation of data - Basic elements of statistics – Application of Parametric and non parametric statistics in hypothesis testing: chi-square, Student „t" test, correlation techniques, Analysis of Variance; Thesis writing method – Use of SPSS – Thesis writing format and style - Ethics in conducting research.

REFERENCES :

1. Research methods in mass communication" by stempell and westley, Prentice Hall, 1981.
2. Communication Theories: origins, methods and uses" by severin and tankard, Hastings house Publishers, 1979.
3. Mass media research – an introduction" by Roger wimmer and Joseph Dominick. (3rd edn.) wadsworth Pub1991.
4. Handbook of radio and TV Broadcasting" Ed – by James Fletcher,Van Nostrand Reinhold company, London 1981.
5. Studies in Mass communication and technology" Ed, by art Thomas, ablex publishing company, 1984.
6. Qualitative methodologies for Mass communication research" Ed by Klaus Bruhn Jensen and Nicholas W.Jankowski , Routledge, London, 1991.
7. Introduction to communication studies" (2nd edn.) by John Fiske, Routledge. 1990.
8. Channels of Discourse" edited by Robert Allen, Methuen & Co.. Ltd., London, 1987
9. International Media Research – a critical survey" Ed, by John corner et al... Routledge, London,1997.
10. Case study research – design and methods" by Robert yin, sage, 1984.
11. Media Analysis techniques by Arthur Berger , sage, New Delhi. 1988.
12. Content Analysis – An introduction to its Methodology" by Klaus Krippendorff, Sage, New Delhi. 1980.

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CORE PRACTICAL III

AUDIO AND VIDEO PRODUCTION TECHNIQUES (P)

List of Practical's

1. Give examples for different methods of storytelling.
2. Give examples for different types of Script- Writing.
3. Produce a 'Signature Tune' for an imaginary TV Channel.
4. Produce one segment of a 'Talk Show' not exceeding 10 minutes.
5. Produce one segment of a 'Musical Programme' not exceeding 10 minutes.
6. Produce one segment of a 'Children's Programme' not exceeding 10 minutes.
7. Produce a 'Promo' for a new serial.
8. Create a 'Story Board' for a short film not exceeding 20 minutes.
9. Produce a Documentary / Short film not exceeding 20 minutes.
10. Edit the given footage with a specific editing technique.

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ELECTIVE III

AUDIO VISUAL MEDIA

Objective:

To have an overview of the communication media's development, structure, characteristics and functioning and policies related to the broadcasting in India.

Unit I

Development of Radio Broadcasting in India – Ownership – Control – Autonomy for Radio – Types of Radio services- Radio as a source of News – Broadcast News – Value – Radio Language – News Bulletin – News Source for Radio – Reporters, Editors and Agencies – External News Services Interviews – Features – Writing for Radio.

Unit II

Special Audience Programmes – Rural and Farm Broadcasting – Educational Programmes – Programmes for Children, Women and Youth. Women Welfare – Children Welfare – Health and Family Planning – Rural Development – Urban problems

Unit III

Spread of Nationalism and Gandhism – Communal Harmony Programme at the Time of Emergency and Mourning – Involvement of Public and Radio Programme – Radio formats – Audience Research – Committee Reports on Radio in India.

Unit IV

Cinema and Society – Influence over Society- Effects – Cinema as Main Source of Entertainment – Powerful Media to Spread Message – Cinema for Political supremacy. Film Censor – Film Censor Enquiry Committee – Documentary Film – Newsreels – National and International Film Festivals – Film Awards – Future of Indian Cinema.

Unit V

Development of Television in India – News Programmes: a) News cast b) News Review – Formats of TV Programmes – Documentary – Special Features – Interviews. TV as a powerful Audio – Visual Media – Commercial and Sponsored Programme – Educational Service (ETV) – Satellite Instructional Television Experiment (SITE) – Role of TV in Social Changes – Cultural Exchanges – Economic Uplift – Advertisement in TV – Specialist causes and consequences – TV News and Agencies.

Governments policy on AIR to inform, educate, entertain and elevate a common man – Government Control over AIR in functioning – Competition among the Audio-Visual Media – Development of Videography – Cable TV. Audio-Visual Media in Developing Countries – Future of Audio-Visual Media in India – Research in Audio-Visual Media – Implications of Press Media over Audio-Visual Media.

References:

1. Chatterji, P.C, Broadcasting in India, Sage Publications, New Delhi, 1987
2. Mehra Massani, Broadcasting and the People, National Book Trust, New Delhi, 1985
3. Luthra, H.R, Indian Broadcasting, Publications Division, New Delhi, 1986
4. Warren K. Agee, Introduction to Mass Communication, 6th Edition, Oxford &IBH, Calcutta
5. Kumar, Keval J, Mass Communication in India, Jaico Publishing House, Bombay, Delhi, Bangalore, Calcutta, Madras, 1987
6. Krisha Sondhi, Problems of Communication in Developing Countries, Vision Books, New Delhi 1980
7. Jag Mohan, Documentary Films and National Awakening, Publications Divisions, Delhi, 1990
8. John Wyver, The Moving Image: An international History or Film Television & Video. Brazil
9. Blackwell, BFI Publishing, Oxford 1989
10. Andrew Boyd, Broadcast Journalism, Techniques of Radio and TV News, Heinemann Professional Publication.
11. Ivor Yorke, The Techniques of Television News, Focal Press
12. Robert Tyrell, The Work of the Television Journalism, Sugeet Publication.
13. Ahuja B.N, Audio Visual Journalism, Sugeet Publication.
14. Shrivastava K.M., Radio and TV Journalism, Sterling publishing Pvt. Ltd., New Delhi, 1989.
15. Mankekar, D.R., One-Way Free Flow

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ELECTIVE COURSE IV

CONTEMPORARY MEDIA SYSTEMS

Objective:

To have an outline of the different media practice in various countries and understand its characteristics of its content and its audience.

UNIT I

Characteristics of the media systems in the SAARC region with particular reference to the ownership patterns, audience characteristics and content categories.

UNIT II

An overview of the Indian media system with special reference to the impact of the emergency and post-emergency periods on the content and character of media.

UNIT III

Characteristics of the media systems in the ASEAN, North Asia and Middle East regions with particular reference to the ownership patterns, audience characteristics and content categories.

UNIT IV

Characteristics of the media systems in the regions of Western Europe, Eastern Europe, North America and Latin America with particular reference to the ownership patterns, audience characteristics and content categories.

UNIT V

Workshop: Students must analyze media products from at least three different media systems of the world and two case studies (each not less than 2500 words) must be submitted as the record for internal valuation and viva.

REFERENCE BOOKS

1. Elizabeth Fox,Media and politician Latin America
2. Sita Ram Sharma, Media and world Education Volume
3. GulrsKothali Newspaper Management in India
4. ZahidHussain –Vanitha Ray Media and Communication in the Third World
5. DayaKishanThussu, International Communication
6. ArvindShingal, Everet Rogers India's Communication Revolution
7. DayakishanThussu, Des Freedmar, War and The Media
8. A.GanesanThe Press in Tamil Nadu and the Struggle for Freedom1917-1937
9. J.Natarajan History of Indian Journalism
10. J.V.Vilanilam Mass Communication in India.

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CORE COURSE IX

MEDIA MANAGEMENT

Objective:

To understand the organizational structure of various media organizations and functioning of different departments from policy making to implementations.

Unit I

Introduction to media management - Principles of media management and its significance – Media as an industry and profession – India"s major media houses and their holdings.

Unit II

Ownership patterns of mass-media in India – sole proprietorship, partnership, private limited companies, public limited companies, trusts, co-operatives, religious institutions (societies) and franchisees (Chains). Policy formulation and controls in media organization.

Unit III

Organization structure of Media and different departments – Functions - general management, finance, circulation and Sales promotion – Pricing - Advertising and marketing, personnel management, production and reference sections; apex bodies: DAVP, INS and ABC.

Unit IV

Editorial – Response system. - Economics of Visual media – management, business, legal and financial aspects of media management. Budgeting and finance, capital costs, production costs, commercial policy, advertising and sales strategy, completion and survival, evolving a strategy and plan of action, operations, production schedule and process, evaluation, budget control, costing, tax, labour laws

Unit V

Planning and execution of programme production – production terms, control practices and procedures - Administration and programme management in media – scheduling, transmitting, record keeping, quality control and cost effective techniques. Employee / employer and customer relations services; marketing strategies – brand promotion (space/time, circulation) – reach – promotion – market survey techniques – human research development for media.

References:

1. The New Media Monopoly, Ben H. Bagdikian (Beacon Press, 2004)
2. The Problem of the Media, Robert W. McChesney (Monthy Review Press, 2004)
3. Management of Electronic Media, Alan B. Albarran (2nd ed., Wadsworth, 2002)
4. The Economics & Financing of Media Companies, Robert G. Picard (Fordham University Press, 2002)
5. The Business of Media, David Croteau and William Hoynes (Pine Forge Press, 2001)
6. Who Owns the Media? Benjamin M. Compaine, et. al., (3rd ed., Knowledge Industry, 2001)
7. Balancing on the Wire: The Art of Managing Media Organizations, James Redmond and Robert Trager (2nd ed., Atomic Dog, 2004)

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MEDIA ETHICS

Objective:

To know the ethical issues in media and to understand and practice it in a democratic set up with social responsibility.

UNIT I

Role and responsibilities of the Press – Press and Democracy – Powers and privileges of the press – Fundamental rights – Press freedom – Constitutional provisions – Reasonable restrictions – Press and the public opinion.

UNIT II

Media agenda – private and public media institutions – Media conglomeration – Commercial Vs Public interests – Media and politics – media and corporates – Ad. Revenue – Editorial policy – implications of foreign press in India.

UNIT III

News selection – News values – Journalists as gatekeepers – sources of news – maintaining confidentiality – investigative journalism – sting operations – fair practice and professionalism – cases of unfair journalism.

UNIT IV

Media and the Judiciary, Legislature and the Executive – Media Laws – violations and restrictions – media censorship – recent cases.

UNIT V

Role and powers of Press Council – Responsibilities of the Advertising Standards Council- Prasar Bharati : Responsibilities and powers and limitations – Broadcasting Council- Broadcasting codes – Film Censor Board: role and functions – other media regulatory bodies of the government

Reference:

1. Ahuja, B.N. History of Press, Press Laws and Communications. New Delhi: Surjeet Publications, 1988.
2. Aggarwal, Vir Bala. Essentials of Practical Journalism. New Delhi: Concept Pub. 2006.
3. Nalini Rajan (Ed.). Practicing Journalism. London: Sage Pub. 2005. Joseph, N.K. Freedom of the Press. New Delhi: Anmol Pub. 1997 Ahuja B.N. Audio Visual Journalism. New Delhi. Surjeet Pub. 2000.
4. Shrivastava, K.M. Radio and Television Journalism. New Delhi: Sterling Pub. 1989.

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CORE PRACTICAL IV

WEB DESIGNING PRINCIPLES AND TECHNIQUES (P)

Objective:

To understand principles of visual communication fundamentals to learn the Different perspectives on visual application, design, language and culture.

List of Practical's

1. Design a web site for (with interactive commercials) for Periyar University.
2. Design a web site for (with interactive commercials) the Department of Journalism and Mass Communication.
3. Design a web site for (with interactive commercials) any Government Department for e-governance.
4. Design a web site for (with interactive commercials) any NGO.
5. Design a web site for (with interactive commercials) an e-Business Organization.
6. Design a web site for (with interactive commercials) a Search Engine.
7. Design a web site for (with interactive commercials) Entertainment.
8. Design a web site for (with interactive commercials) a Social Networking Community.
9. Design a web site for (with interactive commercials) in Tamil with Unicode.
10. Design your own web site.

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ELECTIVE COURSE V

CULTURE AND COMMUNICATION

Objective:

To recognize and identify the cultural association of the society and application of it with to give an indigenous way of effective communication.

UNIT I

Why study media? Understanding mass media. Characteristics of mass media. Effects of mass media on individual, society and culture-basic issues. Power of mass media. Media in Indian society. Definition, nature and scope. Function of mass media.

UNIT II

Media Audience analysis (mass, segmentation, product etc, social uses). Audience making. Active Vs Passive audience: Some theories of audience-Uses and Gratification Uses and Effects etc.

UNIT III

Media as text. Approaches to media analysis Marxist, Semiotics, Sociology, Psychoanalysis. Media and realism (class, gender, race, age, minorities, children etc.)

UNIT IV

Media as consciousness Industry. Social construction of reality by media. Rhetoric of the image, narrative etc. Media myths (representation, stereotypes etc.) - Cultural Studies approach to media, audience as textual determinant, audience as readers, audience positioning, establishing critical autonomy.

UNIT V

Media and Popular culture-commodities, culture and sub-culture, popular texts, popular discrimination, politics popular culture, popular culture Vs people's culture, celebrity industry-personality as brand name, hero-worship etc. Acquisition and transformation of popular culture

REFERENCES

Potter, James W (1998) Media Literacy. Sage Publications
Grossberg, Lawrence et al (1998) Media-Making: Mass Media in a popular culture. Sage Publications
Berger, Asa Authur (1998). Media Analysis Technique. Sage Publications

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PROJECT

DISSERTATION & INTERNSHIP

DISSERTATION

To demonstrate the student's competence in a chosen area of specialization with a view of gaining a placement in the Media Industry.

Methodology

Students are expected to do a project of professional nature within the stipulated time. Criteria for selecting the topic will be based on the area of specialization by the student. Emphasis will be given to producing works that are of professional and broadcasting quality that will help students enter the media industry with an evaluated portfolio. The project presentation and viva voce will complete the process of evaluation.

INTERNSHIP

To help student get exposed to actual situations and functioning of the media industry and experience reality.

Methodology

The student will be attached to the media industry for a period of three months on an internship basis. The intern will be exposed to a particular area of specialization. The department in coordination with the industry will closely monitor the progress of the intern. A Report and a viva-voce will complete the process of evaluation.

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